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# PARONOMASIC PUNS: TARGET RECOVERABILITY TOWARDS AUTOMATIC GENERATION

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# PARONOMASIC PUNS:

# TARGET RECOVERABILITY

# TOWARDS AUTOMATIC GENERATION

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# ABSTRACT

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The aim of this dissertation is to create a theory to model the factors, prominently, but not exclusively the phonological similarity, important in imperfect punning and to outline the implementation of this measure for the evaluation of possible imperfect puns given an input word and a set of possible target words. Imperfect, heterophonic, or paronomasic, puns differ from perfect, homophonic puns in that the target is different in sound from the pun. While homophonic puns are interesting for the linguist primarily with respect to their semantics, heterophonic puns present a research issue also to the phonologist, because they use one of two similar sound sequences to stand for both meanings associated with them, for example, *bang* to denote a noise as well as a financial institution. The specific question here is, how much contrast is possible between the pun and its target to make the latter recoverable, in terms of the semantics, phonology, and syntax of the pun-target pair and its context. The theoretical framework for the phonological part of this project is inspired by a recent version of Optimality Theory (OT), adopted in phonology, because it is able to describe the occurrence of related forms through a selection process from among possible candidate forms more appropriately than derivational approaches can by way of rules operating on one input form and

yielding one output form. Taking more parameters—both phonological and syntactic—into account than previous studies, this project is intended to describe the linguistics of the imperfect pun in terms of a set of hierarchies of constraints weighing the differences found between the puns and targets of a sample corpus. Based on this measure, I will outline a computational implementation of the results that can evaluate an input word with respect to a set of existing English words from a machine-readable dictionary. The basic idea is to assign values to constraint violations and combinations thereof and then adding up the "penalty" for each violation in which a possible target does not conform to the pun.

# 1. INTRODUCTION

## 1.1 Outline

The intended audience of the present study are primarily humor scholars, for whom the basic linguistic ideas involved will be outlined in sufficient detail, but also linguists—prominently, phonologists—who should be interested in the insights gained from applying their linguistic theories the field of humor and for whom so much detail will be provided in some sections that the humor scholars may not be able to benefit from all of them, and I apologize to my colleagues in the field of humor research. This is particularly the case in chapters 3 through 5. The humor scholars, in turn, may want to skip section 2.1 as it introduces basic semantic humor theory, which will be relevant for the linguist to follow the discussion.

Humor in general and puns in particular, the central focus of the present study, provide a field of application for all subdisciplines of linguistics, and chapter 6 will focus on linguistic contributions to the study of the pun beyond phonology. But semantics, in particular script-based semantics, has contributed most prominently to the analysis of humor. Accordingly, after the phenomenon of the pun as the purview of the paper has been outlined in chapter 1, this contribution will be presented in detail in chapter 2. On this foundation, I will focus on the question what makes a good heterophonic pun in the remaining chapters of the present research.

Chapter 3 surveys previous work on sound similarity that approached the issue at the level of distinctive features in which two segments differ. While there are some distributional insights to be gained from such approaches, it will become clear in my discussion that the isolated distinctive feature is neither the degree of abstraction, nor the amount of environment—namely none—with the help of which the relation between a pun and its target word can be described. But important empirical results from Sobkowiak's study (1991) will be used to inform the present research inspired by the more recent and theoretically much better grounded work in optimality theory (OT) surveyed in the following chapter.

In chapter 4 the theoretical framework for this central section is a metaphorical model-extension of a recent version of OT, which will be briefly summarized in its canonical form, before the following sections will focus on Correspondence in OT and its theoretical implications as well as several applications. Recently, OT has been very successfully applied to the relation between related output forms, for example, in reduplication and semi-rhymes, as well as in an initial study on the onsets of imperfect puns.

Chapter 5 is the core of this research, where the previous discussion and results are brought together, adapted and united with the new insights gained in the present study. Taking more parameters—phonological, syntactic, and semantic—into account than previous studies, and accounting for the environment of the differences as well as the asymmetricality of the target-pun relation, my project is intended to arrive at a hierarchy of constraints weighing the differences found between 1,182 puns and targets of a sample corpus (selected from 4,000 transcribed puns in Sobkowiak (1991) and based on Crosbie

(1977)). The format of this central section is the detailed description of the output-output constraints violated in punning and the cost implications of these violations. Based on this measure, the final section of chapter 5 outlines a computational implementation of the results for an application of this research that can evaluate an input word with respect to a set of existing English words, for example the CELEX corpus, or CMU Dict. The basic idea that will be developed in this section is to assign values to constraint violations and combinations thereof and then to add up the "penalty" for each violation in which a possible target does not conform to the pun. The lower the penalty, the better the pun. If the penalty is too high, the target is out.

Chapter 6 shows how these phonological constraints of imperfect punning interact with supporting phenomena analyzed at the morphological, syntactic, and semantic levels. Syntactic parameters that need to be taken into account are the word class identity of pun and target, as well as the question across what kind of word boundaries and in what syntactic phrase contexts such contrast between these forms can be established, as, for example, in the following attested puns: *Adelaide* targeting "I'd have laid"[1] and *Adelia* targeting "I'll deal you." In particular, formulaic patterns like idioms and proverbs have been found to play a prominent role at this level. Discussing the importance of the interaction of such issues casts a new light on the relative importance of phonological similarity in punning as a type of ideal, symbolic, and not primarily acoustic similarity which functions as the logical mechanism of the humor in jokes, and at the same time concrete, acoustic similarity that facilitates the recovery of a target given the word that

[1] I am grateful to Shaun Hughes who made me aware of Sobkowiak's mistake in reading the target of this puns as "I've laid."

puns on it and the torso of text surrounding it. As such it describes new insights into the pun as a linguistic problem in general.

The final summary in chapter 7 provides an overview of the results achieved in this research, and, on this basis, approaches the theoretical issues of drawing clear boundaries in the purview of research, and the implications of the present research in humor theory for linguistics in general and phonology in particular.

## 1.2 Main Hypotheses

The central question that inspired this research is whether the phonological difference between a pun and its target can be described and explained more adequately within a framework inspired by Optimality Theory (OT) than it was possible with previous theories, most notably feature-based approaches. While this will shed light on the nature of puns as the particular object of study, such an explanation will also facilitate a better understanding of the phonology of English in general, as well as the usefulness of the theoretical approach and its method.

Trivially underlying this question is the observation that a pun and the word it is punning on must be similar in sound. Deriving from this observation and research in humor theory, the present study will be based on two distinct hypotheses related to the sound similarity in imperfect puns and just as valid for the sound identity in perfect puns:

(1) A target and its pun cannot be arbitrarily different in sound because their similarity has a function in
  a. the phonological support for recovering the target from the pun, and
  b. creating the humorous semantic overlap between the two scripts, one including the pun, the other including, and often triggered by, the target.

In the following example, with respect to hypothesis (1a) the target “pearly” is sufficiently similar in sound to be recoverably from the pun “curly” to evoke the latter, and the idiomatic force of the collocation “Pearly Gates” aids this recovery substantially.

(2) *Labia majora*: the curly gates.
*curly* -> *pearly* (60)[2]

Note the nomenclature used in the present study. The term *pun* will be reserved for the ambiguous word in the text—“curly” in example (2)—of what will be called the *punning joke*. The second word that sounds similar to the pun and is not actually present in the text, but paradigmatically available—is called the *target*—“pearly” in the example.

With respect to hypothesis (1b), the two main semantic requirements for a text to be a joke are, in short, a semantic opposition, here the sexual vs. non-sexual as non-religious vs. religious, in general a low vs. high opposition, and compatibility of part of the text with both these meanings. This portion of the text is the pun, compatible with one meaning, and the paradigmatically available target, compatible with the other. But there is not only the overlap in sound between the pun compatible sexual meaning (“curly” pubic hair) and the non-sexual religious meaning triggered by the target (“pearly” gates), but also a semantic one, both “gates” being entrances to pleasurable, blissful, places. In this respect, despite being somewhat crudely anatomically graphical, example (2) is actually an exceptionally good punning joke. As will be discussed in more detail in section 2.3, many puns create the overlap only through the sound similarity, which

[22] I adopted the following notational convention for pun examples in these early chapters where examples aren’t taken exclusively form Sobkowiak (1991): After the full text, first the pun and, after an arrow, the target are given in italics as they are spelled in English; after a comma, the standard IPA is supplied in the usual square parentheses for both, pun and target, if the phonology is part of the point of the particular example; in later examples the transcription is provided according to Sobkowiak’s convention after it will have been introduced; if the source of the pun text is given as a number only, it refers to pages in Crosbie (1977), the source of the corpus used here.

renders them mere wordplay, but not humor. And I claim that this lack of semantic overlap is the reason puns are often perceived as feeble and unsophisticated humor.

In sum, if a pun in a text is too different in sound from the target to fulfill function (1a), the punning joke fails completely, no humor is created, the text is not a joke, and, if the attempt to joke has been detected, the teller will probably be prompted to supply additional explanations to make the target recoverable, although this is a dangerously face-threatening act. But if the pun and target are sufficiently similar in sound for the latter to be recovered, the text may be perceived as a joke, but the pun-target pair may still be so dissimilar in sound that function (1b) is barely fulfilled and it will be perceived as a bad joke. But, again, this second function is interacting in crucial ways with the semantics of humor.

As should have become clear, the recovery function (1a) of the sound similarity will be the central interest of this dissertation. The specific kind of punning logical mechanism (1b), on the other hand, is discussed in detail in section 2.2. This specific form in which the major requirement for a text to be funny is manifested in punning is a major factor interacting with the other ones I will introduce in the present study. At one level, the semantic relation between a pun and its target is straightforward: two meanings of words are similar, because their signifiers sound similar. But while I will focus on the question in what way they *sound similar*, I will not attempt the far more interesting task of explaining how the meanings *are* alike, "overlapping" in terms of the semantic theory this approach is based on, beyond summarizing and relating what has been attained so far, and what may well be all we can attain at this stage of research in semantics. The assumption is that only if puns conform to the phonological constraints that will be discussed here, can they fulfill their semantic function, the latter being, so to speak, a constraint working largely against—and not alongside—the ones within the scope of the theories employed here. While this sounds trivial, it has the important implication that the humorous logic is indispensably facilitated by the phonological similarity. In other words, puns and targets must be as similar as possible to fulfill the functions described in (1), while they must be different enough to represent two different lexical items denoting two different meanings, which can then be presented as opposite in the text of the joke. But they can never be perceived as not being similar at all to still form a pun-target pair.

A related, but different issue is the semantic support for the recoverability of the target. This rarely operates along the lines of the semantics of humor in particular, but through the general principles of semantic coherence and priming. This point will also be discussed in more detail in a chapter 6 in connection with the non-phonological factors of heterophonic punning.

The main problem that arises from this broader look at the issue of punning is the delimitation of the purview of the research in order to not have to do a full analysis of *all* aspects of heterophonic punning, or—even worse—any text in the English language. A joke, and in particular a verbal joke, of which the pun is the prototype, is a text, an artifact of the most complex symbolic system we know, namely, human language. In the processing of a text, we employ all techniques available to us, and these techniques are analyzed in linguistics in different subdisciplines, most centrally semantics including pragmatics, but also phonology, morphology and syntax. Therefore, an exhaustive analysis of a text will use all available theories and methods from all these fields to capture all factors, as well as the complex interaction between them, relevant to the texts description. But such an approach is, of course, neither science nor attainable. A level of abstraction must be found at which we can make meaningful statements based on the theory we chose, so that we can ignore less relevant issues and ensure that our model of the phenomenon under scrutiny does not aim to recreate the phenomenon itself and thus become just as unwieldy and consequently fail to provide insights.

I realize that I open myself up to this very criticism, when I extend the discussion to the syntactic and semantic factors of heterophonic punning. But I claim that failing to outline them to illustrate the importance of these aspects for the phonology of imperfect puns would be equivalent to discussing the history of Bauhaus architecture based exclusively on the basis of the types of concrete used in erecting the actual buildings and a general notion of angles. In short, while this paper is about sounds as the stuff from which language is built, it needs to relate its findings to the purpose for which it is used, namely to create meaning—understandable to humans practically and functioning aesthetically, as English language and as the art of humor.

The rationale underlying my approach is then still first and foremostly a phonological one: Heterophonic puns can reveal much about phonotactics, because they have to obey not just them, but also the need for one segment to sound like one word (or lexeme) and at the same time close enough to another, while homophonic pun segments sound exactly like two lexemes. The question to be answered is then, in short, what *sounding similar* means and *how* the similarity is realized in pun-target pairs. The answer will lie in a descriptive method inspired by OT and an explanation sketched in relation to perceptible similarity and additional crucial factors lying outside the scope of purely phonological approaches.

## 1.3 General Linguistic Parameters of Punning

After the theoretical issues involved in this research have been briefly introduced, the ground is prepared for a more detailed description of the phenomenon at hand. In view of the rich taxonomies developed very early on in classical poetics and rhetoric, it seems helpful to have a brief look at medieval rhetoric as it can sufficiently contribute to the clarification of terminological issues in puns. The *Rhetorica ad Herennium* (Ad Her.), long attributed to Cicero, and the *Poetria Nova* (PN), attributed to Geoffrey of Vinsauf and based on the doctrine of Ad Her. (cf. Gallo 1971), include the following selection of relevant figures of word-play:

1. *traductio*:[3] same sign, used twice (*Ad Her.* IV. xiv. 20-21, *PN* 1104-8)
2. *adnominatio*: slightly different sign, used twice (*Ad Her.* IV. xx. 29, *PN* 1140-44)
3. *significatio*: same sign, used once (*Ad Her.* IV. liii. 67, *PN* 1550-53)

Medieval rhetoricians—as well as modern-day linguists as we will see in this section—put emphasis on the distinction between homonymous (mostly homophonic and

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[3] A special form of *traductio* is the *rime riche*. Ideally, a rime riche uses the same sign not only twice, but also in rhyming, usually endrhyming, position. The signs should be identical in sound, but in less ideal form also only similar. Rime riche, like the other figures of speech, need not necessarily have a punning, that is, humorous, intent, but can be a purely rhetorical ornament or a style-marker. The purest form of the rich rhyme is then the connection of two phonologically identical forms that stem from different words and have different meaning.
So that I have my lady in myne armes.
For though so be that Mars is god of armes, (KnT I 2247-48)
[armes = arms (limbs + weapons)]

possibly homographic[4]) puns and heteronymous, heterophonic, paronomasic, or "imperfect puns." The former feature the same sign once, or twice, in both cases with two unrelated[5] meanings, the latter feature two slightly different signs, or one sign that triggers a slightly different one, both with different meanings. The following table illustrates the difference:

Table (1): Types of Punning

| | | |
|---|---|---|
| A. heteronymy | | [horological instrument vs. male genitalia] |
| 1. single sign | (pure) | "your clock is very big" |
| 2. double sign | adnominatio | "his clock was bigger than his cock" |
| B. homonymy | | [domesticated male bird vs. male genitalia] |
| 1. single sign | significatio / syllepsis | "the farmer has a big cock" |
| 2. double sign | traductio / antanaclasis | "the cock has a big cock" |

In this table, types of pun are listed according to two main criteria and two intersecting additional criteria: Heteronymical puns under A involve a pun and target that are not identical but similar in sound, while homonymical puns are a special case of this in that the similarity is perfect, that is, pun and target are identical in sound. Under each of these categories a distinction is made according to the presence or absence of the

[4] Homophony and homography are subcategories of homonymy: Two homonyms share spelling and pronunciation, while homophones share only pronunciation and homographs only spelling. Before Caxton's introduction of the printing press we find no large-scale systematization of spellings in late Middle English, thus orthography lent itself to the molding hand of the inventive scribe and homophony was more important as a criterion for potential puns than today. When a certain spelling indicated phonetic differences it could even be changed to some degree to function properly, for example, for end rhymes: *reaume, reawme, reame, realme, rewne* ("realm"). The distinction between *adnominatio* and *traductio* is so much at the mercy of the Middle English author (or scribe) that he or she can turn an *adnominatio* into a *traductio* at his—or, rarely, her—will. The same goes for the distinction between pure heteronymous puns and *significatio*. This is not to say, of course, that pronunciation—and accordingly spelling—was so free that "anything went:" Chaucer's beautiful *adnominatio* with "frankes" and "flankes" in ShipT VII 201-02, for example, could not have become a *traductio* (except for an audience consisting of native speakers of a language in which the distinction between the liquids [r] and [l] is not phonemic, for example, Japanese.

[5] When the two meanings are different, but related, one speaks of polsysemy, e.g., in the metaphorical extension of the meaning of "hot" from referring to a temperature to denoting an attractive human. For the present discussion the distinction between homophony/heterophony and polysemy is not assumed to be a significant parameter, as it seems to have little or no effect on the humor of the pun if the two meanings are etymologically related or not. I am grateful to a colleague at the University of Twente who made me aware of the possible significance of this parameter, but will leave the pursuit of this issue to others.

second sign, the target, in the actual joke text (2) or only paradigmatically as triggered by their corresponding puns (1). In type A1 a single sign, the pun, is used to evoke a second similar sounding sign which is thus paradigmatically present. A less frequent variant of this typical kind of paronomasia is illustrated in row A2 providing an example of *adnominatio* in which both the pun and the target are present in the text. This form of punning is not virtually never used in contemporary humor. Under B1 we find the corresponding variant of punning where only one sign is present in the joke text but it evokes the second identical sign and both their meanings, and under B2 the variant that shows both identical signs present in the text.

It should be clear why *significatio* (B1) is considered to be the prototypical, "pure" type of pun: Using only one sign, two opposed meanings are denoted that share this sign completely. But this paper is restricted to the discussion to puns that are characterized by heteronymy in absence—or rather virtual presence as the target—of the second sign. The example in the table (A1) features the pun-target pair *clock-cock* with only the pun actually present.[6] This is the most frequent type of punning occurring in English today.

Zwicky and Zwicky summarize as follows: "In a perfect pun, a single phonological entity is to be understood as representing two distinct lexical items. In an imperfect pun, one phonological entity (the p u n) stands for a phonologically distinct (but similar) entity (the t a r g e t), the two representing two distinct lexical items as before." (1986: 494). So in fact, the imperfect pun *means* both, the pun and the target. And while in a

[6] Although this example was concocted for illustrative purposes, consciously aiming for a sexual script triggered by the target because of the universality and prominence of these scripts, this actual pun-target pair is too good (as a pun, if not as a joke) to be passed up by Crosbie (1977: 49), although not in its sexual sense, but figuratively for dumbness: "For years he stayed at home and collected clocks. Then, one day when he was sixty-nine, he finally admitted his real problem was that he was a clock sucker."

perfect, homophonic, pun phonology has no contribution to the understanding of this overlap of two meanings, in imperfect, heterophonic, puns we can describe how much distinctness is allowed and how much similarity is required. In sum, the field of application of this dissertation are English heterophonic, imperfect, or paronomasic puns. Before I will go into a finer taxonomy of these below, let me briefly distinguish them in more detail from perfect puns.

In homophonic puns there is (almost) zero phonemic distance. The following is one of the rarer examples of word boundaries being involved, a phenomenon I will return to in chapter 6. The punning segment consists of the sequence [əwɵfr], the pun is *a wafer* and the target *away for.* Note that the distinction between pun and target is not clear in homophonic puns, as the signifier is fully compatible with both signifieds in the given context, but a web search on this pun yielded an almost unified result for *a wafer* as the actual pun in the text.[7] The distinction is always clear for heterophonic puns.

(3) Why did the cookie cry?
Because her mother has been a wafer [əwɵfr] so long.
*a wafer ->away for*
(from Pepicello and Green 1983: 59, quoted in Attardo 1994: 128)

In heterophonic puns not all phonotactically possible distance is encountered. For example, the English word *hit* is obviously not a possible pun on the target *proprioceptively*, to pick two radically different, but possible sound sequences of English. In a less far-fetched and rare instance found in *The Onion*, a U.S. American satirical magazine, the fine line that distinguishes sufficiently similar from insufficiently similar

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[7] This result was to be expected, because the script for BAKING GOODS needs to be firmly established and confirmed through *wafer* to form the background for the switch to ABANDONED CHILD which demands playful resolution in the answer to the question why the cookie cried (see chapter 2).

pun-target pairs is topicalized: The article makes fun of the sophomoric humor of parochial adolescents who refer to the towns neighboring their hometown through imperfect puns. For example, fictional Paul Sadecki from real Vandalia, Illinois, refers to St. Elmo as "St. Smellmo" and Litchfield as "Bitchfield." But when it comes to another nearby town, Van Burensburg, Sadecki runs into problems:

> "Van Burensburg seems like it'd be easy, but it's not," Sadecki said. "I used to call it Van Turdburglar, 'cause they got a lot of homos there, too, but *that kind of felt like a stretch*." ("Man has Derogatory Nicknames..."; my emphasis)

This example is somewhat atypical, because the pun is a name, a class of words for which special phonotactic rules hold (cf. section 4.6 below). But the main point here is that the need to refer to two different concepts, one denoted by the existing English word "turdburglar" (derogatory for homosexual) and the other the name of a town named after a President of the United States, which are in a humorous constellation for Sadecki—presumably high vs. low register—, force him override the sound similarity requirement to a degree that the joke may still be perceived as such, because the target is clear enough in the given context, but only as a bad joke because that target does not sound similar enough to the pun, the relation between them "kind of felt like a stretch."

These observations imply a cut-off point, above which we have possible puns and below which we have two segments not perceived as (sufficiently) related in sound to make the target recoverable at all, an issue I'll return to in section 4.4.4. But even above this cut-off point, there is better puns and worse puns, even in phonological terms, that is, puns that sound more similar to their target and those that do less so. According to my (admittedly non-native) intuition, the following pun doesn't work too well (the next three examples are from Monnot 1981: 91ff):

(4) Public transportation: It's a dime good deal.
*dime* -> *damn*, [daym] -> [dæm]

I think the following two are better:

(5) Schmidt Beer: Rhapsody in brew.
*brew* -> *blue*, [bru] -> [blu]

(6) Thirst things thirst: Miller.
*thirst* -> *first*, [θr̲st] -> [fr̲st]

Of course, the central assumption for this paper is that this intuition is motivated largely by the smaller distance, or reversely, a greater similarity of sound in the latter examples. While in (4) we have a vowel targeting a diphthong, in (5) we have one lateral targeting another, and in (6) one fricative targeting another, their difference in the given environment supposedly being smaller than that between the vowels. This observation is curious as, generally, the consonantal skeleton is more important for the identity of a word than its meat of vowels, es cen be seen frem thes semeler exemple en wretten Englesh.[8] I will return to this issue in section 5.3.

But Sobkowiak observes correctly that a main issue is the "the non-categoricality of most punning phenomena, where the traditional all-or-nothing, or yes-or-no approach is bound to fail" (1991: 3). And OT is the prime candidate for a such a gradational, shades-of-grey, analogue approach. Application of an extension of OT aimed at describing how much difference is possible in semi-rhymes (Steriade and Zhang 2001) and how much variability can be tolerated in proper names (Lutz and Greene 2001) can be extended to

[8] I must give credit to Mayerthaler for the original play with letters along the lines used by me here (1982: 226n).

answer a closely related question that is posed by heterophonic, or paronomasic, puns, and this has been partially attempted in Fleischhacker 2002. In sum, the two central question are, where the threshold lies between puns that do not identify the word they pun on, and puns that do (Attardo 1994: 121) and, in addition, to sort the latter according to higher sound similarity. In other words, how much distance is permissible for paronomasic pun-target pairs to still fulfill their task of representing two words and two meanings in one signifier, and which possible pun-target pairs do so better than others?

Earlier approaches have measured the distance in sound of two words in terms of the number of distinctive features in which two forms differ (e.g., Vitz and Winkler 1973, Sobkowiak 1991, Frisch 1996). Comrie illustrates this type of construal:

> "[T]he phonetic distance between two segments may be defined as the number of features (within some framework of overall features) by which they differ; if features are arranged hierarchically [...], then hierarchical position will also be relevant, with alternation of a feature higher in the hierarchy involving greater phonetic distance." (1979: 51-52)

And for the discussion of sound distance, pun-target pairs are as fertile a field of application as are related issues which have been discussed on the basis of distinctive features, e.g., semi-rhymes (Zwicky 1976) speech errors (Fromkin (ed.) 1973, 1980; Frisch 1996), or approximations in aphasia (Joanette, Keller, and Lecours 1980). To the degree that these issues can inform my approach, the literature on them will be surveyed in chapter 3 below.

The main difficulty for these feature-based approaches is pointed out by Steriade:

> When we assess the relative similarity of two pairs x-y and w-z, the simplest case is that in which the pair x-y shares a number of properties, and the pair w-z shares those same properties plus others. The less similar pair, x-y, shares a proper subset of the features common to w-z. If however the shared properties of the two pairs *do not stand in a subset*

> *relation*, the evaluation of relative similarity poses an obvious difficulty: is the similarity comparison meaningful in this case and, if so, what do speakers compare to find the more similar pair? (2001: 7; my emphasis)

Distinctive features are a problematic tool for the kind of comparison required to assess pun-target similarity. They are largely based on articulatory criteria and do not form a hierarchy of quantifiable relations, witnessed by the fact that, for example, the fricatives [f], [s], and [θ] are hardly distinguishable from each other, because they differ only in the place of articulation in the SPE system (Chomsky and Halle 1968), while the same holds for [f] and [x], which are clearly perceived as more different, regardless of their environment, implying a higher cost when they are the only difference between a target and its pun. An improvement over these approaches surveyed in chapter 3 lies in the use of features as arranged in the feature geometry model. But more importantly, the relative distance values assigned to featural difference must be based on their acoustic effect, which is highly dependent on the environment in which the difference is located, an issue related to grouping sounds into natural classes according to identical behavior in identical environments. I do not pursue this idea any further here in this introduction, but will return to this issue in the context of Steriade's *P-map* hypothesis discussed below in section 4.3 and the specification of my own parameters for the constraints on pun-target similarity relation in chapter 5.

Another issue of early feature-based approaches to imperfect puns is the alignment of the domains that are compared. To optimize correspondence between a pun and its target it is often necessary to start the comparison not at either edge of the words, or to skip word-internal segments in the comparison. This is illustrated by Vitz and Winkler in the following example (1973: 375):

(7) sɪt* *sit*

*ɪts *its/it's*

I will return to their approach to alignment in more detail in section 3.1. A full implementation of the results of the present study will require the automatization of alignment with the help of Markov-chains.

On the basis of a more detailed discussion of these issues, the present study will turn to the contribution that an OT-inspired theory can provide to a model for the central issue of a punning similarity model in English. The very struggle on which OT focuses, namely between opposing forces cast in constraints to evaluate several outputs with respect to one input finds a special correspondent in heterophonic punning. Namely, that between sufficient FAITHFULNESS[9] of the pun to the input target in order to render it recoverable and MARKEDNESS to indicate meaning differences required by the humor the text has to carry, when transferred into output-output (OO) constraints holding between two surface forms. As noted above, puns depend on confusability, i.e., high similarity. The motivation for deviance, or MARKEDNESS, is the pressure to represent two underlying and recognizable forms at once, as well as conforming to phonological well-formedness.

## 1.4 Conventionality of Punning Similarity

It has to be heeded that there is no a priori identity or even similarity in the processes, or constraint hierarchies, that underlie puns and other "metaphonological" phenomena. Zwicky observes this for the phenomena in his purview: "the principles of English rock

[9] Small caps are used both for OT constraints as in this instance (see section 4.1) and semantic scripts (see section 2.1). Since they will not occur in the same points of the discussion, no ambiguity will arise from this.

rhyme do not follow in any obvious ways from other relationships between segments ... we see artistic conventions using some rather abstract aspects of phonological systems" (1976: 694; cf. 3.2 below). That is, there are types of sound similarity that cannot be recorded with a microphone and reduced to an algorithm based on acoustic principles alone. As with all matters that involve language, which implies human users, the situation is more complex than purely physical or biological models can capture. Language is always also a cultural artifact. That we can expect less aesthetically informed arbitrariness in the similarity relation between a pun and a target lies in its necessary recovery function which must be assumed to allow for less variability.

Another example of this conventionality of similarity can be seen in Irish syllabic poetry which shows an obviously culturally specific concept of rhyme (cf. Knott 1974). Here, a rhyme between words is considered perfect, *comhardadh slán*, when "the stressed vowels are identical, and all the consonants subsequent to the first stressed vowel are of the same class and quality" (Knott 1974: 4). These classes appear quite heterogeneous to members of cultures not versed in Middle Irish poetry. The sounds represented by the letters *bh, gh, dh, l, mh, n, r*, for example, are considered to rhyme, as well as *ll, mm, ng, nn, rr*. Accordingly, *cluineam* and *fuigheall* are in a relation of perfect rhyme, a judgment clearly different from contemporary concepts of rhyming in English, where much less variation is allowed (cf. section 4.4.3). And since both corresponding forms in rhyme are part of the surface text—in contrast to imperfect punning where the target is only paradigmatically available and has to be recoverable from the pun and context—we can assume that rhyming indeed allows for less sound similarity between forms and the notion of similarity to be subject to culturally specific aesthetic influences.

Also, while in puns there is obviously a different additional motivation beyond the sound similarity in semi-rhymes, namely the semantic one sketched in section 1.2 and discussed in more detail in section 2.3, for both we have the general structure of two corresponding forms, one, the pun, being dependent on the other, the target. This goal is the “perfect rhyme” for semi-rhymes, and the homophonic target for paronomasic puns. For both, the general question is the same, namely, how much deviation from the ideal goal they tolerate, even if deviation must clearly be considered in terms of different parameters for each domain.

# 2. LINGUISTIC HUMOR THEORY

Before I continue the phonological discussion by surveying feature-based approaches to sound similarity in chapter 3, it is necessary to discuss the semantics of humor in general and the cratylistic logic of the metaphonology of puns in particular in sufficient detail in the present chapter. This will serve to ground the discussion in the context of linguistic humor theory, in particular the General Theory of Verbal Humor (GTVH; Attardo and Raskin 1991). Based on this, central parameters of my analysis can be derived from the groundwork laid in that theory, while my results in turn can inform the reshaping and enhancement of this theory towards greater descriptive and explanatory adequacy. Centrally, the importance of semantic analysis for a meaningful analysis of humor will become clear. In addition, the entangled interaction of linguistic factors in the verbal humor of puns, repeatedly pointed out above, centrally in the main hypothesis (1), will become more formalized and applicable when cast into the terms of a model that is based on tried and tested linguistic humor theory.

## 2.1 Semantic Mechanisms of Humor

The present approach is eclectic in the sense that it selects theories on the basis of the usability of the methodologies within those theories for the purpose of answering the main issue. While the phonological part will be formulated following a optimality-theoretic framework, the humor-theoretic part of it is based largely on the linguistic theory of humor as developed in Raskin's Semantic Script Theory of Humor (SSTH) and its revision by Attardo and Raskin, the General Theory of Verbal Humor (GTVH). Although some aspects of these will have to be outlined in more detail, the reader is assumed to be familiar with, at least, Raskin (1985) and Attardo and Raskin (1991).

In Raskin (1985), the compatibility of the joke text with two scripts, called overlap, is proposed as the necessary condition and the opposition of these scripts as the sufficient condition for a text to be funny. This corresponds to the observation within the incongruity-resolution theories, that incongruity is a necessary feature of humor, but its resolution—for jokes, in the punch line—is the sufficient element (see above, cf. also Attardo 1997). Raskin summarizes it in the following way:

(8) A text can be characterized as a single-joke-carrying text if both of the [following] conditions [...] are satisfied:
(i) The text is compatible, fully or in part, with two different scripts
(ii) The two scripts with which the text is compatible are opposite (1985: 99).

Script oppositeness is a matter of situational, contextual, or local antonyms. Oppositeness can therefore be defined and detected by the combinatorial rules in the semantic links, or rather 'anti-links.' The most likely kind of link constituting oppositeness is the binary category "real vs. unreal" (Raskin 1985: 113). The lexical entry x in the center of the domain that is evoked as one script is semantically linked to an entry non-x, or y, of the opposite script (and often also the trigger for it). This basic opposition can be an actual vs. non-actual situation, or a normal vs. abnormal state of affairs, or a possible vs. impossible situation. This two-fold hierarchy of real/unreal opposition at the highest level and actual/non-actual, normal/abnormal, and possible/impossible oppositions as instantiations of the real/unreal level, is supplemented by a third level of most concrete pairs of opposition. Typical pairs of opposite scripts as described at this level are, for example (Raskin 1985: 107): DOCTOR vs. LOVER; SEX vs. IMPOTENCE; WISE vs. FOOLISH.

Having started from script opposition as the only element of analysis, the revised SSTH (Attardo and Raskin 1991) encompasses six knowledge resources (KRs) that are used when a joke is generated, and a tentative hierarchy among them: *script opposition*, the highest KR in the hierarchy, the opposition of two overlapping interpretations of the joke; *logical mechanism*, the faulty, local logic of the joke; *situation*, what the joke is about; *target*, the optional butt of the joke; *narrative strategy*, its narrative genre; and *language*, the actual words used in the joke. The expansion leads to the semantic theory becoming founded in linguistics at large. This theory is the main tool used here and relevant parts of it will be illustrated further where appropriate. In terms of the GTVH, this approach is an extension of the existing discussion on the phonology of the *language* aspect of jokes as it becomes crucial in puns who find their *logical mechanism* at this level as I will discuss in more detail in the next section.

The pivot for script oppositeness are triggers that provide a means to detect the switch from one script to another, taking for granted that the first script must be instantiated. This semantic script-switch trigger corresponds to the punch line of the joke and is often verbalized in, or as, the punch line itself. Raskin identifies two sorts of semantic script-switch triggers that can be found in simple jokes: ambiguity or contradiction; hence his emphasis on the disambiguating capacity for a semantic theory. As joke-telling is a form of non-*bona-fide* communication, ambiguity need not be reduced to one unmarked interpretation only, but other interpretations (scripts) evoked by the ambiguity may be instantiated. The resulting conflict is not so much a blocking barrier, but the sufficient oppositeness for a text to be funny.

Raskin distinguishes regular ambiguity, e.g. *gentleman* as ‘man’ vs. ‘man of quality’ and figurative ambiguity, e.g. *innocence* as ‘justice’ vs. ‘chastity,’ often reinforced by an auxiliary trigger; syntactic ambiguity, e.g. *with* heading a prepositional phrase either containing an agent ‘hand’ or an instrument ‘spoon,’ and situational ambiguity, where incoming information both triggers the new script and continues the original one. Relevant for the present approach is in particular ambiguity created through sound similarity as it can be found in punning knock-knock jokes like the following example:

(9) Knock Knock. Who’s there? Cantaloupe. Cantaloupe who? Can’t elope tonight—Dad’s got the car. (from Pepicello and Weisberg 1983: 67)
*cantaloupe -> can’t elope*

The next section will focus on this specific kind of trigger to create semantic overlap, the faulty logic of word magic through sound similarity.

## 2.2 The Illogical Logic of Puns: Cratylism

This section discusses the specific type of logical mechanism of puns. We encountered this humorous paralogic incorporated into the GTVH (Attardo and Raskin 1991) as the logical mechanism (LM) in the previous section. The LM in general is formalized and discussed in more detail in Attardo, Hempelmann, and Di Maio (2002). Its specific manifestation in punning was first discussed at some length in chapter 4 of Attardo (1994), which forms the basis of this section. The present study is crucially informed by the concept of LM, which is the second-highest in the hierarchy of KRs as originally proposed. And while it is also the most problematic one (cf. Ruch, Attardo, and

Raskin 1993), its importance as the second key element after script oppositeness will hopefully emerge from the following discussion.

In a much quoted passage, Coleridge identified the two key elements of poetry as "a human interest and a semblance of truth sufficient to procure for these shadows of imagination *that willing suspension of disbelief* for the moment, which constitutes poetic faith" (1817: 169; my emphasis). Accordingly, I would like to suggest that for a text to be a joke as a specific type of poetry, i.e., aesthetic text, we need not only the oppositeness of incongruity, which may well be what makes it of human interest for us. But to reconcile this incongruity at least playfully, so as to facilitate the suspension Coleridge speaks of for poetic text in general, and to accept a relation between the incongruous concepts, the joke needs the LM to appear to bridge that unbridgeable gap between them.

For the illustration of this paralogic of puns I will use an example by Chaucer, who wrote at a time when spelling conventions were not as fixed as today and provided a more forgiving fool's license to pun in writing than English permits today (see note on page 8 of the present study). The following instance, found in the Summoner's Tale and identified by Baum (1956: 231), is *ars* as either *art* or *arse* and it maps the two semantic scripts of EXCREMENT and NON-EXCREMENT onto each other. Because the word can denote both the concepts "lower back" and "art" it creates an overlap between the contrary scripts:

(10) In ars-metrike shal ther no man fynde,
Biforn this day, of swich a question. (SumT III 2222-23)
ars-metrike: *ars metric -> arse metric*

The incongruity of this homophonic pun is that of high/low as non-/excrement, referring both to the farting into the friar's hand searching at the arse of Thomas, and the arithmetical problem of the division of the fart among the dozen members of the friar's convent, that is, a problem for the art of measuring, a possible third reading, in meaning compatible with the "arithmetic" one, and folk-etymologically related to it, making this a particularly complex pun.

The local logic of puns functions on the basis of obviously erroneous reasoning in two steps: first, sound symbolism as a motivated relationship between a word's meaning and it's sound, and second, that this motivated relationship works across sound similarity between two words. The following paralinguistic syllogism, which necessarily implies the contradictory statement in (12)  and is nevertheless assumed to be valid for the sake of punning, summarizes the faulty logic:

(11) If meaning motivates sound,
and sound is identical (similar),
then meaning must be identical (similar).

A formalization of the pun logic base on this rationale makes the particular dilemmatic false reasoning involved clear:

(12) $\forall$ a, b, p, q: $f(a)=p \wedge f(b)=q \wedge a \oplus b \Rightarrow p \otimes q$
For all sound sequences a, b, and meanings p, q, if function (f) ("denotation") maps a onto p and b onto q and a is in relation $\oplus$ ("has the same sound") to b, then p is in relation $\otimes$ ("has the same meaning") to q.

This line of paralinguistic reasoning is named after Kratylos, a participant in the eponymous Platonic dialogue (Plato 1961), who argues for the natural, motivated, non-arbitrary relationship between sound and meaning (cf. Attardo 1994: 152ff). And although cratylism clearly requires a "momentary suspension of disbelief" like all false logic used as an LM of jokes functioning in non-*bona-fide* communication (cf. Raskin 1985: chapter 4), it is false logic, albeit of such pervasive power that we encounter it in many contexts that are not at all perceived to be non-*bona-fide*, but in which statements implicitly involving this kind of reasoning are taken at face value.

A more sophisticated discussion of the *iconicity* (cf. Morris 1946) of sound and meaning can be found in Humboldt (1836, 1971),[10] who provides a sufficient background against which all issues relevant for the present discussion can be developed. Humboldt subscribes, if not to the arbitrariness of the connection between sound and concept, then to its general inexplicability, when he admits that "to portray external objects that simultaneously impinge on all the senses and the internal stimulation of the mind merely by impressions upon the ear is to a great extent an inexplicable operation as far as the detail is concerned" (1971: 52). But he nevertheless boldly goes on to discuss three types of non-arbitrary, motivated, iconic types of sound-concept relations:

> 1. The first is the directly imitative concept, in which the tone that a resounding object brings forth is reproduced to the extent that articulated sounds are capable of reproducing unarticulated ones. [...]
>
> 2. The second is the indirectly imitative designation, which shares in a property that is common to the sound and the object. [...] It selects sounds to designate the objects which, inherently and in comparison with others, produce for the ear an impression similar to that of the object upon the soul. For example, "stand," "steady", and "stare" give the impression of fixity; [...]
>
> 3. The third is designation based on phonetic similarity in accordance with the relationship of the concepts to be designated. Words whose meanings closely approach one another become endowed with similar sounds; however, in contrast to the designative bracket just considered, emphasis in this instance is not upon the character inherent in these sounds themselves. (1971: 52-53)

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[10] The relevant passage is in the chapter on the "Lautsystem der Sprachen: Natur des articulirten Lautes," which is the tenth chapter in the original edition (Humboldt 1836), but the seventh (The Phonetic System of Languages) in the translated and edited one (Humboldt 1971). The discussion of iconicity is embedded into the question how language change—that is, a change of either part of the sign, sound or concept, independent of the other—is possible, when their relation is not arbitrary. For a more complete taxonomy see Marchand (1957, 1958), updated in Marchand (1969: 397-428).

It is important, though, to stress the difference between the concept of iconicity found in those words classified in the quote above, most prominently the onomatopoeia of Humboldt's first type, and sound symbolic systems like cratylism, which claim not just a resemblance of sound to concept, but a conventional connection of unspecified logical nature. That is, among sound symbolic systems in general, a distinction is made between imitative sound symbolism (Humboldt's first class), and conventional sound symbolism (Humboldt's second and third classes), which includes cratylism (cf. Hinton, Nichols, and Ohala 1994).

The *klang* association Humboldt describes in his second category comes closer to cratylism than onomatopoeia, but is different in that the shared sound sequence, called *ideophone* or *phonestheme* or *phonetic intensive* (Bolinger 1965), is believed to carry context-independent meaning. In the example the sound sequence [st] is associated with a certain quality (cf. Bloomfield 1895: 409f). Cratylism, on the other hand, does not depend on established ideophone families sharing a sound sequence, but is dependent only on the assumption of a relation between sound and concept in *any* word, or any two words when it is used for the punning LM.

Another type of iconicity subsumable under this category is illustrated by Köhler's famous *maluma-takete* experiment (1929), where the former word was preferredly chosen by subjects to refer to a drawn figure with round shape, and the latter to a star-shaped figure with pointed edges. But this type of sound symbolism clearly involves iconicity motivated by a synaesthetic effect between "sharp" or "round" sound and meaning, thus cannot be classified as purely conventional sound symbolism. For further discussion of sound symbolism in general see Allan (2001) and the research collected in

Hinton, Nichols, and Ohala (1994), and in particular at the level of ideophones see, e.g., McGregor (1996) and Nuckolls (1996), as well as the essays in Erhard Voeltz and Kilian-Hatz (2001)

The third of Humboldt's categories can be considered inverse cratylism, in that the relationship between concepts is considered to influence their sound similarity. But this is surely fallacious reasoning because the sign does not involve symmetric relations: pigment on a paper can stand for a man, but not vice versa (cf. Sebeok 1976). On the basis of this inverse cratylism, Humboldt subscribes to the possibility of general motivated sound-concept relations without the mediation of sound sequences that relate to meaning synaesthetically as in the first two categories, that is a purely conventional sound symbolism that can take scope over any meaningful unit of language. This is the kind of "pure" cratylism found in punning.

In sum, punning cratylism only indirectly—if crucially—depends on the assumption of a motivated relation between a sound sequence and a concept (cratylism). More importantly, it posits an analogical parallelism, as formalized above in (12): if there is similarity between *two signs* in the realm of sound, then there is similarity between the *two signs* in the realm of meaning. Iconicity does not involve such an analogy (except for the inverse cratylism of Humboldt's third category), but focuses exclusively on the motivated relation between sound and concept of *one sign*, which, of course, can be extended into the parallelism of punning cratylism, but does not necessarily entail it.

At this point it seems necessary to point out a common mistake again: The meaning similarity required for humor and provided by the sound similarity in puns, along the lines of cratylistic logic, does not mean that measuring this sound similarity provides a metric to measure the meaning similarity. Sound similarity in puns interacts with too many other linguistic factors, most significantly to fulfill the target recovery function, and in particular with semantic factors that are unrelated to the semantic resources required by humor, that is, script overlap and, most significantly the script oppositeness (cf. the next section 2.3). In short, a pun with more sound similarity is not a funnier pun, as is often claimed, for example by Fleischhacker )2002; cf. section 4.5.3).

Cratylism in word magic, the assumption of a non-arbitrary relation between a linguistic sign and its *denotatum* as equation or partial identity or at least binding power, plays a significant and well-documented role most prominently in many religious systems, like the cosmogony of the Gospel according to John (1:1): “In the beginning was the Word, and the Word was with God, and the Word was God.”

Cassirer summarizes the mythical importance of the word as follows:

> The original bond between the linguistic and the mythico-religious consciousness is primarily expressed in the fact that all verbal structures appear as *also* mythical entities endowed with certain mythical powers, that the Word, in fact, becomes a sort of primary force in which all being and doing originate. In all mythical cosmogonies, as far back as they can be traced, this supreme position of the Word is found. (1946: 44-45; emphasis in the original)

The magical use of words on the basis of their cratylistic equation with their *denotata* is particularly common in connection with names, which are understood not only as a specific symbol, property, or part of a person or deity, and can not only be used to denote that person, but literally *stand* for the person, evoke it, commonly in prayer and incantation (for more examples on tabooed words and names in particular, see Frazer (1935: chapter VI, 318-418). As Cassirer explains, in another paraphrase of religious cratylism,

> in the religious system of the myth the word which denotes that thought content is not a mere conventional symbol, but is merged with its object in an indissoluble unity. The conscious experience is not merely wedded to the word, but consumed by it. Whatever has been fixed by a name, henceforth is not only real, but Reality. The potential between 'symbol' and 'meaning' is resolved; in place of a more or less adequate 'expression,' we find a relation of identity, of complete congruence between 'image' and 'object,' between the name and the thing. (1946: 58).

From this cratylistic reasoning arise the strong word and name taboos, for if the word *is* what it stands for, the name *is* the person, one must use them extremely cautiously. Freud cites the widespread taboo on mentioning the name of a recently deceased (1950: 54-57). In analogy to cratylistic punning logic, this taboo also applies to words similar in sound to the name of the deceased, as Freud explains:

> This taboo upon names will seem less puzzling if we bear in mind the fact that savages regard a name as an essential part of a man's personality and as an important possession: they treat words in every sense as things. As I have pointed out elsewhere, our own children do the same. They are never ready to accept a similarity between two words as having no meaning; they consistently assume that if two things are called by similar-sounding names this must imply the existence of some deep-lying point of agreement between them. (56)

Not surprisingly, the "elsewhere"  referred to in this quote is chapter 4 of Freud's discussion of *Jokes and their Relation to the Unconscious*, which reiterates the false analogy of "savages" and children, committing such cratylistic "mistakes that are laughed at by grown-up people" (1960: 147).

The most famous example of taboo based on word magic is the commandment that "Thou shalt not take the name of the LORD thy God in vain" (Ex 20: 7), but extended versions include such diverse phenomena as swearing, summoning ghosts by saying their name, magic formulae, kabbalah and other exegetic exercises (cf. Hausmann 1974: 21). But also onomatopoeia, as discussed above, and poetry, folk etymology and the explanatory power of etymology in general (Redfern 1984: 84-87) are more or less loosely based on the cratylistic principle, if necessary extended to operate across sound similarity (cf. Jakobson and Waugh 1979).

Of course, the exact opposite position, the arbitrariness of the linguistic sign in which signifier (sound sequence) is related to signified (mental concept) for speakers not through cratylistic motivation, but systematically and conventionally only within the structure of their particular languages, is the canonical assumption, most famously treated in Saussure (1983: 67-69). And this assumption of arbitrariness is generally valid, witnessed simply by the fact that different languages use different sound sequences for similar concepts, e.g., German *Stuhl* and English *chair*. Yet the opposite assumption of a motivated relationship is operational in important areas of language use, as this section has shown, among which punning takes a prominent position.

## 2.3 Pseudopunning Wordplay

On the basis of the humor theoretic discussion in this chapter, we are now in a position to reconsider the feebleness—and often plain non-humorousness—of what is called “pun” in general, non-technical use. Raskin claims that the script overlap of these jokes is triggered by the quasi-ambiguity based “on purely phonetical and not semantical relations between words” (1985: 116). I agree that in puns, the ambiguity can be achieved through the phonological overlap as logical mechanism. But, crucially, sound similarity—including the ultimate similarity found in identity—cannot alone create the incongruity required by humor, so that a text lacking the latter will be mere wordplay rather than humor. In short, the phonological overlap can trigger and support the script overlap, but without the appropriate script constellation of oppositeness, it remains too weak to constitute a joke text as defined in (8) above. I will return to this point in the subsection on "definition puns" below (6.10).

Accordingly, I propose that in addition to the overlap in sound of the segment written as *cantaloupe* (target "can't elope"), there is semantic oppositeness, if of the feeblest kind imaginable, like food vs. sex. Otherwise example (9) would not be a joke, and for those who fail to see the oppositeness, it indeed isn't a joke, but merely wordplay. This is, of course, different for those who do identify the semantic overlap, but find it too feeble. They will identify (9) as a joke, but won't enjoy it. And given that humans are desperately good disambiguators with vast semantic networks available to them as well as excellent pragmatic interpreters, if a mere wordplay is uttered, we seek any kind of semantic oppositeness to be able to handle the phonological (quasi-)ambiguity as humor.

The following table makes these possible constellations clearer. Of particular concern is the difference in rows 1 and 2, which are both commonly identified as "puns," whereas the constellation in row 2 actually lacks the necessary semantic script oppositeness to qualify such a text as humor. Note also the peculiar overlap of semantics and phonology in the logical mechanisms of puns.

Table (2): Pun vs. Wordplay in terms of SO and LM

| | *semantic opposition SO* | *cratylism LM* | *interpretation* | *common name* |
|---|---|---|---|---|
| 1. | present | present | punning joke | "pun" |
| 2. | absent | present | wordplay | "pun" |
| 3. | present | absent | a. non-punning joke<br>b. non-joke ambiguity | |
| 4. | absent | absent | non-joke text | |

The following are examples for each row:

(13) 1. *Labia majora*: the curly gates. (60)
curly -> pearly
2. Magnet: To some, it is what you find in a bad apple. (145)
magnet -> maggot
3a. Gobi Desert Canoe Club
(non-punning LM: direct juxtaposition)
3b. The square circle ate five freedoms.
4. In case of an emergency, pull cord.

Notice the semantic script of APPLE triggered by “apple” in (13) 2. which crucially supports the recovery of the target “maggot” as well as the lack of semantic oppositeness between any possible scripts including slots for “maggot” or “magnet.” As Stanford puts it:

> Nothing is more futile than the irrelevant pun that is based on only a verbal similarity and brings out no contrast, innuendo, or congruity of meaning. Nothing is a clearer sign of incompetent writing than word-play that distracts rather than concentrates the reader’s attention. (1972: 72 quoted in Redfern 1984: 20)

In sum, punning includes “word play,” but play with words cannot work on the sound level alone, that is, be mere “Klangspiel” (play with sounds), if it strives to be humor as well. But it must be accompanied by “Sinnspiel” (play with meaning; cf. Hausmann 1972: 20) in order for the pun’s weak, cratylistic logic to support the opposite overlapping script constellation that would make it a joke. The near failure of this latter requirement, that is, the belief on the part of a joker that he or she can get away with mere “Klangspiel” is what earns puns their deserved pariah status in the family of jokes. I would like to conclude this section on the last note, duly putting into words the professional distance I maintain from my subject of investigation.

# 3. PHONETIC DISTANCE IN TERMS OF DISTINCTIVE FEATURES

In the previous chapters, I have outlined the issues that participate in the relation between target and pun in paronomasic punning (chapter 1), as well as provided a humor theoretic framework for the discussion (chapter 2). With the present chapter, the discussion can now turn to its central theme, the phonology of imperfect puns. I will first survey previous approaches to this issue in this chapter, before the subsequent one (4) will introduce a new theoretical basis from which I will approach the phonology of the pun-target similarity.

As mentioned above, most early contributions to the discussion of puns from the field of phonology were applications of the concept of distinctive features as a measure of tolerable dissimilarity between a target and its pun. In this section I will discuss the most prominent representatives of this school in chronological order. Sobkowiak's central question—or obvious variations of it, as not all of the approaches summarized in this section deal exclusively or primarily with puns—underlies all approaches discussed in this section: "What kind of rule underlies the transition from the present form to the juxtaposed form of a heterophonological pun in terms of feature geometry?"[11]

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[11] It needs to be noted, that in this study the juxtaposed target is assumed to be the underlying form and basis from which the pun present in the text deviates (cf. section 5.2).

## 3.1 Vitz and Winkler 1973

An early influential study on judged similarity of words in terms of sound is Vitz and Winkler (1973). A central important contribution of their research is that in order to minimize the phonetic distance between words and maximize the correspondence, correspondents have to be optimally aligned. This can be described metaphorically like sliding the two words along each other until maximal correspondence among their sound segments is achieved (1973: 375f). The following is an extreme example, adapted to standard transcription conventions:

(14) #*****rəleʃn# *relation*
#ʌndərrɪ**tn# *underwritten*

Based on alignment, and including a notion of featural identity developed for their approach, Vitz and Winkler calculate the predicted phonemic distance (PPD) of two words and test it against similarity judgments of subjects in a series of experiments. Interestingly, while the PPD does not fare as well as expected with alignment as the only criterion, the revision accounting for phonemic similarity in terms of the classic feature matrix (Chomsky and Halle 1968) fared no better or even worse. Vitz and Winkler conclude that “relatively little of the variance in the rating of complete words is due to factors existing at a lower or more molecular level than the phoneme” (1976: 386).

Another adjustment to their sound similarity model proved to be more successful. Comparing “phonemic clusters,” corresponding to the components of the syllable of the monosyllabic words they examined resulted in a much more accurate prediction of perceived distance. An example for the adjusted PPD, not accounting for feature similarity is reproduced in (15) below. The calculations are based on the following assumptions: The domain of comparison are the syllabic units onset, nucleus, and coda. For each domain the dissimilarity value is calculated as follows: For a given phoneme pair from the two words compared, only full identity of two phonemes in terms of distinctive features counts as towards the PPD as the value 0 (“no distance”). Any dissimilarity is assigned the value 1. Similarity, for example, in terms of place or manner of articulation, is not taken into account, but counts as non-similar, hence leads to the value 1. The values for dissimilar aligned segment pairs are summed up and the mean for the domain is calculated. The total PPD for a pun-target pair is then the mean of the individual means of the domains, so that the value 0 represents highest, the value 1 lowest predicted distance between the tow words.

(15) pl.æ.nt
gr.æ.nt = (1 + 0 + 0) / 3 = .33
spl.ɪ.*t
*pl.æ.nt = (1/3 + 1 + 1/2) / 3 = .61 (1973: 386)

The domains based on syllable structure ensure that consonant clusters in the onset and coda don’t have too much of an influence on the PPD, and that the vowel nucleus has a particularly strong similarity cost attached to it.

Several observations of Vitz and Winkler, culled not only from predicted but also rated similarity, are worth repeating here. Higher similarity is perceived when the following elements are identical or more similar: the onset of the first syllable, stressed syllable positions, i.e., vowel nuclei, and the word rhyme (cf. 1973: 381-3). In sum, Vitz and Winkler’s evidence “suggests a serial position curve with a strong recency effect and a moderate primacy effect [...]. An explanation of the common poetic devices of alliteration and rhyme is that they take advantage of this curve of relative importance within a word" (1973: 387). Also, "vowels or at least certain vowels tend to be weighted more than consonants" (ibid.). Together with the alignment requirement and the weak influence of subphonemic distinctive features, this focus on the syllabic structure of the words that are compared for sound similarity is the main finding of Vitz and Winkler. Such resulting observations will be summarized again at the end of all further research surveyed in this chapter in order to systematize them later. This will provide a set of hypotheses which can be evaluated against each other so that a qualified subset can inform the building of an ordered constraint hierarchy in the OT-inspired framework laid out in chapter 4.

## 3.2 Zwicky 1976

Zwicky discusses imperfect or semi-rhymes in the lyrics of rock music, drawing examples mostly from *Dylan* and *The Beatles*. This application is relevant here because in semi-rhymes, just like for successful punning, minimal distance in sound seems to be a general constraint on the correspondence relation between two segments intended to be perceived as similar. His results are that these *rock rhymes* cannot be described adequately in terms of classical semi-rhyme concepts, namely *light rhyme, apocopated rhyme, consonance,* and *assonance,* but predominantly use two different kinds of deviation from perfect rhyme (1976: 677):

a. *feature rhyme*, "segments differing minimally in phonological features," e.g., *stop - rock*, and

b. *subsequence rhyme*, "X counts as rhyming with XC, where C is a consonant," e.g., *pass - fast.*

In the 700 tokens of rock rhyme, Zwicky finds the following phonemes, separated into consonant and vowel groups, significantly often contrasted in rhyming relations:

(16)

| | | | | |
|---|---|---|---|---|
| d - z | 14 | | ɪ - ɛ | 19 |
| t - k | 10 | | ʌ - ɔ | 10 |
| s - z | 9 | | i - e | 9 |
| p - k | 8 | | ʌ - a | 8 |
| v - ð | 7 | | u - o | 6 |
| t - d | 7 | | ɛ - æ | 4 |
| p - t | 5 | | ɛ - e | 4 |
| d - v | 4 | | a - ɔ | 3 |
| b - d | 3 | | (1976: 691) | |
| t - f | 3 | | | |
| (1976: 685) | | | | |

In contrast to the findings of Vitz and Winkler, for both sets of rhymes he emphatically—and obviously oversimplifyingly—concludes that the distance between the two rhyming segments is one feature "in any plausible set of distinctive features" (1976: 686), respectively "in anybody's feature system" (1976: 691). Additional observations that could become relevant in a discussion of correspondence constraints in puns are that alveolar obstruents are easily deleted in casual speech[12] (1976: 681; cf. Sobkowiak 1991: 78-80) and that syllabicity is violated in only 6 of the 700 examples (cf. 1976: 693).

What must be noted again in this context is that rhyming and punning are crucially different domains, so that we must assume distinct, if related, notions of sound similarity to operate in models to describe them. The main differences are the lack of the specific semantic requirements, an LM involving cratylism and SO, in (semi-)rhyming. In

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[12] And Bob Dylan's delivery is clearly underarticulated enough to count as casual.

addition, the presence of both corresponding sound sequences in rhyming eliminates the recovery of a target from the functions to be performed by the sound similarity. The latter means that rhyming is far more of an aesthetic, and thus culturally variable, similarity function than punning as witnessed by the notion of rhyme in Old Irish poetry sketched above (cf. section 1.4; see also subsection 4.4.3; Redfern 1984: 99-100).

## 3.3 Zwicky and Zwicky 1986

In contrast to Zwicky's study on rock rhymes, his later cooperation with his wife on the issue of sound similarity shares the purview with my approach,[13] namely puns, with two notable exceptions. Zwicky and Zwicky "omit all perfect puns and also those imperfect puns involving stress, word division, languages other than English, speakers indicated as having nonstandard accents, matchings of vowels with consonants, or reversal rather than replacement of segments" (1986: 494). I will not attempt to streamline my corpus to the same degree, but include multiple-word domains here, and reflect the strong effect of stress change and segment reversal to similarity through their high ranking in the constraint hierarchy to be sketched below.

Zwicky and Zwicky sort their 2140 pun instances into the following three contrast categories

1. segment/zero (738 instances):
   The lobe was the original earring aid. (74)
   *earring -> hearing*

---

[13] This overlap of purview also extends to the material basis of Zwicky and Zwicky's and the present study. As Fleischhacker (2002: 8n10) notes the Zwickys' corpus seems largely culled from Crosbie (1977), just as Sobkowiak's on which my study is based. The only other primary source listed in Zwicky and Zwicky's references is Monnot (1981).

2. featural
involving vowels (547):
Engraving gives one the satisfaction of scratching the etch
*etch* -> *itch*[14] (79)

involving consonants (818):[15]
One day Prince Jacques and his sister, Jill, went for a walk with the court jester. Unfortunately, Jacques fell down and broke his clown – and Jill came tumbling after. (50)
*clown* -> *crown*
(Zwicky and Zwicky 1986: 494f)

A major complicating issue described by Zwicky and Zwicky is the fact “that particular segments do not appear equally often in targets and puns” (1986: 495). They call this effect *ousting* and define that “when Y appears as a pun substitute for [the target] X more often than the reverse [...], we shall say Y o u s t s X” (1986: 496). Using the voicing feature in stops as an example, the authors show that in general this ousting effect seems related to the underspecification of unmarked features in that “there is a clear tendency for marked (voiced) to oust unmarked (voiceless)” (1986: 497). The ousting effect, also discussed in detail by Sobkowiak (1991: 108-115), will be incorporated into my study by accounting for the asymmetry of pun-target and target-pun segment relations by directionally assigning different cost to them. For example, crucially assuming that more similar target-pun pairs are more frequent in the corpus, it seems to create less sound dissimilarity to replace a voiceless [t] in the target with a voiced [d] in the pun than vice versa, witnessed by the fact that the former occurs 60 times in Sobkowiak’s corpus and the latter only 40 times.

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[14] Zwicky and Zwicky marked the target as *etch* and the pun as *itch*. I assume in view of the remainder of their discussion that they intended the corrected reading I have given here.
[15] 738+547+818=2103; I was unable to account for the missing 37 instances.

Mohr and Wang (1968) confirm the difference in correspondence of segments with marked and unmarked features. They speculate that the reason for their observation that "members of a marked category should be more similar to each other than the members of the corresponding unmarked category" (1968: 41) might be that "listeners were apparently reacting more to the presence of this (voicing) cue than to the significant lack of it in the other half of the gap [...]. The subjects attended more to the marked half than to the unmarked half of the gap, attaching more psychological weight to the former" (1968: 42). If this observation that markedness to occur more often in the pun than in targets is correct, it will translate into a higher ranking of identity constraint on marked features as they are implying the recoverability of their counterpart phonemes with the unmarked feature. Other than its implicit importance for similarity, markedness in ousting will not be a target for my analysis. A look at Appendix F will confirm that it is not a major parameter in punning.

While Zwicky and Zwicky find only the ə/Ø correspondence occurring frequently in the segment/zero class (50 instances),[16] there are several significant patterns in the featural categories. For illustrative purposes, I chose the following frequent correspondences (more than 12 instances) from their summary, not taking into account ousting effects, that is, which of the phonemes occurred in the target and which in the pun (1986: 497-500) as significant:

| | | | | | | |
|---|---|---|---|---|---|---|
| (17) | unvoiced - voiced | | peripheral - coronal | | two feature (alveolar - velar) | |
| | t - d | 57 | n - m | 34 | t - k | 26 |
| | s - z | 39 | d - b | 14 | | |

[16] While this is very likely related to the low ranking constraint on schwa syncope in American English (cf. Hooper 1976), the lack of examples in Zwicky and Zwicky's discussion hinders me from confirming this hypothesis.

| | | | | | |
|---|---|---|---|---|---|
| k - g | 29 | t - p | 13 | | |
| p - b | 17 | | | | |
| *alveolar - dental* | | *alveolar - palatal* | | *posterior – anterior* | |
| s - θ | 21 | s - ʃ | 38 | p - k | 13 |
| *manner* | | *vowels: height* | | *vowels: tenseness* | |
| r - l | 38 | ɪ - ɛ | 40 | i - ɪ | 27 |
| r - w | 21 | ɛ - æ | 29 | e - ɛ | 18 |
| w - v | 14 | i - e | 26 | o -ɔ | 12 |
| s - t | 13 | | | | |
| f - p | 14 | | | | |

Zwicky and Zwicky summarize (1985: 500): "For consonants, voicing is clearly the most important; there are 163 examples [...]. Position features are the next most important; coronality and anteriority between them account for 197 examples [...]. For vowels height and tenseness are obviously the most important [..]." For my purpose I will start out by ranking the IDENT constraints for these features low. Overall it is striking, that most of the puns of this study "involved a single feature difference (434 of the 818 consonant examples, 264 of the 547 vowel examples)" (ibid.). Sadly, without their material, I am unable to examine the structural effects, like clusters and position of deviant phonemes in terms of syllables, which are at least as important for the discussion of sound similarity in puns, as will become clear from the discussion in the next section. Therefore, I will have to recreate the analysis in the present study, based on the same material as made available to me by Sobkowiak, whose seminal study I will briefly review in the next section, insofar as it isn't based on assumptions form the studies summarized in the previous sections of this chapter.

## 3.4 Sobkowiak 1991

Starting from Vitz and Winkler's (1973) approach to predicted phonemic distance (see section 3.1 above), Sobkowiak's discussion of English paronomasia presents a major quantificational application of distinctive feature-based accounts for sound similarity in puns, employing an impressive corpus of 3850 puns, which—as noted in the acknowledgements—he generously made available for the empirical verification of the present study. In this sense, his research must be considered the main empirical foundation of my own discussion as presented here. Not only is my corpus a subset of his,[17] but his transcription of the pun-target pairs will form the starting point for my own phonological approach, beginning with a reassessment of the transcriptions themselves.

Sobkowiak confirms the tendency to transpose word-onsets more than codas, that is, stricter identity constraints on the end of words and relates this effect to Hockett's (1958) "Syllable Structure Hypothesis" which "assumes that syllable onsets will be more free to move as they are structurally less adhesive to the rest of the syllable" (1991: 63). In addition to this observation, he summarizes the following significant tendencies that should be reflected in my constraint hierarchy: For a subset of his corpus different from mine, but affected largely by comparable similarity constraints, he finds that "the sounds which are significantly *more* frequent in spoonerisms all are obstruents and noncontinuants, with four out of six noncoronals [...], thus representing an epitomy of consonantism in terms of sonorance hierarchies" (1991: 65). Lesser information load of

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[17] I selected 1182 puns that I could analyze for their syntactic and, partly, semantic aspects because their context was available to me from Crosbie (1977).

vowels “means that to maximize understandability of a pun it is reasonable to keep the consonantal skeleton relatively intact” (1991:113).

Sobkowiak also employs a more sophisticated conceptualization of phonemic distance based on the sum of distinctive feature (DF) differences after alignment. Despite its simpler structure, the Vitz and Winkler (1973) approach is supported by Sobkowiak’s prediction algorithm. Both confirm that “[p]uns are more similar phonologically than malapropisms not only phoneme-wise, but also DF-wise” (1991: 96).

## 3.5 Summary

The following observations can be extracted from the survey on distinctive feature-based approaches to target-pun similarity in paronomasic punning. Since word onsets, i.e., the onsets of the first syllable and to a lesser degree word codas, i.e. the consonantal coda of the final syllable, or the rhyme including the nucleus of that syllable, play a crucial role, a more detailed analysis of imperfect puns should include the syllable as a level of abstraction that the model of similarity accounts for. Already in Vitz and Winkler (1973) alignment was based on the notion of syllable and Zwicky (1976) found only six violations of syllable structure in his 700-sample corpus. But, as noted, the syllabic skeleton is more important as tier of analysis to provide a meaningful localization of dissimilar segments. For example, the contrasting of the consonants *d* -> *t*, will be of different significance in the onset of the first syllable of the pun-target pair than in the final coda, where it could be an external *sandhi*—the voicing interacting with that of the onset of the next word—and is assumed to generally have less impact on perceived similarity. In general, the environment of the phoneme(s) in which a pun-target pair differs, will be an important determiner of the perceived similarity, as it has a crucial influence on its perceptibility as I will discuss in more detail in the next chapter. These two levels of analysis will have to be included in the next evolution of research on imperfect puns as represented by the present study.

Most earlier approaches make strong claims based on the difference between the vast majority of target-pun pairs differing in no more than a single distinctive feature of a single phoneme. Sadly, a brief glance at any collection of imperfect puns will confirm that the picture isn’t quite that neat. In particular where extraphonological support for the recovery of the target is available (see chapter 6 below), the pun can differ considerable from it, while the pair is still successfully playing its word magic (see section 2.2 above). Nevertheless, the distinctive feature is still an indispensable tool at useful level of abstraction for the analysis of heterophonic punning. As reformulated and hierarchicalized in feature geometry the distinctive feature, together with the syllable, will form the backbone of the phonological side of my own approach. But I will be able to return to this central strand in the present study— centrally informed by a reformulation of Sobkowiak’s (1991) discussion and corpus and incorporating the findings of the other distinctive feature-based studies summarized in this chapter—after an introduction of OT in general and recent work on output-output correspondence constraints in particular in the next chapter.

# 4. TARGET-PUN DISSIMILARITY AS OUTPUT-OUTPUT CONSTRAINT VIOLATIONS

This chapter will first introduce Optimality Theory (OT) in its standard form as it has been introduced by Prince and Smolensky (1993). On that basis, it will then discuss correspondence in OT, and output-output correspondence in particular. This will form the fundament for the central discussion of the output-output correspondence of target-pun pairs in an OT-inspired model, both in terms of previous studies as surveyed towards the end of this chapter, and for the purpose of the present research. For the following chapter (5) we will then be in a position to reformulate our theory, based on humor theory (chapter 2) as well as the findings for pun phonology in terms of distinctive features (chapter 3), and their recasting into optimality-theoretical terms presented in this chapter, before the theoretical pudding thus concocted can be shown to be edible, that is, when the theory meets the corpus data and can be adjusted and its model enlarged (chapter 6) towards its automatic application to novel input (chapter 7).

## 4.1 Optimality Theory

OT is a relatively recent and theory in phonology that currently dominates much of the discussion in this subfield of linguistics and has spilled over into related fields like morphology and syntax. It has been proposed in contrast to standard phonological theories to overcome a number of weaknesses of the latter. Most previous phonological theories, in analogy to the dominant generative paradigm in syntax, model the problems they are created to account for in terms of the structural description of an input and rules specifying the structural changes the input undergoes to become the actual output. In short, they propose three key parts in their models: an underlying structure, rules that operate on it, and a well-formed, "grammatical" surface output. This has the advantages of providing a tractable model for the language issues that have to be described, by providing a finite number of underlying structures and a finite number of possible changes to account for the infinitely diverse output observable in human language. This output is understood as *derived from* the input and rules, or the rules are understood to *transform* the input into becoming the output, hence *derivational* or *transformational* theories. A central problem of such theories are the rules, which are often ad-hoc, non-universal, attempts to explain a language issue and, if more than one rule applies, they need to be ordered.

OT, on the other hand, is a theory of language that does away with rules and replaces them with a finite number of universal constraints that operate on outputs to determine their well-formedness. These potentially conflicting constraints apply simultaneously to outputs, so they don't need to be ordered according to when they apply one after the other, which is an undesirable theory-driven component of generative models, but ordered according to which one has more influence than the others for a given phenomenon in an given language to account for language variability, and which may be reranked to facilitate language change. And in contrast to the rules of generative models, these constraints are soft, violable. In sum, OT accounts better for language universals and language variation then generative models and uses less ad-hoc theory-driven components in its model. Another advantage of modified OT is its ability to be used for analysis at the high level of formalization required by theoretical and computational linguistics. I will return to this point below. For analysis at this level, generative models are useless, since they can—as their name suggests—only generate output, possibly infinitely, but the rules cannot be reversed to determine underlying input.

Let us look at the model of OT in more detail. It assumes an unspecified generative component (GEN), which creates a set of output forms, the surface representations (SRs) on the basis of an input form, the underlying representation (UR). For example, the UR /in-/[18] of a common prefix in English produces, among all other output forms, the set of output candidates [in-], [im-], [i-], [iŋ-], etc. And, most importantly, OT has an evaluation component (EVAL) that for a given context selects the most optimal of these forms and disqualifies the others as violating higher-ranked constraints, rather than generating that one form directly from the input and a set of rules as generative approaches do.

In sum, OT makes use of four components (cf. Golston (1995: 5)):

(18) UR an unprosodified input string of segments;
SR (candidate) a prosodified output string of segments;
GEN(erator) a function taking one UR to multiple SRs;
EVAL(uation) a function to select the optimal candidate using a tableau of
Constraints, a universal set of ranked, violable well-formedness conditions, the ranking of which is language-dependent; and
Violations, indicators of ill-formedness in terms of constraints.

The main tool used in OT are tableaux with the UR and (selected) SRs in the rows of the left-most column and constraints in the remaining columns, with the lowest-ranking, a violation of which is least damaging to an SR, farthest to the right (see (19) below). The

[18] Notice that the form of the UR here is not claimed to contain a nasal underspecified for place (/N/), because that would prevent an evaluation on the basis of an input-output identity constraint.

ranking of constraints is indicated by solid lines between their columns, while constraints that are not ranked with respect to each other have dotted lines between them. In the cells violations are indicated by an asterisk in the column of the constraint violated and the row of the candidate that violates it.

For example (cf. Pulleyblank 1996: 61-65), in the following tableau the SR [impossible] is not generated through an assimilation rule from the UR /iN-possible/, but selected through weeding out the SRs that violate a ranked group of constraints. The candidates [in-possible] and [iŋ-possible] are excluded through the violation of a syntagmatic constraint on cluster identity (IDENT$_{PLACE}$) ranked higher than the other constraints relevant here. This leaves two candidates to be evaluated, which is achieved through a constraint requiring that every segment of the input has a correspondent in the output, in OT-speak "maximize the output with respect to the input" (MAX$_{IO}$), which is violated by the SR [i-possible], because it has one less segment. Crucially, both of these constraints are ranked higher than a constraint on input-output identity of the features of segments [IDENT$_{IO\text{-}place}$] that is violated by all candidates but [in-possible].

(19)

| /in-possible/ | IDENT$_{PLACE}$ | MAX$_{IO}$ | IDENT$_{IO\text{-}PLACE}$ |
|---|---|---|---|
| ☞ [im-possible] | | | * |
| [i-possible] | | *! | * |
| [in-possible] | *! | | |
| [iŋ-possible] | *! | | * |

Three additional elements in the tableau need to be mentioned here: The shading of the right-most column indicated that its constraint is not instrumental to the choice of candidates. It is included to make a point about its ranking in relation to the crucial constraints to its left. The small hand marks the most optimal form for expository purposes. The exclamation points show for each candidate which constraint violation has excluded it as a possible optimal form.

As this example shows, OT does not take an input and applies rules to it, possibly creating intermediate representations, whose relation to the UR is problematic. Rather it evaluates a candidate set of SRs against one UR, and, importantly, vice versa: Not only is output assessed in relation to a hypothetical input, but the input is evaluated against observed—and unobserved—input, whereas rule-based theories are strictly unidirectional, from input to output. For this very reason, they cannot be applied for automatized analysis of language, that is, output, but only for generation on the basis of a known input.

Because of this bidirectionality of the EVAL of OT, it has also been very successfully applied not only to evaluate output candidates against their input form, but in the form of correspondence theory (McCarthy and Prince 1995) to the relation between related output forms, accounting for their mutual relation, for example, in reduplication and semi-rhymes, as well as in an initial study on the onsets of imperfect puns and proper names.

Another reason it lends itself to the analysis of the similarity of one form to a set of candidates is, of course the non-binary gradational nature of EVAL, namely that we cannot just assume identity or non-identity in imperfect puns, as we can for perfect puns, but there will always be violations of full identity. And, as this brief introduction was intended to show, the evaluation of types and numbers of violations is exactly what OT is good at.

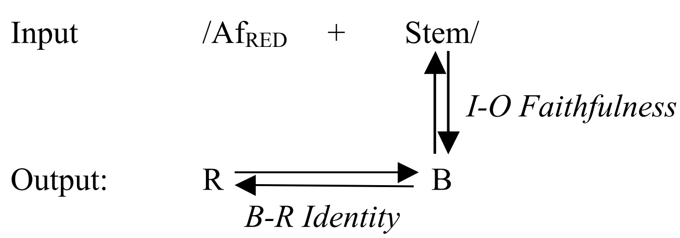
## 4.2 Correspondence (McCarthy and Prince 1995)

In general, correspondence in OT is any relation between morphologically related words as proposed in the following straightforward definition by McCarthy and Prince:

(20) Correspondence:
Given two strings $S_1$ and $S_2$, **correspondence** is a relation R from the elements of $S_1$ to those of $S_2$. Elements $\alpha \in S_1$ and $\beta \in S_2$ are referred to as **correspondents** of one another when $\alpha R \beta$. (1995: 14)

McCarthy and Prince's discussion of reduplication is one of the earliest expansions of OT to include not only constraints between input and output forms, but to focus on the relation of morphologically related output forms in terms of correspondence constraints embedded into the OT framework. Their full model includes correspondence between the stem and reduplicant, but the following graph is a rendition of their "Basic Model" of correspondence only between the base and a reduplicant, which sufficiently illustrates the issues relevant for the present discussion, namely Base-Reduplicant (BR) Identity, as well as between the base and the stem, namely, Input-Output (IO) Faithfulness (McCarthy and Prince 1995: 4):

(21)




($Af_{RED}$ = reduplicating affix; R = reduplicant; B = base)

The main types of correspondence constraints between different types of output are corresponding to the basic constraints between input and output (cf. McCarthy and Prince 1995: 16):

(22) MAX constraints:
Every element of $S_1$ has a correspondent in $S_2$. (i.e., no deletion)

(23) DEP constraints:
Every element of $S_2$ has a correspondent in $S_1$. (i.e., no insertion)

(24) IDENT(F) constraints:
Let $\alpha$ be an element in $S_1$ and $\beta$ be any correspondent of $\alpha$ in $S_2$. If $\alpha$ is [$\gamma$F], then $\beta$ is [$\gamma$F]. (i.e., correspondent elements are identical in feature F).

Obviously, I expand the notion of correspondence to phonological processes not motivated morphologically, but cratylistically as outlined above in section 2.3. The following subsections will show that such an extension of OT is not without precedent by first summarizing Benua's discussion of morphological Output-Output (OO) relations other than reduplication, then discussing at length Steriade's approach to similarity in semi-rhymes, where identity is usually not motivated morphologically, but largely phonetically and semantically, and finally establishing the basis for my own discussion by outlining Fleischhacker's application of OO constraints in OT to the very issue at hand in this paper, heterophonic puns, as well as a similar extension for the domain of proper names (Lutz and Greene 2001).

## 4.3 Output-output Correspondence (Benua 1997)

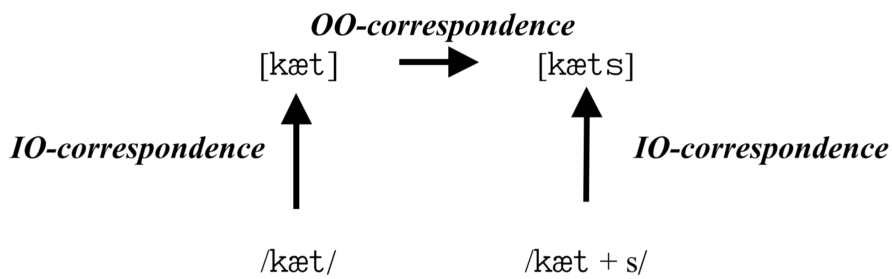
Benua's rationale is to extend OO correspondence to other morphologically related forms than those introduced originally by McCarthy and Prince (1995). She discusses constraints and their ranking in order to explain how "a derived word can mimic its base in features, segmentism, and prosody" (1997: 8), for example, derivational relations like Gr. *δειγνυμι* vs. *δειξις*, or inflectional ones like *house* vs. *houses* in English. Her term for these relations is *transderivational identity*: "Constraints defined over transderivational (output-to-output or OO) correspondence relations state identity requirements on pairs of words, or PARADIGMS, constructed by morphological derivation" (1997: 3; emphasis in the original).

Like for McCarthy and Prince's discussion of reduplication, where "faithfulness constraints on the stem domain always dominate those on the affixal domains" (1997: 4), Benua's ordering of the recursions reflects the paradigmatic relation of the two words between which the correspondence holds. "Paradigmatic relations are asymmetrical, in that the base can influence the derived word, but the derived word never influences the base" (Benua 1997: 53).[19] From an analytical perspective, the same relation holds in the paradigm between a pun and the target it aims at. The target corresponds to the base in a base-reduplicant relationship, in that it is the pivot from which the pun can deviate, but not vice-versa. That is, the target cannot be subject to any change, or in non-generative terms, constrained by correspondence to the pun. But even for puns and targets one must caution that, with a view to pun generation, not any target can form the basis of punning for purely phonological purposes like its uniqueness in a language, thus leading to an—admittedly indirect—influence of pun on target.

Benua illustrates OO correspondence in the diagram reproduced in example (25) with a fairly unproblematic morphologically motivated relation (1997: 7). Of course, she has not summoned this rather sophisticated tool for the analysis of such simple matters, but the complex discussion involving over- and underapplication and related issues is not of concern for my approach to heterophonic punning here.

[19] While this is generally true for puns and their target, Benua should qualify the general statement to account for phenomena like paradigmatic leveling as in Latin rhotacism: L *honos, honoris* > *honor, honoris* (cf. Kenstowicz 1994b: 24-26). I am grateful to Mary Niepokuj who pointed this out to me.

(25)




For this kind of morphologically motivated OO-correspondence, Benua introduces recursiveness in the evaluation metric, because both forms between which the correspondence holds must be evaluated against other such pairs, not just one SR against one UR at a time. The following is an example of such a recursive evaluation tableau (1997: 34). It uses the hypocoristic-truncation she focuses on and evaluates the pair in d. with underapplication of the backing of a low vowel before tautosyllabic *r* as least violating:

(26) Recursion (A) Recursion (B)

| /læri/ | OO-ID | *ær]$_\sigma$ | IO-ID | >> | /læri-TRUNC/ | OO-ID | *ær]$_\sigma$ | IO-ID |
|---|---|---|---|---|---|---|---|---|
| a. la.ri | | | *! | | a'. lar | | | * |
| b. la.ri | | | *! | | b'. lar | * | * | |
| c. læ.ri | | | | | c'. lar | *! | | * |
| d. ☞ læ.ri | | | | | d'. ☞ lær | | * | |

In this tableau, the SRs læ.ri and lær, and their URs, which turn out to be the optimal forms, are simultaneously evaluated against a candidate set of 2 SRs and 2 URs per candidate. Both the full name and the truncated form are evaluated with the same constraint hierarchy, in which two constraint regulate the individual UR-SR relation, an input-output identity constraint IO-ID, a phonotactic constraint on syllable well-formedness $*ær]_σ$[20]; and the highest-ranked OO-ID constraint, which demands output-output identity between the two SRs.

The key to recursive evaluation is the ranking of the constraints for the base form above those of the truncated form, which "makes underapplication possible without contravening the $*ær]_σ$ >> IO-IDENT[BK] ranking. The lower-ranked constraint, IO-ID, compels violation of the higher-ranked one, OO- ID, only because IO-IDENT[BK] is violated in a dominant recursion of constraints" (1997: 49).[21]

The purpose of this section was to introduce the concept of OO-correspondence that is not morphologically motivated. On the basis of this discussion we can now turn to the specific case of non-morphological correspondence between the target and pun in punning. Fortunately, in contrast to the complex interaction of IO and OO constraints described in Benua's model, the present study will not have to pay attention to IO relations, because the corresponding SRs, target and pun, have to be English words, regardless of their IO optimality status. So the cratylistic sound similarity correspondence model does not have to interact with morphological or non-punning transderivational correspondence.

[20] Although Benua admits that this constraint is a "brute-convenience" (1997: 33n), this does not diminish its ugliness as an *ad-hoc* solution. I'm grateful to Mary Niepokuj who pointed my attention to this.
[21] An important theoretical question poses itself here: Do we not rather have cyclicity of the same hierarchy of IO constraints (in two cycles in this example), but not really OO-constraints? While the answer to this question lies beyond the scope of my approach at this stage, it needs to be addressed by those focusing on morphology-based OO correspondence.

## 4.4 Perceived Similarity and Correspondence Environments (Steriade 2001)

Steriade (2001) aims to explicate an important issue that is left implicit in OO correspondence hierarchies and has not been addressed as such before. Based on the common-sensical assumption that OO correspondence is restricted to a large extent by what is perceived as similar sounding, she proposes that a mechanism is required that relates the hierarchies to perceived similarity. In other words, we require the least necessary difference between a pair of output forms, for example, in a semi-rhyme, just as between a paronomasic target and its pun, but we have so far no measure for this difference to be used to order the constraints. This subsection will discuss such a mechanism in Steriade's *P-map*, before the other implications of her work on semi-rhymes to my approach to imperfect punning are outlined.

### 4.4.1 Theoretical Note

Before I will outline these issues, I would like to point out a different understanding of OT and Steriade's approach on my part: I have assumed perceived similarity to be implicit in all OO constraint hierarchies, in the sense that higher-ranking constraints rule out "more deviant," "less similar," output forms. It is obvious that I am entangled in a metaphorical understanding of a theory that is very metaphorical itself, viz., "higher," "lower ranking," "violate." etc. Accordingly, we must assume that Steriade's insights have made explicit what has been implicit all along. While this may seem to be a moot point, it entails a reason for my disagreement with Steriade who claims that this formerly implicit—now explicit—hypothesis can help to evaluate OT other than making one of its facets tangible. In other words, I claim that it does not add a new external criterion that enables the empirical verification of OT, but elaborates an assumption on the relation (perceived similarity) between observed material (observable output) and theoretical description (constraint hierarchy).

Steriade seems to have gone the full circle from performance to competence to performance, when she claims: “the P-map is a set of statements about the distinctiveness of contrasts, whereas current correspondence constraints refer to contrast, if at all, indirectly: It is therefore necessary to make explicit the contrast-based nature of correspondence statements” (2001: 27). There is another way to put this circularity: When we observe one output and not another, it is essentially the same thing to say a) that in a description in OT the constraints relevant in the evaluation of this form are in a certain order, implying different levels of perceived similarity, and b) to say that there are different levels of perceived similarity, implying that in a description in OT the constraints relevant in the evaluation of this form are in a certain order. What is gained, and I don’t mean to cast a doubt on the fact that this is an important gain indeed, is a higher descriptive adequacy for a model based on a theory all parts of which are explicit.

And it should be noted that, obviously, the very assumption that lead Steriade to make the issue at hand explicit was feeding my hope at the outset of the present project, namely, that OT could help shed light on heterophonic puns, an issue that has all along been identified as crucially involving different degrees of perceived similarity. Steriade started from the theory and found an application, I started from an application and found her (elaboration of) a theory.

### 4.4.2 The P-map

As stated above, Steriade's work in relation to sound similarity is motivated by the lack of justification of constraint hierarchies in view of perceptual differences of the evaluated forms: "what is needed is a mechanism that relates rankings between correspondence constraints to perceived difference of similarity degree" (2001: 4). Her proposal centers around the concept of a P-map, a map of perceptibility of segmental similarity in relation to different contexts. She defines: "The P-map hypothesis is the claim that one aspect of linguistic knowledge, namely knowledge of similarity, controls grammatical structure, by projecting correspondence constraints and determining their rankings" (Steriade 2001: 13).

The following table is a fragment of such a P-map of Romanian, taken from the handout for a presentation by Steriade and Zhang (2001):

Table (3): P-Map

| voicing | V_V | V_# | N_V | N_# |
|---|---|---|---|---|
| p/ b | p/ b | p/ b | P/ B | p/ b |
| t/ d | t/ d | t/ d | t/ d | t/ d |
| k/ g | k/ g | k/ g | k/ g | k/ g |
| s/ z | s/ z | s/ z | s/ z | s/ z |

(size of letter signals relative degree of discriminability: smaller = more confusable)

voice discriminability varies with context (V=vowel, N=nasal, #=word boundary)

The main idea expressed by (20) is that in Romanian voicing contrast is most perceptible in intervocalic environment and least perceptible after a nasal, especially after a nasal and in word-final position. In general, more discriminable segment contrasts are related to higher ranking correspondence constraints. So perceptual similarity factors are dependent on distance between the segments, contextual cues, and cue duration, an issue I will not discuss here, although it has bearing on puns, albeit at a richer level of analysis and consequently at such a high cost that it is not helpful to enlighten the issue here. These factors determine the ranking of discriminability which in turn determines the ranking of the constraints in a hierarchy.

The P-map aims to explicate how OT was designed to do well what it does, namely to capture the interaction of phonological segments at various levels that do not belong to purely segmental or featural ones. In contrast to such approaches discussed above, the context of the feature-bearing segments ca be taken into account in OT. This is obviously a step in the right direction. Fleischhacker has taken this approach even further in her discussion of onset transfer as we will see below, blazing the trail first traveled by Steriade, and now open for my attempt at a more exhaustive investigation-*qua*-application of sound similarity beyond the level of abstraction of isolated segments.

### 4.4.3 Correspondence Domains: Rhymes and Puns

The P-map within OT has been developed on semi-rhymes (Steriade and Zhang 2001), a central concept for which is the rhyming domain (RD), circumscribing a string containing one stressed vowel at the end of a line of text in a poem and all segments that follow it. A perfect rhyme is characterized by full identity of this domain in the two segments that form the rhyming pair, identity of the segments before the RD being considered ugly, e.g., *collate-late*, where the onset [l] is outside of the RD, namely just prior to it, but identical. A semi-rhyming pair is assumed to have maximally possible identity, full identity being precluded here, because different meaning has to be denoted by the two words to which the segments belong (see also the discussion of Zwicky (1976) above).[22]

The central effect Steriade and Zhang examine is that "for some feature F, SR's [semi-rhymes] containing different F values are more frequent in contexts of reduced perceptibility for F." (2001: n.p.). The interpretation for this is, of course, that "judgment of phonological similarity is affected by perceptibility" (ibid.), in contrast to articulatory characteristics of phonemes.[23] And perceptibility is influenced by the context of a given segment, for example, through consonance. Accordingly, Steriade and Zhang not only postulate the usual OO correspondence constraints to hold between the corresponding RDs, e.g., MAX, IDENT[F], but also highlight contextual constraints pertaining to each of the subsegments of the RD and its correspondent.

In puns, the correspondence domain is, of course, potentially larger than in rhymes, because of the constraint on full identity in noted above and the additional metric constraints in rhyming. Generally, the segment comprising the target-pun pair has to be at least one full lexical item that can denote a concept, two of which are required for the humor of the pun to function semantically, with the additional requirements on the scripts

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[22] Interestingly, at this point the discussion appears to overlap with puns that could be used for the rhyming pairs, a paronomasic pun in semi-rhymes and a homonymic pun in perfect rhymes. Of course, rhymes also require a difference just before the rhyming domain, an issue not specifically mentioned in Steriade and Zhang. But obviously, the following is a particularly infelicitous rhyme (and, of course, atrocious in terms of an attempt at poetry):

> I brought my check to the local bank,
> which was lying on the river's bank.

[23] It has been argued, that similarity perception between words is influenced by the articulatory information stored in their lexical entries, which leads to competition in lexical access (cf., e.g., Cutler and Clifton 1999). To take the analysis to this grainsize is clearly not advisable here.

to which these two concepts belong outline in section 2.1. In short, puns work in general around two complete words represented by the target and its pun.

### 4.4.4 The C-Constraint: Multiple Survivors

Another central, controversial, and highly valuable feature of Steriade's approach and its application in Steriade and Zhang (2001) deserves discussion in its own subsection: In OT there is only one survivor that is filtered through the constraints. Although there are seemingly better contestants who made it closer to the finish line, it is not a prototypicality or gradational theory, but has binary output, namely the optimal form vs. all other candidates. Assuming the customary ideal speaker-hearer who has only one possible grammatical form for any linguistic choice, OT models this highly idealized unambiguous competence. Of all infinite candidates produced by GEN, only one makes it through EVAL, all the others don't. As we will see, for the discussion of semi-rhymes, Steriade and Zhang (2001) allow for more than one candidate to survive the rigorous EVAL, whose rigor is softened through the introduction of a threshold that lies lower than directly behind the sole survivor in canonical OT.

This main deviation from most other approaches in OT is that they introduce a cut-off point marked by a constraint C in the hierarchy of constraints. Output forms that only violate constraints ranking below that point are allowed to surface, while output forms that violate constraints above the constraint C are filtered out as suboptimal. This is motivated by the fact that not only one, but a number of deviant semi-rhymes are acceptable.

(27) CORRESP.$_1$ >> **C** >> CORRESP.$_2$

↓ (CORRESP.$_1$) The Unusable

↓ (CORRESP.$_2$) The Usable

So the evaluation metric does not just pick the one and only optimal form, which would be the perfect rhyme. Nor does it choose the next best candidate, postulating an additional constraint on full identity that the perfect rhyme or the homophonic pun would violate. So we do not have a form of canonical optimality, but rather an evaluation metric for runner-ups to the best candidate, many of which are not going to be filtered out, namely those that only violate constraints below C.

An interesting question is implicit throughout their discussion, but remains unanswered by Steriade (2001) and Steriade and Zhang (2001). If their evaluation metric is able to distinguish more than one acceptable candidate from the unacceptable candidate(s), is it also a metric evaluating "better" semi-rhymes among the acceptable ones? In other words, could it also be applied as a tool not only to tell puns from non-puns, but also to evaluate more acceptable puns from worse ones?

As should be clear from my discussion in chapter 1, it is my assumption that for the strictly phonological criteria applied the answer would be positive. One must of course be careful, not to make claims about "better" puns on this basis, where better means anything other than closer phonological similarity to the target, in particular any evaluation of the degrees of funniness of puns, as Fleischhacker does when she claims that "there is a positive correlation between pun-target similarity and the goodness of the pun" (2002: 6; see next subsection). Again, from my previous discussion, and even more so from the section on non-phonological factors in heterophonic puns in chapter 6, it should become clear that even in a form of predominantly verbal humor, such as puns, the semantic element is the most crucial one for the humor of the text.

Yet, the general transferability of the concept of a break-off constraint C to puns should be obvious. In puns we cannot only allow the single phonologically optimal output form to survive, because that would restrict the number of semantically usable candidates too strongly. The likelihood that the one most similar form is usable in semi-rhymes is extremely low, because the rhyming form must be a meaningful string in the language used for rhyming, as well as be an appropriate lexical choice, and compatible with the context. I propose that the likelihood for the single most similar candidate to be a possible target for a pun is even lower, as the semantic requirements on puns are even stricter than those on rhymes: not only must both the pun and the target be meaningful words, but they must be in a humorous relationship of SO (see chapter 2) to each other.

For purely phonological constraints *fire* and *friar* could be considered to stand in a punning relationship, but they are not, unless we find them in a context that conforms to the semantic criteria for a joke, namely evoking two opposite scripts that overlap. This overlap is established through the cratylistic reasoning about the sound similarity (see 2.2), but the *fire* and *friar* are only a target and a pun in the relationship established by all the other elements[24] of this example:

(28) Q: What did the egg in the monastery say?
A: Oh well, out of the frying pan into the friar.

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[24] Among these also the contamination through the repeated [fr] onsets in *frying* and *friar* should be noted. But the assumption that *friar* is also a possible homophonic pun on the target *fryer* must be rejected. While *fryer* conforms to the script of COOKING, it would fail to create the overlap to the religious script, that is, the set-up introducing an egg-frying scene in a monastery would be useless. In addition, the force of the proverb “from the frying pan into to fire” must be assumed to force the recovery of the target *fire* from the pun *friar*, and not the target *fryer*.

Without jumping too far ahead in the discussion, let us assume *pyre* to be the most similar sounding English word to *fire*. Letting only this form survive through EVAL, we would not have the possibility to use *friar* as a pun, which would not pose a terrible problem as *pyre* provides us with a word from the same semantic field, an appropriate humorous opposition for which should be fairly easy to find. Using actual words to represent constraint combinations, a hypothetical positioning of C for targets for the pun *fire* could look like this:[25]

(29) *wolpertinger*[26] >> ... >> *fur* >> **C** >> *friar* >> *pyre*

Despite many open theoretical questions, several central ones of which have been outlined in this section, I hope the particular adaptation of OT introduced so far strikes the reader as applicable to possible phonetic distance not only in semi-rhymes, but also in puns, because it makes previously implicit aspects of OT explicit and addresses the central issue of how a certain constraint ordering is motivated. Not only did it inspire me to work on this project, but also Fleischhacker, whose approach to the onset of heterophonic puns has been pointed out to me by Steriade as I was working on an earlier version of this study.

## 4.5 Onset Correspondence in English Imperfect Puns (Fleischhacker 2002)

### 4.5.1 Perceptual Similarity vs. Simplification

In many languages, reduplicative processes play a prominent role (cf., e.g., Niepokuj 1997). Usually for morphological reasons, a word contains two similar parts, one of

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[25] Of course, *fire* itself is a possible target, and actually the one that should be evaluated as most similar, but the homophonic target, for example as *fire from a job*, is not of concern here.

[26] *Wolpertinger* is the German word for a "jackalope," in which the bodies of several animals are used in a *collage* of taxidermal fancy.

which is the base of which the other, the reduplicant, is a copy. While many complex relations between the two have been described, typically, the reduplicant is simplified with respect to the base. For example, to form the past in this example, the onset of the stem, [sl], is copied and simplified to [s] as part of reduplication:[27]

(30) saíslêp [se-slep] Gothic 'slept' (cf. Braune 1966: §78, Anm. 3)

Despite the tendency to simplification, patterns like the one in example (30) seem to have a privileged status because of their low perceptual difference between base and the reduplicant and are commonly found across languages. Thus, example (30) illustrates the kind of conflicting constraints of similarity vs. simplification typically found in reduplication.

Parallel to this, we have conflicting constraints in punning: On the one hand we require the highest possible similarity for the two purposes of providing a logical mechanism as well as recoverability. On the other hand, we need to have two English words that denote meanings that are compatible with two different scripts. The first requirement is most optimally fulfilled in the case of homophones, but very rarely do two meanings of homophones successfully fulfill the second function. This is where OT-inspired correspondence constraints can be used to model the evaluation of possible candidates that are not fully optimal in order to provide candidate sets that, in turn, can be evaluated by a semantic evaluator that distinguishes jokes from non-jokes. This latter, much more complex task will have to be left for future research (see chapter 7), while the former is out stated goal for the next chapter (5).

[27] The vowel identity between base and reduplicant is incidental as Gothic uses the default vowel [e], spelled <aí>, in the reduplicant irrespective of the stem vowel (Braune 1966: §78, Anm.3; Niepokuj 1997L 144-147).

Fleischhacker (2002) discusses heterophonic puns as evidence for certain privileged patterns of output-output relations in order to support her observations on reduplicative processes. In this subsection, I will outline her discussion on puns in its own right, as it seems to provide a promising attempt to unite the phonological forces at work in punning and, with much extended scope and embedded into the humor-theoretical context provided in the present study, can serve as a starting point for a meaningful account of heterophonic punning.

The variety of onset reduplication patterns encountered by Fleischhacker does not allow for an analysis at a level of generalizations over segment similarity, but leads her to a constraint hierarchy that captures similarity in relation to the environment of the segments as it influences their relative similarity, a level of analysis that I have stressed needs to be included for in punning similarity as well (see P-map above, 4.4.2): "these patterns [...] are sensitive to the relative perceptual similarity of the correspondence strings" (2002: 6). Her main result for our purposes here is that "$O_1R_2V$ -> $O_1V$ is the cluster simplification map resulting in the smallest possible difference between base and reduplicant" (ibid.; O=obstruent, R=resonant, V=vowel). In the following subsections I will follow her discussion of heterophonic puns as it supports this main result and will highlight its relevance for my own approach.

### 4.5.2 Again: Punning Similarity is more than Acoustic Similarity

Fleischhacker's excellent research goes into as much depth as is warranted by the complexity of the object of her study. It naturally lacks the breadth required by the different purview of a broader approach like the present one. What Fleischhacker provides for the humor researcher, though, is a template that is extendable to the whole punning domain of a pun-target pair beyond the onset, foremostly to the rhyme of the domain that seems to be a prime target for deviance between pun and target (cf. section 3.1 above) and ultimately to cover relative perceptual similarity in punning in general.

But before I discuss Fleischhacker's approach to English imperfect puns, it is necessary to stress the difference between reduplication and punning, which makes obvious that the exclusive focus on the phonological similarity is a dangerous oversimplification of the relation between the two (see also chapter 5): Whereas in reduplication we see mostly constraints of cluster simplification (markedness, reduplicative constraints) interacting with similarity (correspondence), in punning, the two outputs to be evaluated also have to belong to two opposite, overlapping scripts, possibly even trigger the second script and/or furnish the overlap (markedness, complex semantic constraints) in addition to their sound overlap [=much of the recoverability, all of the cratylism] (correspondence, semantic/syntactic support [idioms, etc.]). But both are "states of compromise reached in the face of conflicting forces" (Fleischhacker 2002: 26).

### 4.5.3 More Frequent Violations = More Similar Puns?

Three main assumptions underlie Fleischhacker's use of imperfect puns as evidence for her study. They will be evaluated with respect to my own model of imperfect punning in this subsection, and this subsection will also provide the rationale for my use of a corpus. The first hypothesis, that "the pun word must be sufficiently similar to the target that the target can be inferred" (Fleischhacker 2002: 7), is also my assumption for one of the two functions for the phonological side of this study on punning similarity. But that other factors determine the recoverability at least as much and in interaction with the phonological ones is discussed in a later chapter 6.

Secondly, Fleischhacker assumes that higher frequency in a large corpus is taken to indicate more similar puns (ibid.). This is the only necessary assumption for the present study, and it is not trivially true. The reason that more similar pun-target pairs are more frequent than less similar ones lies in their higher recoverability and, consequently, utility for punning, not in their funniness as I will argue in more detail in the next subsection.

In sum, this reasoning from higher frequency of violation type higher punning similarity is also the basis for the following central claim that we can safely assume that for a given corpus of puns, we more frequently encounter types of similarity constraint violations in target-pun pairs that have a smaller effect on perceived similarity than vice versa. For example, if within consonant clusters in the word onset the final consonant is missing in an overproportional number of puns as compared to the targets in the corpus, this violation is assumed to be less detrimental for the perceived punning similarity than another less frequent violation type. I will use this crucial assumption in chapter 5.

### 4.5.4 More Similar Puns = Better Puns?

The necessary semantic requirements of humor (chapter 2) that hold for puns, make Fleischhacker's third assumption the most problematic: "there is a positive correlation between pun-target similarity and the goodness of the pun" (2002: 8). This claim can only be salvaged, if similarity is understood to be constituted not only in relation to the phonological environment as Fleischhacker does. Perceived funniness as it can be modeled within the humor theory used here is largely semantic issue. In view of the necessity of the target not only to be similar to the pun, but also to trigger an opposite, overlapping script, its support for this task from non-phonological factors, and the lack of humor of many pseudopun word-plays found in pun corpora (like Sobkowiak's on which mine is based, Zwicky and Zwicky's corpus used by Fleischhacker is culled from Crosbie (1977)) it is unlikely "that degree of representation in the pun corpus correlates with pun goodness" (Fleischhacker 2002: 10), however one chooses to define "goodness" here. It must suffice to aim at a theory that generates an output that is as similar in composition to that of the observed corpora as possible. More specifically, if a constraint hierarchy evaluates as higher those pun types that are more frequent in the corpus, it has fulfilled its purpose. Of course, to infer similarity from higher frequency is less dangerous than inferring funniness.

### 4.5.5 Onset Difference in Heterophonic Puns

Fleischhacker selects four types of pun-target pairs differing in their onsets in a fashion compatible to the reduplication patterns which are her main focus, three of which are illustrated in the following table:

Table (4): Three Types of Onset Deviance in Pun-Target Pairs with Examples from Crosbie (1977: 31, 223, 191); O=obstruent, V=vowel, T=stop, S=sibilant, R=resonant (from Fleischhacker 2002: 8)

| **pun word** | **target word** | **pun segment** | **target segment** | **segmental context** | **pun type** | **syllabic context** |
|---|---|---|---|---|---|---|
| *Blown-apart* | *Bonaparte* | l | Ø | b_o | Ø~R/O_V | medial |
| *surgeon* | *sturgeon* | Ø | t | s_ɛ | Ø~T/S_V | medial |
| *raise* | *praise* | Ø | p | #_r | Ø~O/#_R | initial |

She continues by calculating the *observed* and *expected* frequencies of the four pun types: The observed frequency is the ratio of instances of specific segment-type deletions (rows in table (1)) divided by instances of medial deletion of any segment type. The expected frequency is calculated as the ratio of the four pun types to existing word pairs (from the CELEX database) that show the same segment contrast, e.g., *pay - play*.

The result of these calculations is first, that the $O_1R_2V$ - $O_1V$ type (first row of table (1)) is significantly prominent, in terms of making up 44.15% of the deletions in the pun corpus (observed frequency), as well as overrepresented, this percentage being 1.34 times higher than the instances of the same segment contrast in a non-punning corpus (expected frequency). Second, the $S_1T_2V$ - $T_2V$ contrast[28] is significantly underrepresented, with an observed frequency of 2.64% which is much lower than its expected frequency of 8.07%.

A major flaw of Fleischhacker's discussion[29] needs to be noted here, namely that she does not take the directionality of the target-pun relation into account. This becomes clear when she describes the relation between the target *Bonaparte* and the pun *Blown-apart* as "$O_1R_2V$ to $O_1V$" and at the same time the relation between the target *Stabitha* and the pun *Tabitha* as "$S_1T_2V$-$T_2V$" (2002: 8). Obviously, if directionality were acknowledged as a parameter the first relation would have to be described as that of $O_1V$ to $O_1R_2V$, assuming the target as the input and the pun as the evaluated form. Indeed, as modeled in the present study, as well as the previous approaches discussed in chapter 3, the target is assumed to be the basis from which the pun deviates. In analogy to models of reduplication, the target corresponds to the base, and the pun to the reduplicant, a point

[28] Not to be confused with the inverse contrast in row 2 of table (4), where we have the following contrast: $T_2V$ -> $S_1T_2V$.

[29] I am, again, grateful to Mary Niepokuj who pointed my attention to this issue.

that will be argued in more detail in section 5.2. This asymmetry of the relation has important implications, which I will return to, and these are consequently overlooked by Fleischhacker.

Despite her oversight of directionality in the target-pun relation, Fleischhacker's approach to segment contrast classification seems promising. The next chapter (5) of the present study will present a subset of my pun corpus tagged for punning type similar to Fleischhacker's approach, in terms of contrasting segment(s) and their context, in context in terms of punning domain and syllable position. The pun types thus identified will be tested for their frequency in the remaining corpus, and a constraint hierarchy for puns should be set up to evaluate overrepresented types higher above any cut-off constraint than underrepresented types and exclude unrepresented types as already violating constraints below the cut-off one.

### 4.5.6 Not CONT, but MAX (and DEP)

For a discussion of reduplication in particular, and possibly output-output constraints in general, and thus also of relevance for pun-target relations, is Fleischhacker's observation that CONTIGUITY constraints are not a promising approach to account for the similarity between forms, be it base and reduplicant or target and pun. CONTIGUITY prohibits deletion and skipping in correspondence relationships, preferring a contiguous copy. Rather, because "correspondence constraints serve the purpose of minimizing the difference between correspondence strings [...] the relevant notion of difference in correspondence relationships is perceptual, not string-based" (Fleischhacker 2002: 12). And in particular, "[t]he perceptual similarity is encoded as the action of *context-sensitive*

Max-C constraints" [my emphasis] in onset transfer in reduplication. The following table summarizes Fleischhacker's constraints enforcing the similarity (2002: 13), where Δ stands for perceived difference. We can ignore the constraints that enforce reduplication and simplification (2002: 14, 15) as they play no role in punning:

Table (5): Similarity and Constraints for Fleischhacker's Onsets

| | | | | | | |
|---|---|---|---|---|---|---|
| similarity scale: | Δ(C-Ø)/C_V, | Δ(C-Ø)/#_C | > | Δ(R-Ø)/S_V | > | Δ(R-Ø)/T_V |
| corr. constr.: | MAX$_{BR}$-C/C_V, | MAX$_{BR}$-C/#_C | >> | MAX$_{BR}$-R/S_V | >> | MAX$_{BR}$-R/T_V |

In this table, the first row represents assumed influence on similarity perception of a given correspondence, based on the frequently observed instances in the corpus, and ordered according to this frequency from left to right. The second row translates these into the respective correspondence constraints that are violated. Since to contrast is between a segment in the base and its omission in the reduplicant, these are all MAX$_{BR}$ constraint, e.g., MAX$_{BR}$-R/S_V: "Don't delete (MAX) a resonant (R) in the reduplicant as compared to the base (BR) after a sibilant (S) and before a vowel (V)."

It needs to be explored whether violations of such MAX ("no deletion") constraints—as well as DEP ("no insertion") violations that are not encountered in reduplication, because it involves simplification (see (30) above), but will be shown to play a significant role in punning—prove to be the more adequate approach to other constellations of similarity in pun-target constraints. In view of the previous discussion it will be clear that my assumption is that they indeed will. Also in this respect, Fleischhacker's method, built on Steriade's extension of OO-correspondence constraints, is a promising basis for an approach to my field of application, where MAX$_{PT}$-C/x_x constraints—maximizing the identity of pun (P) and target (T) of consonants (C) in relation to a given environment (x_x)—and similar MAX, DEP, and IDENT constraints will be the main tool to model pun-target similarity.

## 4.6 Similarity of Personal Names (Lutz and Greene 2001)

Another recent approach to model sound similarity for a specific domain with the help of OT is Lutz and Greene's (2001)[30] study of personal name variants. The type of variation that motivated the application-driven approach of Lutz and Greene is largely based on orthographic variation, e.g., *Conrey* vs. *Connery* or *Geoff* vs. *Jeff*, which occurs when names are transmitted over error-prone audio channels, in particular the telephone or radio, but also due to spelling changes and historical linguistic variation, as well as variation in transliteration from scripts other than Latin, e.g., Russian, Arabic, or Chinese. One major application for name similarity metrics is genealogical research, where comparatively primitive and error prone systems like Soundex (Nara 1995) and Metaphone (Philips 1990) are still in use.

But several differences to the present approach will emerge from my survey of their study, most stemming from the different issues for sound similarity in personal names and some from problems that Lutz and Greene have overlooked. First, a crucial difference in purview exists: pun and target are real words, therefore semantic factors must be taken into account, more difference must be allowed, stricter syllable structures can be expected than in proper names, and different effects of conventionality on perceived punning similarity. Second, and equally importantly, the environment of

[30] Their study is published only as an unpaginated technical report, therefore no page numbers are provided in this subsection.

violations is not taken into account by Lutz and Greene. Third, in target-pun correspondence there is clear directionality of the constraints, the target being the pivot form (parallel to the base in reduplication) from which the pun (parallel to the reduplicant) deviates. In personal name relationships, on the other hand, there is a historical relationship of newer to older forms, implying the older forms as the basis from which the newer ones can be understood to deviate. But, more typically, two current name variants that share an underlying older form are compared, for which directionality could only be useful, if this operation is done in two separate steps of comparing each of the current forms to the shared ancestor and then combining the results. This is, of course, only possible if the ancestor is known. It is clear that Lutz and Greene are operating with a notion of asymmetry when they state the "costs [...] are not inherently reflexive: the cost of [X] going to [Y] will not necessarily be the same as the cost of [Y] going to [X]." But, regrettably, it remains unstated which directionality between names is underlying this asymmetry, and why.

In general, Lutz and Greene's computational approach to name comparison is based on similar—but in essential aspects different—theoretical assumptions, not least its implementation of a significantly modified version of OT. It is therefore useful to outline their concept of phonological similarity in more detail. They base the initial similarity algorithm on pairs of corresponding IPA characters between which they determine edit distance just as in Sobkowiak (1991) and the present study. But, as mentioned, a major difference to the approach here lies in the inclusion of the environment of the segments that do not fully correspond is taken into account. A simple edit distance algorithm would simply assign a value of *1* for every non-matching pair and sum up these values to produce the total score for a given segment, yielding as imprecise a value as produced by the earliest Vitz and Winkler method (see section 3.1).

Realizing this problem, Lutz and Greene modify their initial algorithm "to score pairs of different characters gradiently according to their phonological relatedness." The different grades were collected into a cost table matching each pair of the phoneme inventory with a value ranging from 0.0 to 1.0, related to the number of distinctive features in which the two phonemes of the pair differed. The key to this modification is, of course, the central problem of modeling the notion of phonological relatedness and how it is formalized for the purpose of creating a cost table matching each phoneme pair to a value.

In an attempt to enhance the similarity performance of the cost table, Lutz and Greene go the same way independently chosen in my approach, namely to use the hierarchy of feature geometry in autosegmental phonology rather than simple feature counts based on SPE,[31] and to base the values conceptually on OT constraint violations (see section 5.7). In this context they note the important difference of conceptualizing constraints in this way with respect to standard OT, a difference I require for identical reasons in my approach: "constraints are used to build an abstract cost model that gives a measure of the costs associated with bridging the feature differences between any two phonemes. A final distance cost for any two phonemes is the sum of the individual costs for each violated constraint. The constraint rankings determine the relative weight of each constraint in the

[31] On the problem of using an articulatory model like feature geometry for similarity judgments, which are largely acoustic (see subsection 5.3.2).

calculations." In other words, the cost table represents the constraint hierarchy in a convenient formularization for a computational implementation.

Let us now turn to the phonological assumptions about sound similarity that underlie Lutz and Greene's model. In general, sonority is considered the key parameter. The following aprioristic set of violations is the core of their cost matrix for changed—in contrast to inserted or removed—segments (corresponding to my IDENT(f) constraints). Accordingly, the most basic root level of the feature hierarchy is

(31) consonantal >> sonorant.[32]

This assigns a higher cost for a change from a C to a V, a correspondence violation that leads to severe loss of similarity, than to those constraints that just changes the sonorance between the segments at hand. These constraints assign varying costs that are related to how distant the corresponding pair of sounds is in terms of the standard sonority scale:

Vowels > Glides > Liquids > Nasals > Obstruents ( Fricatives > Affricates > Stops ).

The sonority scale implies higher similarity between sounds that are adjacent in it than sounds that are further apart, so that a violation that has a nasal and a fricative as corresponding segments leads to less perceived distance between the respective names than one involving a vowel corresponding to a stop.

It remains unclear from their discussion, how exactly Lutz and Greene would formulate the corresponding correspondence constraints, but we must assume individual constraints, all of which are ranked—that is, practically assign a different cost—for each of the possible relations in the sonority scale. For example, IDENT(son)-GN >>

[32] Lutz and Greene use this more current term rather than "resonant" as implied, for example by Fleischhacker's acronym R for this sound class. I will treat these terms as interchangeable.

IDENT(son)-VG would mean that a violation of identity of the sonority feature that involves a vowel in glide is more costly than such a violation in a corresponding pair of a vowel and a glide.

Lutz and Greene handle epenthesis and deletion, i.e., violations of DEP and MAX constraints, symmetrically in the same hierarchy at the root level and using the same analogy between higher cost and larger sonority difference. In view of the asymmetric ousting effect (see sections 3.4 and 5.2), it seems highly problematic to assign the same cost to insertion and deletion of segments, hence my own independent ranking of DEP and MAX constraints.

The remaining three feature dimensions, place of articulation, manner, and the laryngeal feature are assumed to contribute to similarity distance in terms of the following hierarchy (contrasting with Zwicky and Zwicky's (1986) model; cf. section 3.3):

(32) place >> manner >> laryngeal

Note, again, that these aren't constraint hierarchies, but hierarchies of features in terms of the autosegmental feature tree, in terms of how much they contribute to perceived similarity. But they imply a ranking of constraints against the violation of similarity, such that, for example, a change in manner from one correspondent to the other is less costly than a change in place of articulation.

Among the place features, the following hierarchy is assumed to hold, again, implying a higher cost for larger distances traversed at this level in the feature hierarchy by a given correspondent pair:

(33) labial, dorsal >> coronal >> pharyngeal

In more detail, this hierarchy represents the violation penalties given in (34). Note, that unlike in the previous hierarchies in this section, the following one does not indicate the importance of a feature in terms of its influence on perceived similarity when it is changed, but a set of constraints on these violations ranked according to their cost, and including directionality of the violation (→), respectively the lack thereof (↔).

| | | |
|---|---|---|
| (34) | least costly | coronal → pharyngeal |
| | | coronal + dorsal → coronal |
| | | coronal → coronal + dorsal |
| | | labial, dorsal → pharyngeal |
| | | labial, dorsal → coronal |
| | | pharyngeal → coronal |
| | | coronal → labial, dorsal |
| | most costly | pharyngeal → labial,[33] dorsal; labial ↔ dorsal[34] |

Among the manner features [continuant], [nasal], [strident] and [lateral], Lutz and Greene posit the following discrete hierarchy for [continuant], claiming convincingly that "[n]o inclusive universal constraint hierarchy of any kind is yet, or likely, to be established for the highly discrete manner features." They choose not to account for the other manner features as "[r]elatively small, reflexive costs are incurred for any changes in the[se] simple binary features."

(35) -continuant >> ±continuant >> +continuant

This, again, is based on the sonority scale as manifested in the following hierarchy:

(36) stop >> affricate >> fricative >> sonorant

---

[33] It seems odd that this violation is most costly in either direction, when the change from coronal to pharyngeal is least costly. In addition to Lutz and Greene's assumption of "large physical distance within the supralaryngeal articulatory space between dorsals and labials," the low acoustic quality of pharyngeal features can be assumed to account for this.

[34] Interestingly, as Mary Niepokuj pointed out to me, in previous attempts at acoustical feature systems, [labial] and [dorsal] (or [peripheral] and [medial]) were grouped under [grave], because they share a "concentration of energy in the lower (*vs.* upper) frequencies of the spectrum" (Jakobson and Halle 1956: 31). Judging form the results of Lutz and Greene (2001), the similar frequency, while an acoustic common ground, seems to have less influence on the psychoacoustics of perceived similarity.

In more detail, this hierarchy represents the following constraint violation, most notably the fact that "moving in the direction of a positive value for continuance is less costly than moving toward a negative value for continuance," a notable exception to the general symmetry of Lutz and Greene's approach, but consistent with the notion of lenition as a common process[35]:

(37) least costly -continuant → +continuant, ±continuant
±continuant → +continuant
±continuant → -continuant
+continuant → ±continuant
most costly +continuant → -continuant

Voicing as the only laryngeal feature relevant in English was assigned little overall cost, again accounting for asymmetry, as well as the markedness ousting observed by Zwicky and Zwicky (1986; cf. section 3.3), "based on the current theory claiming that voicing is a privative feature, and is marked in obstruents:"

(38) lower cost `+voice → -voice`
higher cost `-voice → +voice`

On the basis of these assumptions, a

> feature table was prepared to itemize the feature values for all phonemes in use in the system. Using this table as input, a utility program was written to evaluate the constraint violations implied, within the model just described, by the pairwise transformation of all phonemes. Costs were calculated for each pair of phonemes and output to a file for input to the system.

As hypothesized, the similarity calculations based on this OT-inspired approach and "more in line with current phonological theory" improved the ranking results compared to those based on the SPE feature-based approach. This contrasts to Vitz and Winkler's approach (see section 3.1), and indicates, somewhat trivially, that the SPE model, as a

[35] Thanks, again, to Mary Niepokuj for making me aware of this.

largely articulatory approach to features, is a less appropriate candidate for the description of sound similarity than more acoustically-based models like the one devised by Lutz and Greene.

Some fine tuning of the cost table that lies at the center of Lutz and Greene's approach had to be done in view of further testing against data. In particular,

> costs for the epenthesis and deletion of the strident coronal fricatives [s] and [z] were lowered to that of epenthesis and deletion of nasals and liquids, rendering them exceptional among the obstruents. Similarly, epenthesis and deletion of the glottals [h] and [/], were adjusted to the same cost as epenthesis and deletion of the glides.

This resulted in the following adjusted scale for epenthesis- (DEP violation) and deletion-like (MAX violation) contrasts:

| (39) | < lower cost | | | higher cost > |
|---|---|---|---|---|
| | < higher sonority | | | lower sonority > |
| | [vowels] | [glides, [h], [/]] | [liquids, nasals, [s], [z]] | [obstruents] |

Another important adjustment concerns nasals, who show extensive place assimilation and are perceptionally extremely similar, so that the high cost put on place feature changes in general had to be significantly lowered here.

Overall, Lutz and Greene's research is a major advance over previous sound similarity models, despite the fact that it ignores much of the OT research outlined above. In line with one of their suggestions for future research, the present study is informed by a corpus-based approach, and will take the issues overlooked by Lutz and Greene into account, most prominently the environment of the constraint violations and the motivated asymmetry of most segment relations.

# 5. PUNNING CORRESPONDENCE CONSTRAINTS

At this point we are in a position to recast the observations of earlier approaches into a formal correspondence theory for target-pun pairs and a tentative hierarchy of OO-inspired correspondence constraints. The previous chapters have outlined the purview of this study (chapter 1), introduced the general humor-theoretic background (chapter 2), surveyed previous models and their hypotheses (chapter 3), and developed a theoretical framework consisting of context-sensitive correspondence constraints modeling perceived similarity judgments over the domain of English punning (chapter 4). I will continue by briefly summarizing the results from chapter 3 insofar as they are able to inform the OT-based hierarchy of my new model. This hierarchy will then be related to the empirical findings of pun-target correspondence violation in the corpus of 1,182 puns, and improved with the help of these findings as they are accommodated by the phonological theory outlined above.

## 5.1 Overview of Previous Results

The distinctive feature as the main or sole parameter for modeling sound similarity has been found to be inadequate, at least insofar as standard sets of distinctive features are largely articulatory and not acoustic. Perceived sound similarity, on the other hand, insofar as it is non-arbitrary and culturally variable, is obviously chiefly an acoustic issue.

Accordingly, a modified model based mainly on sonority and acoustically biased feature geometry will be used here.

The phoneme as the main subunit of corresponding targets and puns has been confirmed by all studies, but its environment, in particular its position with respect to the syllable and word has so far not been accounted for sufficiently in any of the previous models except for Vitz and Winkler (1973) who grouped phonemes into onset, nucleus, and coda thus effectively introducing the consonant cluster as an intermediate level in their analysis.

Identical assumptions were made about the relative importance of consonants as compared to vowels. All studies assumed vowel quality to be more violable than consonant quality. Within the group of consonants, most frequently stops have been found to resemble other stops most closely so that they are most interchangeable, followed by stops and fricatives sharing the same place of articulation. Another frequent type of correspondence is that between the voiced and unvoiced variants of otherwise identical consonants, indicating that in terms of the classic feature groups, voicing may be different between correspondent consonants with the least cost to similarity, followed by place of articulation, followed by manner with the highest cost. Note, again, that while this hierarchy is the best model available for such distinctive feature classes, these classes themselves are not the best-suited model type for the description of sound similarity. Predictably, vowels tend to be more frequently replaced with vowels that are close to them in height and backness, these terms being metaphors for distinctive features that capture vowel qualities which are more directly acoustically based than those of consonants.

Alignment of the target and pun is not a simple issue, as the number of segments between the two often varies, and the identification of the correspondent segment to a gap is not *a priori* clear, and only to a certain degree predictable from syllabic structure. On the basis of a similarity metric, on the other hand, alignment becomes a simple computation of which choice of correspondent segment to a gap leads to the overall greater similarity between the two words to be aligned.

Syllable structure is only very rarely different between two correspondents that are to be perceived as similar, and within the syllable, consonants in the onset differ from one correspondent to the other more frequently, followed by the vocalic nucleus, and the coda is usually identical, a difference here resulting in low perceived similarity, indicating the importance of the end of words as in rhyming.

In terms of the autosegmental feature-based approach discussed in the last section of the previous chapter (4.6), the following hierarchy of relations should be accommodated by a model of sound similarity,[36] in which > indicates the sonorance relationship on which these hierarchies are based, >> a higher cost in a change of the feature on the left than in the feature on the right, and -> a directional cost difference between target and pun, and <-> a symmetrical, reflexive cost relation:

(40) Vowels > Glides, [h, ʔ] > Liquids, Nasals, [s, z] > Obstruents (Fricatives > Affricates > Stops)
- a. consonantal >> sonorant
- b. manner >> place >> laryngeal
  1. labial, dorsal >> coronal >> pharyngeal
  2. coronal -> pharyngeal — least costly<br>coronal + dorsal -> coronal<br>coronal -> coronal + dorsal

[36] I streamline Lutz and Greene's (2001) model greatly, omitting, for example, the consonantal vs. sonorant contrast which is unattested in my corpus.

labial, dorsal -> pharyngeal
labial, dorsal -> coronal
pharyngeal -> coronal
coronal -> labial, dorsal
pharyngeal -> labial, dorsal;
labial <-> dorsal most costly

3. -continuant > ±continuant > +continuant

4. -continuant -> +/±continuant least costly
±continuant -> +continuant
±continuant -> -continuant
+continuant -> ±continuant
+continuant -> -continuant most costly

5. +voice → -voice least costly
-voice → +voice most costly

Finally, it is important to note, again, that these possible differences between the correspondents do not occur symmetrically, that is, certain replacements are significantly more frequent in a pun as compared to the target than in the target as compared to the pun. I will return to this issue in the next section.

## 5.2 Asymmetrical OO-Correspondence in Punning

This subsection will summarize the theory of sound similarity developed in chapter 4, as the basis for a model into which the findings summarized in the previous subsection will be incorporated. The following diagram illustrates the phonological correspondence relations motivated by the cratylistic-semantic relation between the pun and its target (for a punning context, see the example in footnote 3). The relation to canonical OT correspondence theory, especially in its expansion by Benua (1997), is obvious. The main difference to her approach is that "[t]ransderivational OO-correspondence relations are the phonological reflex of a morphological relation between two words" (Benua 1997: 28), but punning OO-correspondence does not require morphological relations between a pun and its target, but rather mirrors the cratylistic pseudo-semantic relation between them:

(41)

***OO-correspondence*** →

TARGET [kɔk] ⇄ [klɔk] PUN

← ***dependence***

In this figure, the asymmetrical OO-correspondent relation (black) is represented by an arrow pointing from the target to the pun, indicating that the target is the base against which the pun is evaluated (as well as dependent for its recovery on the pun). For example, if there is an additional phoneme in the pun, as in the figure, this difference is conceptualized as analogous to an insertion. Correspondingly, the violation is that of a DEP constraint that forbids the insertion of segments into the pun for which there is no depending segment in the target form. Inversely, the pun is dependent on the target as the pivotal form (grey), being derived from it, in the metaphorical sense of the classic generativist approach to the punning relationship. In sum, the present study assumes the target as the base for correspondence in relation to which differences in the pun will have to be evaluated. As mentioned above, this is analogous to the directionality of correspondence constraints as found in the reduplicant as evaluated against its base in reduplication.

It is tempting to look for a correlation between the meaning relations of a pun and its target, and the phonological OO-correspondence relations. But this fallacy obviously means to take at face value the cratylistic reasoning that uses the faulty logical mechanism underlying punning itself and has been outlined above. Yet, as noted above, neither Fleischhacker shies away from it, nor does Sobkowiak: After quoting Apte’s (1987) conjecture that the “degree of ambiguity,” a notion the measuring tool for which I would be delighted to see, must be neither too high nor too low, he claims "[i]t would be interesting to see if, and how, this dynamic equilibrium manifests itself structurally in puns" (1991: 103). He never follows up on this promised investigation, though, and I am sure he would realize the false analogy, based on the pseudologic of cratylism, fairly quickly. It remains to be repeated at this point: I am making no claim about any motivated parallelism in the phonological and semantic relationships in a pun other than the playful one outlined in section 2.1.

## 5.3 Constraints on Punning OO-Correspondence

This section will present the basic inventory of OO-correspondence constraints of punning based on the model developed in this study and the findings from previous studies. This inventory, put into a tentative hierarchy, will form the basis for empirical verification, and corresponding adjustment and refinement of the theoretical assumptions behind the model. First, the main constraint types on correspondence will briefly be outlined again.

According to the directionality of punning correspondence discussed in the previous section, constraints are violated in the pun, not the target, while the target is considered the anchor to which the pun must strive to be similar. General IO constraints do not have to be taken into account in any form, because both forms, pun and target, are surface forms that have successfully survived an IO evaluation.

Thus, the constraints that have been found to be relevant for the modeling of punning sound similarity, are all OO correspondence constraints. In order of frequency of their violation and, based on the assumption that more frequent violation implies less detrimental effect on perceived similarity (cf. 4.5.4), in reverse order of the cost of that violation, these families of constraints are:

| | | |
|---|---|---|
| (42) | IDENT(f)$_{PT}$ | no change at level and type of feature f |
| | MAX$_{PT}$ | no deletion |
| | DEP$_{PT}$ | no insertion |
| | MAX/DEP$_{PT}$-σ | no deletion/insertion of a syllable |
| | IDENT(‘)$_{PT}$ | no change of stress position |
| | LIN$_{PT}$ | no metathesis |

IDENT, MAX, and DEP constraints have been discussed in detail in chapter 4 above, and some detail, in particular about the internal hierarchy among the Ident constraints will be added in this section. And I will return to MAX/DEP$_{PT}$-σ and IDENT(‘) as constraints on suprasegmental aspects of identity in section 5.4 below.

Linearity (LIN) is the constraint that prohibits metathesis (McCarthy and Prince 1995). While it is extremely rare—only 7 cases in the whole corpus were found by Sobkowiak—its cost is not assumed to be high, because it may result in very little or very much perceived dissimilarity, depending on the type, position, and environment of the metathesis. The central problem is to identify the size of the domain in which to look for metathesis, as well as to analyze the metathesized segments within the domain in terms of their position in the words and syllables, for example onsets. The problematic nature of the domain size is illustrated by the predilection of metathesis to occur in onsets across word boundaries, while observing morphological segmentation, so-called spoonerisms. Although it has been successfully incorporated into OT-based correspondence theory (Hume 2001), and accordingly could be incorporated into the OT-inspired model here, I have chosen not to implement it, simply because it is too complex and too hard to discover computationally to make the effort meaningful for the few instances the system would have to handle, as a tool for both analysis and generation.

A crucial decision to be made for constraints from all families is the question at what grain size the constraints' operation should be described so as to achieve descriptive and explanatory adequacy. The actual affected segment will be analyzed at the phonemic level, the environment at the level of natural class. The level at which the distance itself is analyzed is the node in an autosegmental feature tree adapted to account for acoustic rather than articulatory dimensions. I will turn to each of these levels of analysis in the following subsections.

### 5.3.1 Phoneme Classes

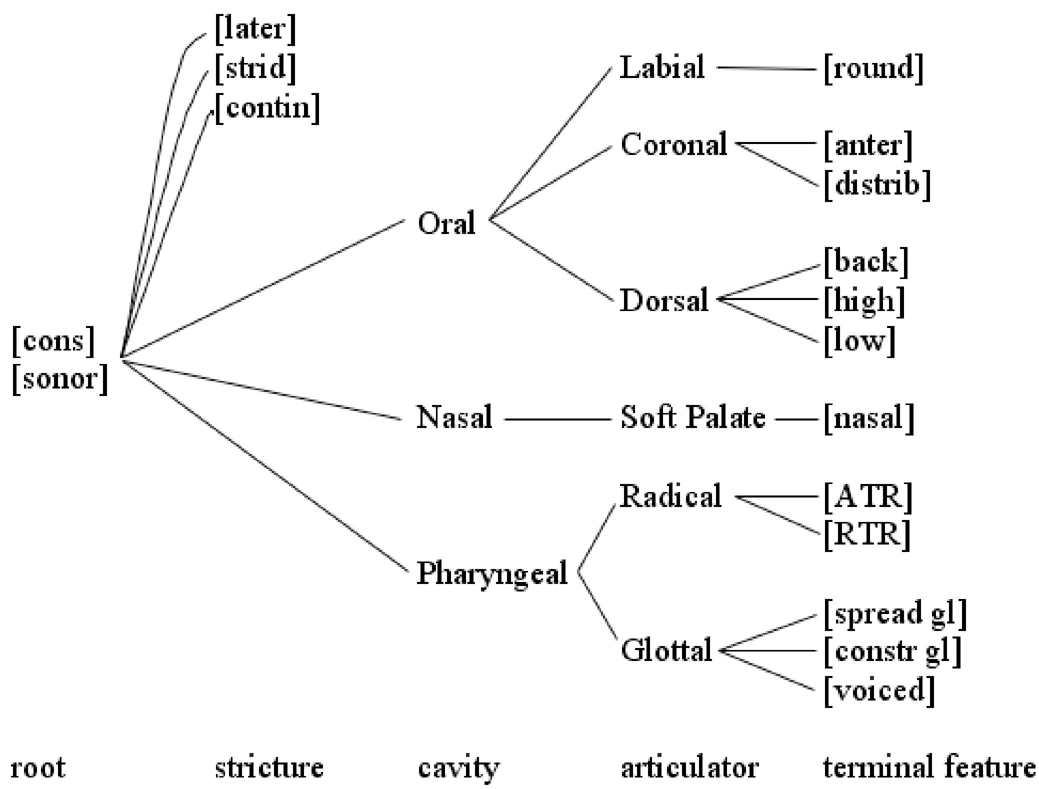
Classes of sounds are considered the most promising level of abstraction along the continuum *allophone - phoneme - class - C/V*. The general assumption about these classes is that "they can be uniquely identified in terms of a single conjunction of features" (Clements and Hume 1995: 245). This traditional assumption, while generally correct, disregards the fact that certain sounds may behave similarly, although they share less distinctive features than other sounds that do behave differently, especially when these features are articulatorily-based. Thus, a better assumption is that "it is much more common for [segments] to be grouped into natural classes because of specific properties relating to the way they are heard" (Iverson 1995: 611). Therefore, these classes should be acoustically-based classes of sounds that are perceived as similar and, consequently, behave similarly in identical environments. This is a criterion for natural classes that can be a significant abstraction for the purpose of analyzing sound similarity. The following such classes have been adapted from Fleischhacker (2002) and Lutz and Greene (2001) and have been used in the tagging tasks of the present study:

| | | | |
|---|---|---|---|
| (43) | T | stop [p, b, t, d, k, g, ʔ] | |
| | N | nasal [m, n, ŋ] | |
| | S | sibilant [s, z, ʃ, ʒ, tʃ, dʒ, θ, ð] | |
| | R | (other) resonant/sonorant [r, l, w, j] | |
| | O | (other) obstruent: fricative [f, v, h] | |
| | V | vowel with additional marking | |
| | | b | back |
| | | f | front |
| | | h | high |
| | | l | low |

### 5.3.2 Acoustic Feature Tree

For the constraint hierarchy, and the implied cost hierarchy of their violation, the level of feature will be used for consonants. The model on which the adaptation of the present study is based is on the feature tree. The motivation underlying the feature tree model is not that linguists cannot think outside of tree metaphors, but the fact that the features of consonants aren't freely combinable. The presence of one can exclude the presence of another. For example, the specification [– consonantal, – sonorant] is "precluded because a [– consonantal] segment's lack of constriction in the oral cavity implies spontaneous voicing indicative of a [+ consonantal] segment" (Kenstowicz 1994: 147). Another reason to use a tree implying a hierarchy is that some features are subdivisions of another feature, for example the articulator features are dependent on their cavity (cf. 44), and only if that higher feature is specified for a sound, do subfeatures of it become relevant, or inversely, the specification of a terminal feature implies the specification of that whole *branch* of the *tree*. A basic tree that captures these feature groupings and combinatorial restrictions is given in (44), adapted from Kenstowicz (1944: 146; based on Halle 1992).

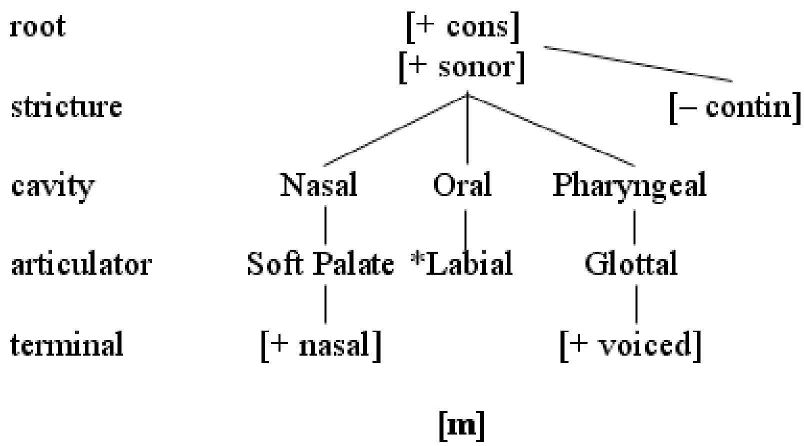
(44)




With the help of such a tree any sound con be described by using its root features, [consonantal, sonorant], the more freely combinable stricture features, [lateral], [strident], and [continuant], and the terminal features, [rounded], [anterior], [distributed], [back], [high], [low], [nasal], [advanced tongue root], [retracted tongue root], [spread glottis], [constricted glottis], and [voiced], grouped under articulators, which in turn are grouped according to cavities.

With the help of this tree, we can now describe a segment not only in terms of their features, but at the same time indicate relations among the features of a segment, and, more importantly in the context of autosegmental phonology for which such trees were invented as a model, but not relevant for the adaptation of the model here, also the specification and interaction of features across segments. Example (45) shows how [m] is represented. The asterisk specifies the major articulator realizing the root features (from Kenstowicz 194: 149):

(45)




After this brief introduction of the articulatory feature tree, we can now turn to the discussion of IDENT(f) constraints for consonants, which will be represented by the lowest point in an adapted acoustics-based feature geometry tree at which the segments in question are identical, or, in other words, the point of most identity. For this purpose, we need a stricter notion of hierarchy than in (44) to actually have such a point, as well as further streamlining of the higher level groupings of terminal features in terms of the acoustic natural classes proposed in (43). The proposal in (46) is based on the assumptions that a violation of manner of articulation identity of a consonantal segment has a stronger effect on perceived similarity than a violation of place of articulation or nasality, both of which incur similarly lower costs. The least effect on perceived similarity is assumed to be achieved by a change of voicing. (46) is necessarily a generalized representation inferior to the more detailed

| | | | | | |
|---|---|---|---|---|---|
| (46) | **root** | root | | | |
| | | **man** | manner | | |
| | | | app | approximant | |
| | | | fri | fricative | |
| | | | sto | stop | |
| | | | **plac** | place | |
| | | | | cor | coronal |
| | | | | lab | labial |
| | | | | dor | dorsal |
| | | | | rad | radical |
| | | | **nas** | nasality | |
| | | | | **voic** | voice |

The tree in (46) is necessarily a simplified representation as compared to the more detailed—and directional—account in (40). But as an overview it illustrates the general assumption well. The indentation represents the following hierarchy of intermediate levels in terms of their importance for perceived similarity (cf. Kenstowicz 1994a: 452ff, Halle 1992):

(47) root >> man >> plac, nas >> voic

This hierarchy, in turn, implies the following ordering of IDENT(f) constraints for consonants:

(48) IDENT(root) >> IDENT(man) >> IDENT(plac), IDENT(nas) >> IDENT(voic)

I hope this subsection successfully outlined an adaptation of the feature tree in autosegmental phonology as an articulatorily-based model to an acoustic model based on the influence of features on perceived similarity in puns. In sum, the resulting hierarchy is intended as a theoretical basis, strongly related to Lutz and Greene's (2001) sonority-based differences (cf. section 4.6), for a model approximating the actual cost calculated on the basis of frequency (cf. subsection 4.5.3). Obviously, more work is needed to convert the feature tree model into a fully specified and theoretically sound auditory-acoustic variant.

Note that a given pun-target phoneme pair in punning correspondence will normally violate several of such IDENT(f) constraints. This ensures for particularly disruptive such cases, that the cost incurred is sufficient to make the violation worse than that of a generally higher MAX or even higher DEP constraint. This is all the more relevant where additional costs for environmental and suprasegmental constraint violations (cf. subsection 5.3.4 and section 5.4) are factored in. For example, a pair that violates all IDENT(man), IDENT(plac), IDENT(nas), and IDENT(voic) constraint, like θ -> n, is assumed more costly to perceived similarity than the deletion of a sonorant in a consonant cluster. This is, of course, a major deviation from OT, where the violation of a higher ranked constrained renders all violations of lower ranked constraints irrelevant for the evaluation of a given candidate. I will return to this point in more detail in section 5.5. below.

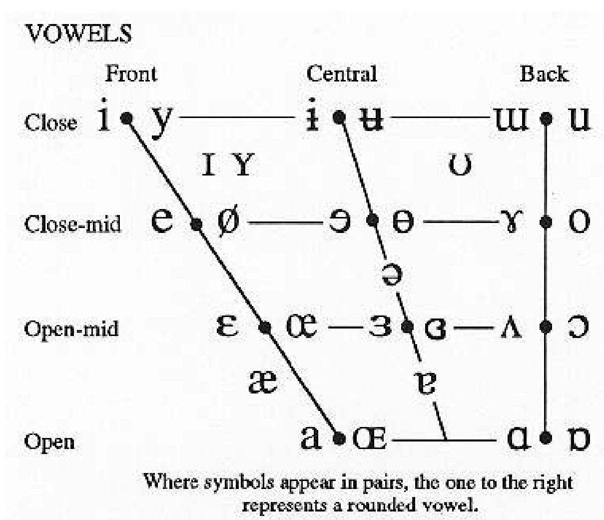
### 5.3.3 Vowel Space

For vowels, a model based on the traditional trapezoidal representation has been found to sufficiently approximate the distribution of contrasts in the corpus. In general, models to distinguish vowel phonemes are more acoustically based than models for consonants, so that a more straightforward implementation for punning sound similarity, which is largely, but not exclusively, acoustically perceived sound similarity, is possible.

Traditionally, vowels were described by charting them along two axes thought to correspond to the position of the tongue, a horizontal one representing how for to the front or back the tongue is situated when the vowel is produced, and a vertical one, representing how high or low the tongue is raised. Charted along these two axes, the vowels were thought to be situated in a ‘space’ that is circumscribed by a trapezoid. With the invention of the X-ray it became clear that the highest points of the tongue were much more along an axis for the vowels of English (cf. Ladefoged 2001: 115). But the trapezoidal model is still used, but with the underlying theory of frequencies of the first two vowel formants frequencies that are used for its axes. Without going into more detail about the acoustics of formants (for that, see, for example, Ladefoged 2001: 31-46), it should be clear that the current use of the trapezoidal 'vowel space' in phonetics is acoustic in nature (frequencies) and not articulatory (tongue position).

The following Table (6) shows the standard vowel chart of the International Phonetic Association (IPA), reproducing the trapezoidal form, and the metaphoric labeling of the axes as front vs. back (horizontal) and close vs. open (vertical). What it represents is rather the frequency of the second formant of the respective vowel as the horizontal axis (non-linearly from ca. 2200 Hz for [i] via ca. 130 Hz for [a] to ca. 700 Hz for [u]) charted against the first formant on the vertical axis (linearly from ca. 300 Hz for [i] to ca. 800 Hz for [z], cf. Ladefoged 2001: 43).

Table (6): IPA Vowel Chart



In the following chart (49) I have simplified the metaphorical distances of the vowels on this formant chart into values for metaphorical space traversed when one is changed into the other.

| (49) | | | | | |
|---|---|---|---|---|---|
| | **i/ɪ** | 0.15 | . | 0.15 | **u/ʊ** |
| | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| | **e/ɛ** | 0.1 | **ə** | 0.1 | **o/ɔ** |
| | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| | **æ** | 0.1 | 0.1 | 0.1 | 0.1 |
| | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| | . | 0.1 | **a** | 0.1 | **ʌ** |

Accordingly, the cost of the violation of vowel constraint identity is assumed to be equal to the smallest possible sum of (non-bolded) figures one has to traverse to get from the pun vowel to the target vowel. This model is thus based on a straightforward metaphor of locality in the simplified vowel chart. Additional differences incur an additional cost of 0.05, namely, the tense/lax distinction, and the difference for an on-, or offglide in a diphthong as compared to its simple vowel counterpart. Note the higher values along the top part of the horizontal axis that are intended to account for the greater frequency distance of second formants against low frequencies of the first formant.

5.3.4 Environment of Constraint Violations

When the types of non-identical correspondent segment pairs of targets and puns are considered in their immediate intrasyllabic environments,[37] several tendencies can be observed that need to be factored into future extensions of the present study to improve its accuracy in modeling punning sound similarity. To facilitate the evaluation of specific environments in which a given violation appeared to occur overproportionately frequently, it became obvious very soon that it was necessary to establish a baseline proportion of a phoneme's occurrence in certain environments, especially for consonants. A simplifying approach to this was pursued by assuming specific relevance of four environments for perceived sound similarity: onsets and codas for consonants, especially with respect to consonant clusters, and beginnings and ends of words, both for consonants and vowels. The assumption here is that overproportionately frequent changes for a given environment should be made less costly, that is in terms of the underlying constraint hierarchy, the corresponding correspondence constraints should rank lower than those for the same non-correspondence in an environment in which the phoneme affected is proportionately as frequently found as it is violated.

The corpus of violation pair types reproduced in Appendix D was evaluated for overproportionately occurring environments. For consonantal pairs the baseline given in Appendix C was established by importing the CMUDict entries into a database to make them searchable and sortable. In order of prominence, the following significant effects

[37] While the syllable has not been implemented as an automatically tagged level of analysis in the present study, such an extension is a readily available as an add-on (cf. Hammond 1997).

were observed, all of which are in accordance with general phonological mechanics (cf. also section 5.1):

1. Word-initial non-correspondence of consonants, in general, seem to be more tolerable, less affecting perceived similarity in punning than non-correspondence elsewhere.

2. Consonants in onset clusters are more volatile than the same consonants carrying the onset by themselves.

3. Parallel, consonants in coda clusters show the same tendency to allow for violation more readily.

In addition, the following less significant observations could be made from the immediate intrasyllabic and word-boundary environments: Related to 1., insertion (violation of DEP$_{PT}$) of any segment, regardless of sonorance status, is more frequent at the beginning of words than at the end of words. Insertion or deletion of [j] before the vowel nucleus, especially high back vowels is frequent. Insertion or deletion of [r] in word-final position after a vowel is less disruptive to perceived punning similarity than elsewhere. The schwa alternates with its fully articulated pendants in target-pun pairs overproportionately frequently before syllabic consonants [l], [r], [m], [n].

## 5.4 Suprasegmental Constraints

Violation of the constraint on identity in the position of lexical stress, IDENT$_{PT}$-STRESSED-V, is extremely rare, indicating a high significance of stress for perceived similarity in punning, and, accordingly, a high cost is associated with it. In 39 instances the stress is positioned later in the pun than in its target, e.g., *cover* -> *covert* (marked “l” in the penultimate column in Appendix E), and in 24 instances earlier, e.g., *important* -> *impotent* (marked “e”).

Similarly, the number of syllables is identical in the overwhelming number of target-pun pairs, i.e., the foot-structure is preserved. Where there is a difference, a significant asymmetry can be observed. In only 23 instances does the pun have one syllable less than the target, e.g., (marked “-1” in the final column in Appendix E), violating a $\textsc{Max}_{PT}$-σ constraint. But in 49 cases, the pun has an additional syllable to the target (marked “+1”), of which two even show two additional ones (“+2”). The predominance of this latter type, violating the $\textsc{Dep}_{PT}$-σ constraint, e.g., *rickshaw -> ricochet*, seems to indicate the influence of recoverability, as it must be assumed that to identify the part of a pun that is repeated in the target is less costly than to infer additional material in the target that is not available in the pun.

In sum, the constraints on stress and syllable identity must be assumed to be violable only under a high penalty in terms of punning similarity. Accordingly, these constraints are ranking high, with the following internal hierarchy:[38]

(50) $\text{Max}_{PT}$-σ >> $\text{Dep}_{PT}$-σ >> $\text{Ident}_{PT}$-stressed-V

## 5.5 Cumulative Cost of Constraint Violation

Another central assumption is that a longer punning domain is more robust than a shorter one. It is intuitively clear that a target-pun pair consisting of three sounds cannot function if all three sounds are different, whereas a pair consisting of 14 sound segments very well may tolerate violation of root identity of three of its sounds. Lutz and Greene

[38] On the crucial assumption that relative frequency in the corpus is equal to lower ranking in the punning correspondence constraint hierarchy, the main difference of the present study to canonical OT, see subsection 4.5.3 and section 4.6.

(2001: n.p.) also have identified this as a major problem preventing the computational implementation of OT:

> As such, in OT constraint violations are infinite. If constraint C1 dominates constraint C2, no number of violations of C2 can ever overcome a single violation of C1. The power of the mechanism of constraint domination has been well argued. Its framework and general results have proven useful here as well, but in the end, for the purpose of measuring phonological similarity, constraint violation must be quantified in some way as something other than infinite. It is in this sense that the evaluation procedure most significantly departs from the principles of OT.

In sum, the combined violation of several constraints must be dealt with differently here than in standard OT. There a hierarchy is sufficient, in which the violation of a single high constraint ultimately decides on the most optimal candidate for a given input form. In OO constraints evaluating the similarity of several output candidates, which have already survived a run of IO evaluation witnessed by the fact that they are surface English words, a cumulative penalty must be assigned. This becomes most clear, when one considers that the multiple violation of the same constraint in the same candidate must carry a higher penalty than its single violation, and possibly a higher penalty than the violation of a more important constraint.

To account for this effect, the total cost incurred by the violations in a pair has to be put in relation to this length factor. In other words, longer target words, providing more of  a torso that supports recoverability, allow for puns committing more violations. A ratio of violations per segment must be factored in. At his stage, the total is divided by a quotient linearly dependent on the sound segment number of the target multiplied with an arbitrary factor to render the result more intuitively understandable by keeping it between 0 and 1.

The next subsection will summarize these assumptions into a formula, which will necessarily oversimplify the complex issue of constraint interaction. But from the previous discussion in this chapter it will be clear that a full enumeration of punning output-output constraints is an impossible undertaking, as well as an unnecessary one, as such a model would not be implementable. The number of constraints themselves is, theoretically as large as the number of phoneme contrasts possible, namely $25^2$ for the consonants, and $18^2$ for the vowels, multiplied with the relevant contexts, in addition to the suprasegmental constraints. Obviously, the relation of the model to tendencies among groups of constraints must remain the level of detail meaningful for the present discussion.

## 5.6 Evaluation of Punning Output-Output Correspondence

Based on the model described in the previous sections, each individual **cost value** *C* for non-correspondence of a pun with respect to its target is computed in terms

of the **IDENT constraint violation**(s) *v* of featural branches of the autosegmental feature tree, already a compositional factor varying according to
- the acoustic feature tree branches involved, including
- the direction of the violation (P->T, P->T), and where it occurs, where the
- **DEP and MAX violations** are conceptualized as special particularly costly instances of IDENT violation, to accommodate them into the same table,

multiplied with the **environmental factor** *e* in terms of
- syllable position,
- neighboring segments,

and added to **suprasegmental factors**, namely
- the DEP/MAX-σ violation $\sigma$ for each string, if any, and
- the IDENT(‘) violation $\alpha$ for each string, if any

divided by the **punning domain length** of the target in terms of number of segments *s* and syllabic structure multiplied by a factor *x*

resulting in the following formula:

(51)

$$\frac{(v_1 \text{ x } e_1) + (v_2 \text{ x } e_2) + ... + (v_n \text{ x } e_n) + \sigma + \alpha}{xs} = C$$

The following section will outline the implementation and improvement of the assumptions on which this formula is based.

## 5.7 Implemented Edit Distance Computation

The actual formalization of output-output correspondence in punning which is to be implemented can't be constraint-based as this is prohibitively unwieldy as a computational model. The main reason is that for the ranking of more than one output candidate, an accumulation of the costs incurred through constraint violations is necessary. Therefore, a cost table, that represents the constraint hierarchy will serve as the interface of the theoretical model and a program that computes the edit distance between the target and pun.[39] The cost table itself is documented in Appendix G. In its current form it is based primarily on the frequencies calculated in Sobkowiak (1991) and repeated here in Appendix F. These frequencies are translated into costs under the assumption that the more frequently a non-corresponding phoneme pair occurs, the less negative effect it has on the perceived similarity between target and pun. The initial specific algorithm to translate frequencies into cost are also given in Appendix G. The different costs are implied by the ranking of constraints in a hierarchy in relation to features applied to phoneme pairs in context. Thus, the accumulation of cost utilizes the ranking and, in turn, implies it. In view of this, the main aim of this section is to describe

[39] I am extremely grateful to Krista Bennett for writing this edit distance program and suggesting many improvements without which this part of the present study would have not been possible.

the computation of the edit distance (Hall and Dowling 1980) and the components required.

The main tools for the computation of the distance between the target and pun in a given pair as performed on a Macintosh G3 computer both in OS X and its underlying UNIX system using the command line interface are:

1. the database of 1182 puns, processed in ACI 4th Dimension, from which the unique number and the transcription of each target and pun are exported into a text file;
2. the cost table based on observed frequencies, processed in Microsoft Excel, and exported into a text file;
3. the program to compute the edit distance by looking up the cost for each pair, written in Java, automatically producing two types of output,
   a. the sum of the cost values for each target-pun pair, and
   b. the individual violations and their cost, and the segmental context in which it occurs.

In addition, the exported text filed to be purged of OS specific formatting characters, for example <^M>, before they could be fed to the Java program, using a simple script.[40]

As mentioned, the cost table was created using a table that had frequencies (x) of the violations and assigned the cost (y) according to the following formulae:

for the consonants, asymptotically, namely: $y=x^{-0.6}$; for vowels, linearly, namely: 0.3-0.3x/161, 161 being the most frequent violation and 0.3 the highest violation cost vowels should carry in view of their assumed influence on punning similarity. These formulae are initial hypotheses, which will have to be adjusted in future implementations, which will be much facilitated by the fact that any input file with pun-target pairs can now automatically be processed with the existing edit distance program.

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[40] I am grateful to Andreas Waschbüsch for adapting a script that took care of this.

Examples for the two types of output provided by the program are given below,[41] (52) showing the sum of the costs and (53) showing the individual costs for contrasts:

(52)

| number | target | pun | total cost | adjusted cost | contrasted pairs | |
|---|---|---|---|---|---|---|
| 9 | spjuri0s | sp.8ri0s | 0.38 | 0.19 | j-. | u-8 |

(53)

| number | target | pun | contrast | environment | cost |
|---|---|---|---|---|---|
| 9 | spjuri0s | sp.8ri0s | j-. | p_u | 0.2 |
| 9 | spjuri0s | sp.8ri0s | u-8 | j_r | 0.18 |

These different outputs are then re-imported into different tables of the relational database for integration with the constraints that still have to be hand-tagged, and interpretation towards the reevaluation of the cost table and the model on which it is built.

## 5.8 Overcoming the Infinity Problem of OT

A final note is required, before we can turn to extra-phonological factors of imperfect punning in the next chapter. The purpose of the present study is to develop the model for punning similarity on the basis of linguistic theory to make it available for actual implementation in natural language processing.[42] While it is itself not a part of the research presented here, the computational implementation makes it necessary that this research must produce a result at a level of formalization high and complete enough for a consumer as dumb as a computer to be able to digest it. In this respect, it is important to highlight a crucial difference between input-output constraints in canonical OT and output-output constraints like those that hold between an imperfect pun and its target. Canonical OT, unlike other generative theories in linguistics, suffers from the crippling

[41] The target and pun are given in the ASCII transcription of the Sobkowiak corpus (see also section 6.1), where a period stands for a segment missing in the correspondent.
[42] See Albro (2003) and Tesar (1995) for a more canonical approaches to OT-based computational modeling.

assumption that its constraint hierarchy evaluates an infinite number of candidates generated from the input, referred to as the “Richness of the Base” (cf. Archangeli 1996: 14, 27). This makes OT in principle impossible to implement. If, on the other hand, an evaluation hierarchy is built to evaluate a finite set against one form, as in my approach the set of existing English words selected at a meaningful level of linguistic abstraction and with respect to the appropriate linguistic parameters, it can become a useful tool. In a future implementation it should be attempted to restrict the candidate set of puns evaluated against the input target even more, by using only words that denote concepts that are in humorous relationship to the concept denoted by the target, that is, make the target-pun pair not just phonologically but also semantically well-formed in the sense described in chapter 2.

# 6. RECOVERABILITY BEYOND PHONOLOGY

## 6.1 Introduction: Interaction of Phonological, Syntactic, and Semantic Factors

The previous chapters have outlined the relatively more developed research that has produced results for many of the phonological factors involved in heterophonic punning towards a more refined model based on new theoretical assumptions, both phonological and humor theoretical. This chapter will venture on the remaining linguistic factors deemed relevant in imperfect punning, in particular at the syntactic level, namely word classes, grammaticality, and formulaicity, as well as the interaction of these factors with a view to recoverability of the target of puns, towards the integration of all relevant target recovery factors into one unified framework. As argued above, recoverability is strongly covariant to, but not identical to phonological similarity, which is only *one* factor that facilitates it. To repeat, a pun must be both, semantically well-formed, having two opposed, overlapping scripts, as well as recoverable, i.e., the target must be relatable to the pun with the help of factors best analyzed separately at the levels of semantics, syntax, morphology, and phonology.

In this section it will become particularly obvious that I am not using a model inspired by Optimality Theory (OT) for the sake of OT, but in order to provide a meaningful account of paronomasic punning. Obviously, such an account must include more than just phonological factors. And if not included as part of a full analysis, then those factors, as far as they have been identified, will be mentioned again and their role outlined. To do this, i.e., to give the necessary breadth to the analysis of a broad phenomenon without getting lost in the problem of infinite levels of analysis, some of the depth that phonological analyses can normally afford to devote to the full exploration of their tools has to be sacrificed for the sake of the useful exploration of the puns themselves. Accordingly, it is my explicit assumption that this is not so much a sacrifice of my discussion overall, but rather a gain. And what I claim to gain is real insight into the complexity of punning and the interaction of the factors at work, even if I have to be eclectic about the use of theories I employ, fitting several connected engines under the hood of a theoretical vehicle explicitly aimed at application. In this sense, it is assumed possible that OT can be replaced in my framework by a different, better theory, should one be identified or become available, without losing the ground gained by my approach. I believe that humor is primarily a semantic issue, so a future extension to semantic priming and recoverability of phonological dissimilarity based on the discussion above is expected to model the issue of punning with respect to these levels of analysis.

The main goal to be pursued in this chapter is based on the hypothesis that the recoverability of the target of a pun must be modeled as a compositional value. The assumption is that if there is little sound similarity, then there must be more syntactic or semantic clues that enable the hearer to infer the target. The following example may, again, not be a good joke, but it is a good example for little phonological similarity between pun and target, which is nevertheless salvaged with the help of a collocation:

(54) Following the Watergate incident in Washington, there were so many lawyers trying to get involved in the settlement of conflicting evidence that they became

known as “ambivalence chasers.” (12)
*ambivalence* -> *ambulance,* &mb**Iv**0l0ns -> &mb**.j**0l0ns[43]

Between *ambivalence* and *ambulance*, there is not only the contrast of phonemic segments typical for heterophonic punning (highlighted by boldface), but through the lack of the nucleus of the second syllable, and with it the whole syllable, there is also a different position of main stress in *ambivalence* (highlighted by underlining). Accordingly, my hypothesis is that this large sound dissimilarity should block the recoverability of the target *ambulance*—having a different stress pattern and one syllable less than its pun—, but that it is crucially counterbalanced by the cohesive force of the collocation *ambulance chaser* triggering its first part *ambulance*. That is, the recovery force of the formulaic language, in this case the collocation “ambulance chaser,” takes over much of the responsibility that would otherwise have to be carried by phonological similarity alone. The force of the formula is, of course, working together with the semantic priming of the script LYING that is triggered by *Watergate* and includes *ambivalence*.

In this chapter I will describe these non-phonological recovery factors as they have been encountered in the full tagging of my corpus of roughly 1,200 puns. Because the aim is to devise a fully formalized model towards automatic generation, more frequent and therefore productive mechanisms will receive more attention and rare ones will only be briefly mentioned, but not systematically integrated into the present approach.

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[43] In this chapter many complete examples from Crosbie (1977) and elsewhere will be quoted. The notational conventions in these examples are the following: After the full punning joke text, the pun and target are given in italics; if the sound similarity is relevant for the point of the example, their transcription is provided either in square brackets in standard IPA, or without brackets in the ASCII IPA adopted by Sobkowiak (1991) if the example is from his corpus. If the citation in round brackets consists only of a single number, it refers to page number in Crosbie (1977), otherwise the standard citation is provided.

## 6.2 Quasi-punning non-phonological Recoverability

It has to be emphasized again that not any distance between two forms is acceptable in punning, even if syntactic and semantic support makes the target recoverable. As discussed in detail in section 2.2, without at least a token amount of sound similarity, the logical mechanism (LM) of cratylism would be lost. In the following example, we have no problem in recovering the intended target of *rosé*. Yet, the example is not a pun, but a different, if similar, form of wordplay. That is, while sharing the support of syntactic and semantic context towards the recoverability of a form—here *blue*—and all formal requirements for a joke—namely an SO of high vs. low scripts along the lines of PATRIOTISM vs. ALCOHOL—it is not within the purview of the present study, because the LM here is not based on cratylism. It works similar to straightforward juxtaposition LMs (cf. Attardo, Hempelmann, and Di Maio 2002), only that the juxtaposition is paradigmatic here:

(55) America: Land of the Red, White and Rosé
*Rosé* -> *Blue* (Time 2003: 83; headline of a short article on wines produced in the United States)

The inverse consequence of the salvaging effect is that there can be purely phonological pseudopuns, mostly with homophony or very little heterophony, which completely lack syntactic embedding, or, worse, even lack a second script. These are not only often hard to get for a non-native speaker, but also often not funny, or even not jokes at all, because they lack a second script, or have no script opposition, which is among the requirements of Raskin (1985). Many non-joke puns are found in the "definition" category (see sections 6.10 below and 2.3 above). There are approximate cases to the non-joke constellation that nicely illustrate the interaction of recoverability factors. The following word-play can be found in Crosbie's collection. It is not a pun, because there is no opposition of overlapping scripts, i.e., no semantic incongruity, only a minor phonological one:

(56) As the weatherman said, "Disgusting is going to come to blows." (67)
*disgusting* -> *this gusting*, dIsg^stIN -> DIsg^stIN

In this quasi-joke there is extremely little phonological distance between the target and the pun, in only two features of the onset of the first syllable: place slightly shifts from alveolar to interdental and a tad more continuous quality is added in the target.[44] But, more importantly, there is no semantic joke quality, no incongruity between the meanings of *disgusting* and *this gusting*, but mere revelry in wordplay through the relation of *gust* and *blow*, in the idiomatic phrase *come to blows*. While these factors support the recoverability of the target, they don't make this text a joke.

In contrast to this example of word-play, I will discuss the interacting factors supporting the target recoverability in punning joke texts in the following sections of this chapter, starting with morphological issues in the punning domain.

## 6.3 Intermediate Level: Morphology

In the present study I will devote only one short section to morphology. This has two very different reasons, in addition to the low frequency of puns that involve morphology in the corpus. The first is that to a large degree, morphology is a function of syntax as it is understood here (and, for different reasons, in current syntactic research).

[44] The little distance that the feature-based analysis provides shows again how much articulatory bias the feature system has, when the pun and target are indeed homophonous in some dialects.

The second reason is that morphology is a very regular subsystem of the English language and because of this regularity has been sufficiently formalized as a NLP task (see, for example, Karttunen 1983, Dalrymple et al. 1987, Ritchie et al. 1992).

At the level of pun generation that my approach ultimately aims at, a morphology module that can increase and enhance the output would simply add the possible inflectional suffixes to a potential pun in order to increase the candidate set with similarity to the target, when the one has a final sequence of sounds that is similar to the other plus the inflectional morpheme.

(57) Once the cooking problem was ironed out, the little fish smelt good. (213)
*smelt* -> *smelled*, *smell* + *ed* (past)

In this example, we see not only one of the numerous names of more or less obscure fish that Crosbie (1977) used in many of his puns (*smelt*=small salmonoid fish of the *osmeridae* family), but a pun joke the tense of which is simple past, because the pun *smelt* -> *smelled* (*smell* + past -*ed*) is more similar than that on *smelt* -> *smells* or *smelt* -> *smell*. The latter two would possible candidates were the joke text in the simple present.

An additional evolution of the evaluation model, and the envisaged joke generator based on it (see chapter 7), could include derivational affixes, but their distribution is far more complex—namely meaning-related—than that of inflectional morphemes.

(58) The lobe was the original earring aid. (74)
*earring* -> *hearing*

In order to match *earring* and *hear* in this example, the latter would have to be turned into the deverbal noun *hearing* through the derivational morpheme -*ing*.

The following is an example from the twelve derivational morpheme puns that make up a mere 1% of the corpus:

(59) An optimist is an anti-sceptic. (212)
(anti)*sceptic* ->(anti)*septic*

As mentioned above, because of their low productivity the expenditure to model these cases fully does not seem warranted.

In sum, these morpheme puns illustrate at short and hence very forceful range an important factor for the recoverability of heterophonic puns that cannot be ignored in any adequate description. Namely, that the pun is often embedded into a larger structure, that statistically significantly often only has the target in the syntagmatic place in general, where the specific joke text has the pun. In other words, the pun and target are in a paradigmatic relationship that crucially enables the recovery of the target. More specifically, at the morphological level, the prefix *anti*, for example, can combine with most adjectives and nouns, of these combinations only 129 became so fossilized that separate entries are devoted to them in a standard dictionary (American Heritage College, 3rd edition: from *antiaircraft* to *antiwhite*), indicating that these have higher potential to be recognized as targets than those that haven't become fixed forms.

## 6.4 Superlexemic, Multiple-Word Domain Punning

The corpus contains only few puns involving superlexemic semantic contrast at the morpheme level, and they are the rare exception among almost exclusively word-level puns and few multi-word puns. Of the latter—jokes in which the contrasted segment crosses word boundaries in the pun, the target, or both—only one combination is of numerical relevance, namely those where a single-word pun is mapped onto a multi-word target. Of such pun-target pairs 216 are in the corpus (18.02%), most of which are two-word targets (173), many three-word (40), few four-word (3) and one even five-word (*onomatopoeia* -> *I don't want to pee*; 165). There are only 30 multi-word puns that are mapped onto single-word targets and 16 multiword puns that are mapped onto multiword targets. Interestingly, of the latter only one maintains the word boundaries from pun to target (*knock need* -> *knock knee*; 158); in the others, usually a coda of a word in the pun becomes an onset of the subsequent word in the target (e.g., *an oaf* -> *a loaf*; 163) or, inversely, pun onsets become target codas (e.g., *wore cologne* -> *walk alone*; 52).

An easily applied and hence frequent mechanism (40 instances) that involves crossing of word boundaries are pun-target pairs of nouns, one of which has an additional article, while the other's first syllable is phonologically similar to *the, a* or *an*:

(60) A publisher who specializes in novels about zombies, goblins and demons has just established the Dybbuk-of-the-Month Club. (72)
*Dybbuk* -> *the Book*

This mechanism should be included in a pun generator because of its frequency and easy implementation, once the phonological component has been assembled.

After these introductory sections providing an overview over some rarer mechanisms, let us now turn to a more general discussion of the superlexemic, syntactic framework in which the non-phonological recovery factors interact, before we continue to look a the syntactic recovery support in punning in more detail.

## 6.5 The Context as Torso

Hausmann calls the incomplete syntagmatic corset that the text a punning joke provides a "torso" (1974: 22f) that provides sufficient co-text to deduce missing parts and make them paradigmatically available through the obvious gap or ungrammatical link in the syntagmatic chain. This general observation and its obvious importance for making sense of language—predicting new input on the basis of already processed input—has also been mentioned by Preisendanz in the connection of verbal humor: "in the medium of language, that what is not uttered brings about the virtual presence of the missing complements" (1970: 23; my translation).

Hausmann illustrates the concept of vertical realization (paradigmatic availability) of what he calls "quasi-homonyms," i.e., heteronyms/-phones, with the following example:

(61) Un parti révolutionnaire, c'est un parti d'extreme ... (1974: 22)
(A revolutionary party, that's a party of the extreme ...)

The force of the idiom *parti d'extreme gauche* (party of the extreme left) within the semantic field of "political party," in particular, "left-wing party," as triggered by *revolutionary*, reduces the possibility of what could appear in the gap at the end of the phrase not only syntactically to a noun, but, crucially, also semantically. The syntactic restrictions pertaining in idiomatic pun jokes in specific and pun jokes in general will be discussed in more detail in a larger subsection below.

The recovery of the missing word in example (31) would receive additional support for its recoverability if a similar sounding form were inserted in the position where *gauche* is expected. Hausmann's example is the nonce form *dauche*. The following version of the example has all features of a heterophonic pun joke, except for the most important one. As there is no meaning in *dauche*, there is consequently no second semantic script that could be in opposition and overlap with another script as triggered by the remaining text with the recovered target *gauche* inserted:

(62) Un parti révolutionnaire, c'est un parti d'extreme dauche (1974: 24)

But the next version of the example includes yet another force at work also in the example as it was indeed found, not as an intended pun, but with a typo that happens to be semantically felicitous as a joke and as such used embedded into another joke:

(63) Un parti révolutionnaire, c'est un parti d'extreme fauche (1974: 25)

The pun *fauche* ("petty theft"), which is the form actually found in Hausmann's corpus where it is presented as a typo, shows the required semantic overlap, although Hausmann seems to misinterpret it as *fauché* ("penniless"), when he analyzes the overlap to lie in "an undeniable solidarity between poverty and revolutionary spirit" (1974: 25)[45]. But the additional force I will focus on in a separate section below is the ungrammaticality, in particular on syntactic grounds.

In general, the recovery of the target in heterophonic puns is just a specific case of the complex task of hearing (and, with some differences, that of reading in the case of eye puns) that we constantly master successfully. Each time a new segment is to be understood, it has already been cued, most importantly semantically, partially as encoded by and in addition to the syntax of the preceding text. We expect a member of a class of words belonging to a specific semantic script and of a specific syntactic word class, maybe even a specific lexeme including its specific morphological realization as appropriate for the syntactic position. And if anything remotely close to it is produced, we perceive not just the pun, but also the expected target.

In heterophonic jokes we have the additional effect that not only the actually uttered segment is perceived, but because it differs minutely, yet crucially, from the expected

[45] I am grateful to Shaun Hughes who made me aware of this mistranslation by Hausmann. Accordingly, the joke is not so much expressing revolutionary sentiment—the Communist Party as the savior of the penniless—but an anti-Communist stereotype—the Communist Party as the thief destroying the wealth created by the capitalist system.

segment, the latter is also recovered. Understood this way, heterophonic punning involves an extremely easy variant of a CLOZE readability test (cf. Taylor 1953) or, if we understand the LM as an enabler of abductive leaping from one script to the other, the target recovery as facilitated by the torso can be understood as "overcoded abduction" (cf. Eco 1983).

But jokes, as a specific text type, possess an additional level of semantic cueing: Since the hearer knows the text is a joke, if the appropriate non-bona-fide mode of communication has been established, he or she is expecting opposite overlapping scripts to be triggered by the joke. And heterophonic pun texts involve a specific level of joke expectation, namely, that one segment of the text, usually towards the end, will not only trigger the second of these scripts, but also that it will do so by virtue of being similar in sound to another segment that will make the joke text semantically well-formed as a text in general and a joke-text in particular, as well as syntactically well-formed. In short, it has to be grammatical at all levels of language, and, additionally, fulfill the criteria for being a joke discussed in detail in chapter 2.

## 6.6 Idiomatic Expressions: Semantic-Syntactic Interface

This section focuses on the role of such formulaic idiomatic patterns as they abound in the corpus and prove that beyond sound similarity and semantic script affiliation, syntactic-semantic formulae are of high relevance to the recovery of the targets in heterophonic punning (cf. Sobkowiak 1991: 118, Zwicky and Zwicky 1986: 500). The main hypothesis here is that "[n]ot only do formulaic puns as a whole show more paronymy; the also have wilder paronymy" (Lagerquist 1980: 189), because they can.

A total of 798 pun jokes involve one kind or another of formulaic torso into which the pun is embedded, and in view of the likely unfamiliarity with some formulae of English and the American culture on the part of this author, this figure can only have to be adjusted upwards. From the 1182 heterophonic puns under investigation here, at least 67% involve formulaic patterns. Lagerquist finds a similar significance of formulaicity for paronomasia in his corpus (Cerf 1968), where he calculates that formulaic pun texts are more susceptible to phonetic distance, i.e., heterophony (64%) than other pun texts where only 45% are paronomasic (1980: 189).

Formulae include phrasal verbs, collocations, idioms, proverbs, quotes/titles, and clichés, in short, "any grammatical form [for which] the meaning is not deductible from its structure" (Hockett 1958: 172). Formulaic language is the clearest case for the non-compositionality of semantics, because the meaning of the whole phrase can't be understood as the sum of the meanings of its parts. At one end of the spectrum we find purely syntactic fixation, for example, an object missing for a transitive verb, combined with a semantic specification about the kind of object required, for example, only edibles can the object of *eat*. On the other end, we have a quote, each single element of which is fixed and fully recoverable, like the much-abused "the rain in Spain falls mainly on the plain" from *My Fair Lady*, featured in five of Crosbie's texts (I hesitate, again, to call the following example of wordplay a joke). Note the heteronymy across four segments that a quote formula can recover:

(64) If you want to do something about altering your cat, it may be consoling to know that the pain in spaying is mostly in the brain. (216; see also two more examples on that page and 57, 249)
the pain in spaying is mostly in the brain -> the rain in Spain falls mostly on the

plain;
*pain* -> *rain*, *spaying* -> *Spain*, *in* -> *on*, *brain* -> *plain*

Within this spectrum, two main types of idiom have traditionally been defined as illustrated by Bolinger's (1971: 111-31) distinction of first- and second-level stereotyping (in that particular case, of phrasal verbs):

(65) first level: can (at least partially) be explained from its components
second level: completely opaque, non-compositional meaning

This distinction is obviously too broad. To account for the recovery force of different degrees of fossilization in idiomatic speech, I chose a subset of Makkai's (1972) more finely graded hierarchy. For further taxonomies with mixed criteria see the synopsis in Hausmann (1974: 51-54) and a more recent approach in Moon (1998).

In general, Makkai also distinguishes two areas of idioms, the lexemic and the sememic (1974: 117ff), corresponding to the traditional distinction given in (65). Examples of the first type are phrasal verbs like *fill up, take down, buzz off*, examples of the second, proverbs like *never steal anything small*. But this distinction is not utilized in my analysis. The reason lies in the centrality of what Makkai calls the "sememic force" that permeates the spectrum of idioms that I am focusing on: The lexemic force enables the recovery of the target when the pun is embedded into an idiom such that its idiomaticity is violated. Such unidiomatic cases call for repair through replacement of the wrongly inserted pun through the paradigmatically available target, forced through the incompleteness of the idiom's torso in the pun joke.

Makkai explains why his distinction between merely phraseologically fixed formulae and genuine semantic idioms for which "synchronic [and often also diachronic] componentialization fails" (1972: 50) will turn out to be secondary for my discussion of the recovering force of idioms: All “idioms of decoding” (semantic, truly non-compositional ones) are at the same time necessarily “idioms of encoding” (fixed strings of lexemes), actually a subset of the latter that is even more resistant to the rearrangement and transformation. Accordingly, the very force relevant for the recovery of a pun target is inherent to both types.

Of the criteria to categorize types of formulaic expressions, like inflexibility, conventionality, or non-compositionality/idiomaticity, only the inflexibility in syntactic and/or lexematic terms will be understood to incorporate—and, in turn, be affected by—the semantic non-compositionality. Conceptualized in this way, it is most relevant for the recoverability support I am interested in, because my application will allow for more phonological dissimilarity for a pun made more recoverable as a part of an idiomatic torso. For the full implementation of an idiomaticity hierarchy a lexicon of idioms would be necessary against which the input target could be checked. If a pun from within an idiom can be found, the C constraint, that is the cut-off point for unusable targets can be relaxed, that is moved lower (respectively a negative value added to the dissimilarity cost computed from the evaluation formula outline in section 5.6), so as to include that target despite larger dissimilarity on the phonological level (and also the humorous semantic level which is not necessarily interacting with the semantic non-compositionality/metaphoricity of the idiom).

Starting from Makkai’s categories, I propose the following provisional hierarchy of idiom-types with lower flexibility/longer sequence/higher recoverability at the top and the number of instances in the corpus identified to fall into them on the right:

Table (7): Types and Tokens of Formulae

| | | |
|---|---|---|
| 1. | quotes | 145 |
| 2. | proverbs | 82 |
| 3. | clichés | 146 |
| 4. | non-compositional, opaque, 2nd area idioms | 135 |
| 5. | compositional, transparent, 1st area idioms | 290 |
| | total | 798 |

Quotes are completely fixed and, consequently, are assumed to have the highest recoverability force. The highest possible phonological or semantic pun-target distance should be possible, but obviously not necessary, here:

(66) The British rain song: A Froggy Day in London Town. (93)
*froggy ->foggy;* a foggy day in London town (song by Gershwin)

(67) An afternoon snack: the pause that refleshes. (89)
*refleshes -> refreshes;* "the pause that refreshes" (a 1947 Coca Cola slogan)[46]

Proverbs are almost fully fixed complete utterances with largely non-compositional meaning, namely a moral, usually metaphorical in nature, i.e., pertaining to a different domain than the literal utterance. The only variability allowed here is that of adjusting minor categories, like tense, number, or gender, resulting in minor morphological difference from the prototype:

(68) Asked why he preferred the more mature hens in the barnyard, the rooster explained, "There's no fowl like an old fowl!" (92; one of Crosbie's favorites, although he was only 57 at the time of publication; 97, 167, 179, 233, 261)
*fowl -> fool;* "there's no fool like an old fool"

(69) Unctions speak louder than words. (240)
*unctions -> actions*; "actions speak louder than words"

Clichés are less fixed longer phrases (more than three lexemes), but not full sentences, with a non-compositional meaning:

[46] In this section, the formula used in a pun example is given in quotation marks, including its source, if it could be identified.

(70) The song of the fisherman's nightmare: "To Dream the Impossible Bream." (34; another fish pun)
*bream -> dream;* "dream the impossible dream"

(71) She thought her new boyfriend was creative but when he finally got down to it he wasn't a Rachmaninov to satisfy her. (190)
*a Rachmaninov -> man enough*; "not be man enough"

The following is a brief list of distinct types of formulae grouped into the more heterogeneous classes 4 and 5 with examples from the corpus. These classes are not strictly mutually exclusive, which is the main reason why I combined them in my tentative hierarchy in Table (6) above:

(72) **phrasal verb** verb particle combination
*rip off* (196), *catch up* (130)

**tournure** more than three lexemes, template: "to X the/a Y" (see Makkai 1974: 148f)
*kick the habit* (190), *have the heaves* (74)

**binomial** two coordinated minimal phrases
*cause and effect* (55), *fish and chips* (87)

**collocation** premodifier and noun combinations
*dying breed* (247), *assorted flavors* (215)

**compounds** noun phrase compounds
*public-opinion poll* (184), *town cryer* (236)

It should be noted that phrasal verbs—despite their prominent role in the English language—are fairly rare in the corpus in positions interacting with the pun-target domain. The simple reason seems to be that the particles are too short to allow for much variation other than in contexts where they are mapped onto the target or from the pun with the help of additional lexical items. In short, the range of phrasal verbs is too short, and only seven of them have been found in the corpus, four of which use the particle in the punning domain:

| | | |
|---|---|---|
| (73) | rip off: | rib-off -> ripoff (196) |
| | pass on: | Parthenon -> passing on (170) |
| | be on: | yawn -> you're on (259) |
| | urge on: | erg -> urge (78) |
| | | urchin -> urgin' (240) |
| | catch up: | kitchen -> catchin' (130) |
| | wake up: | highway cop -> I wake up (111) |

In sum, the higher categories in table (6) a have higher rigidity. If a pun-target segment is embedded into a formula belonging to one of those categories, higher recoverability of the target is assumed, all other factors being equal. As an extreme example, in the sample corpus whole stanzas of songs have been encountered with several pun-target pairs embedded into them. But to conclude this subsection, a somber note is necessary: Until either a lexicon of English idioms labeled for rigidity levels, possibly the ones proposed in this sketch, is set up or a useful tool for the analysis of idiomaticity, short of a full analysis of the whole text into which it is embedded, is created, idiomaticity remains quite literally an academic issue. And that is regretful because of its immense role in heterophonic punning as witnessed by the sample corpus, and language in general.

## 6.7 Word Classes and Syntactic Functions: Lexico-Semantic Interface

This section will discuss the interaction of word class—or classes—of the pun and target with their syntactic function and with the respective syntactic grammaticality of the pun and target in their shared context. The following interaction between the two parameters are possible and documented in the corpus:

Table (8): Word Classes and Syntactic Functions of Pun and Target

| *word classes of pun and target* | *syntactic functions of pun and target* | # |
|---|---|---|
| 1. same | same | **748** |
| 2. different | different | **216** |
| 3. different | same | **203** |
| 4. same | different | **0** |

The figures in the last column give the number of instances of the combinations out of the 1182 puns in the sample corpus. The three classes actually represented are illustrated by the following examples:

(74) Actually, Arab women really fear the wolf in sheik's clothing. (209)
*sheik's* (noun, possessive premodifier) -> *sheep's* (noun, possessive premodifier)

(75) As Ruth said to Naomi, "Lesbian ardent pair." (136)
*lesbian* (noun, possessive premodifier)-> *let's be an* (complex verb, article)

(76) And then there was the traveler who went around the world in a tea daze. (63)
*a tea daze* (prepositional phrase: article, nominal premodifier, noun, object of the preposition)-> *eighty days* (prepositional phrase: adjective, noun, object of the preposition)

In general, target and pun in punning jokes have the tendency to be in the same word class as well as to fulfill the same syntactic function. A pun generator can maximize its output by focusing on this straightforward kind of pun:

(77) Cleopatra instituted the practice of keeping a handkerchief tucked in her cleavage and thus became famous for taking a wiper to her bosom. (254)
*wiper* (noun, direct object) -> *viper* (noun, direct object)[47]

But not all pun-target pairs that fulfill the same grammatical function also stay within the same word class. Accordingly, the 1182 pun target pairs were tagged for parts of speech with the CLAWS tag set (see Appendix A) after initially only having been tagged

[47] Another possible, but less accessible, interpretation for the target in this joke, which Shaun Hughes made me aware of, is [waypə], an acceptable pronunciation of *viper* in certain upper-class British dialects. While it is a rare dialect (cf. Trudgill 1990: 45), it remains alive through fictional characters such as Dickens' Sam Weller.

for grammatical function (see below, Appendix B) in order to identify regularities that should be formalized for a pun generation system.

The aim of the tagging of the corpus for word class/part of speech and grammatical function is to identify the common types of crossing of word class from target to pun. This time-consuming procedure was warranted by the fact that word-class would be the only syntactic information available for the input of the type of pun generator. In order to produce meaningful output, the pun and target must be of such word classes that, if they're not identical for both, a future implementation towards a full joke text can still utilize the output of my module.

Word class difference between target and pun is frequent. Of the general type without the special cases discussed in the following subsection, there are 434 target-pun pairs (36.72%; lines 1-6, 10-11 of the following table (8)) that do not show word class identity in the sample corpus. Two different scenarios with respect to grammaticality are found here (see also below). The more common type has grammaticality only for the sentence containing the target, but not the pun (222; 18.78%; lines 1, 4, 7). This grammaticality imbalance, illustrated by the following example, will receive more attention below (section 6.8). In the following example, the clause "hence lay the eggs" is not grammatical, but with the target "hens" in place of its target "hence" it is.

(78) The roosters do the crowing, but the hence lay the eggs. (110)
*hence* (conjunction) -> *hens* (noun)

The generation of such puns is a necessary feature of a pun generator as they are very frequent. And they have an the additional recovery force that lies in the very ungrammaticality of the pun text and may be required to salvage higher phonological (or other) dissimilarity. But these puns are considered worse in terms of funniness, because this very "brute force" recovery is considered unsophisticated and many of them, like example (78), have to be considered word play rather than jokes as they lack the necessary semantic component (cf. section 2.3).

Table (9): Synopsis of Word Class (WC), Syntactic Function (SF), Grammaticality (G): — = no, X = yes, / = unclear, B = both, T = only target, P = only pun, ne = not embedded

| | **WC** | **SF** | **G** | # | ∑ |
|---|---|---|---|---|---|
| 1 | — | — | T | 169 | |
| 2 | — | — | ne | 37 | |
| 3 | — | — | B | 10 | |
| | | | | | 216 |
| 4 | — | X | T | 31 | |
| 5 | — | X | ne | 14 | |
| 6 | — | X | B | 158 | |
| | | | | | 203 |
| 7 | X | X | T | 22 | |
| 8 | X | X | ne | 74 | |
| 9 | X | X | B | 652 | |
| | | | | | 748 |
| 10 | — | — | P | 1 | |
| 11 | — | / | / | 14 | |
| | | | | | 15 |
| | | | | | 1182 |

This section focuses on the more elegant and less common, yet still frequent type pun that shows different word class between pun and target, but preserves grammaticality for both by maintaining the syntactic role of both. The corpus contains 162 such punning texts, comprising 13.71%. In order not to lose one eighth of the possible output of the generator it seems warranted to also incorporate such puns in the generation scheme, in the sense that a possible pun will not fall below the C-constraint if it lies in a word class that can take on the same grammatical function that the target has.

An initial plausible hypothesis for this class is that the most frequent such pun-target domains should include parts of speech that can premodify and those that can postmodify the head of a noun phrase, as well as anything that has the same syntactic freedom as an adverbial. What makes the analysis simple and the generation hard is that there are very few purely optional, syntactic choices that affect meaning very little, or, ideally, not at all. One example is the positioning of adverbials that is comparatively free in English.[48] Oaks operates under a similar hypothesis for one of these functions when he mentions that he groups appositives as postmodifiers and non-head nouns in a compound as premodifiers, not distinguishing them further as parts of compound (1990: 9).

Appendix B lists the syntactic functions for which the pun-target pairs were tagged initially. These tags were then double-checked against the CLAWS tags (see Appendix A) and adjusted. It should be mentioned again, that the present study does not strive for an exhaustive syntactic analysis that is reflected in these tags, but a useable set that can easily be translated for an application to generate puns and that yields a result with respect to the hypothesis sketched above and refined below.

The following statistics emerge from the material on the basis of my hypothesis and the tagging classes used: Of the 162 pun-target pairs that do not show the same word class but are grammatical for both the pun and the target, by far the largest group with 65 instances shows pun and target as premodifiers of a noun head. The pun is either an adjective that is paired with a target that is a premodifying noun as in (79), or, more frequently (52 instances), vice versa, as in (80):

---

[48] Further examples include: active vs. passive voice, indirect object vs. *to* prepositional phrase, and the position of the phrasal verb particle (cf. Greenbaum 1980: 308). Such syntactic freedom has been found desirable for the same reason, namely that it affects meaning as little as necessary, in another NLP application, namely natural language watermarking (Atallah *et al.* 2001).

(79) One of the guards at the Tower of London is so in love with his job that his colleagues call him "the brief eater." (35)
*brief* (adjective) -> *beef* (premodifying noun)

(80) Birds make tweet music. (238)
*tweet* (premodifying noun) -> *sweet* (adjective)

Other, less significant subgroups pair the same word classes, adjectives and nouns, in different functions. For example, in the position where the existential verb can have a direct object, a predicative adjective can also show up: *She is affected.* vs. *She is a factoid*. Also, nouns functioning as objects can also appear in a sentence-final position, just as adverbs, so that candidates from these two word classes may form pun-target pairs.

Many of the word class differences involve unequal segmentation, leading to their inclusion in this group of word class differences, possibly with additional word class difference only in one of the segments. Again, noun phrases and premodification were prominently involved (29 instances). Single nouns are paired with two coordinated nouns (example (81);  2 instances), with compound nouns and nouns with a determiner or adjective (example (82); 17 instances). Postmodification makes it possible to pair nouns in object position with nouns and subordinate clauses directly adjacent to them (example (83); 10 instances):

(81) The reason they didn't serve pie at the Last Supper was because they had already had piety. (176)
*piety -> pie and tea*

(82) The old sheep clipper's back ached so much from yesterday's work that he couldn't make it back to the farm today. He had to send his young assistant, the sore shearer's apprentice. (215)
*sore shearer -> sorcerer*

(83) Is that a crack in my soup bowl or a heresy? (110)
*heresy* (noun)-> *hair I see* (noun and relative clause)

In sum, the prominence of noun phrases in the corpus, in particular that of nouns and adjectives in premodifying function, warrants a bias of a generator towards inclusion of these in its selection towards an output. Verb phrases with their more intricate syntax play a less significant role in heterophonic puns and should be considered too costly an issue in terms of their full formalization.

## 6.8 Recoverability through Ungrammaticality

Related to these parameters, but not strictly dependent on them is the status of syntactic grammaticality of the pun and target as embedded into their context. While we can expect grammaticality for both when word class and syntactic function are identical, we should assume where the syntactic function differs, that only under conditions of structural ambiguity the grammaticality of both pun and target can be achieved. These are cases of punning interacting with the factors creating structural ambiguity described by Oaks (1990, 1995), for example the interaction of ellipsis and ambiguous coordination in the following example.

(84) 'Tis better to have love and lust
Than never to have love at all.
*love and lust* (coordination of two direct objects) -> *loved and lost* (coordination of two main verbs)

The statistics for grammaticality and formulaicity of the sample corpus of 1182 texts are given in the following table:

Table (10): Grammaticality (gram.) Formulaicity (form.) of Puns and Targets

| *grammaticality* | # | *form. #* | *% gram.* | *% form. of gram.* |
|---|---|---|---|---|
| 1. both pun and target | **861** | **668** | 72.84 | 77.58 |
| 2. only target | **223** | **102** | 18.87 | 45.74 |
| 3. not syntactically embedded | **127** | **27** | 10.74 | 21.26 |
| 4. only the pun | **1** | **1** | 0.085 | 100.00 |

The main point that these figures illustrate has been introduced above: successful syntactic embedding of both the pun and target is desirable, but not obligatory.

It is also remarkable that the number of targets whose recoverability is enhanced through the use of formulaic speech is lower for the puns in which only those targets are grammatical (second row), namely only for 46% of the cases in contrast to 78% for the standard cases. I assume that the ungrammaticality of the pun triggers the target differently here than in puns in which both pun and target are grammatical. If this assumption is correct, it explains how the puns in which only the targets are grammatical attain recoverability despite the phonological dissimilarity without having to fall back to formulaicity, as in the following word play:

(85) "Grass" reefers to marijuana. (194)
*reefers* (noun) -> *refers* (verb)

The pun *reefers* as a plural noun is a synonym for marijuana cigarette. It is ungrammatical in the text, helping to trigger the grammatical target verb *refer* despite their significant sound distance created by stress shift. The whole text thus has but one script, SMOKING MARIJUANA, presumably making it sufficiently enjoyable for those who do, but not sufficient to make it a joke (cf. section 2.3). The contrast between the two readings of the text is just that between a grammatical and an ungrammatical sentence, one of which requires pun-like problem-solving to be recovered, the other being about drugs. If ungrammatical puns trigger the grammatical targets, this is related to Sobkowiak's observation that puns are also "much less frequent in English than their sources [targets]" (1991: 116). It seems easier to trigger a high-frequency, "common" target with a low-frequency, "rare" pun than vice versa.

The majority of the puns that fall into the third class, in which the pun/target is not embedded into a syntactic context, namely 75 (59.05%), are of the *definition* type, which will be discussed in section 6.10 below.

In conclusion, syntactic functions become relevant for punning in those cases, where the pun has a different word class than its target, while both are syntactically grammatical. For the purpose of a pun generator component as envisioned here—namely one stopping short of producing the semantically well-formed joke text, but providing usable pun-target pairs—syntactic functions are a secondary parameter. While it was necessary to confirm this status in the present study, all that a generator component will take into account is the lexical word class of the two members of the pair. This word class constraint will, on the other hand, reflect the insights gained on the basis of the syntactic functions they can fulfill. In other words, if words from several different lexical word classes can fulfill the same syntactic function and therefore appear in the same position, they form a paradigmatic class whose members are, for the purposes of punning, interchangeable and thus possible target-pun pairs.

## 6.9 Syntactic Ambiguity

The following subsection discusses a different case of exceptional grammaticality, not so much one that is preserved through shared syntactic function, but rather created through a more intricate ambiguity of the syntactic and semantic structure of the text, not just the pun-target pair. The mechanism that creates this ambiguity is the embedding into a sentence whose syntax is itself ambiguous and allows for two syntactic functions and/or word classes for the pun-target pair. A small number of puns in my sample corpus utilized this principle, and it sees worthwhile to investigate these jokes as they struck me as particularly witty or, at least, intricate and thus, maybe, sophisticated. These puns require additional syntactic resources for their analysis than those outlined so far. Fortunately, Oaks has devoted not only his dissertation (1990), but also a number of subsequent publications (e.g., 1995) to precisely these types of syntactic phenomena that enable ambiguity.

So far, syntactic factors have been discussed in their function as disambiguators, in particular when they helped trigger the recovery of the target in a context in which the pun was ungrammatical. Focusing on the opposite function, this section will summarize Oak's discussion briefly insofar as it is required to account for the material found in the sample corpus. The distinct quality of ambiguity discussed in this subsection becomes clear when it is contrasted to the similar, but simpler cases already discussed:

(86) The secret of being a happy woman over forty is not to worry about the menopause but the men who don't. (148)
*menopause* -> *man who paws*, PDetPo -> PDetPoWhV[49]

---

[49] For an explanation of the abbreviations of word classes, see Appendix B.

The word class in this example is the same for the pun and the head of the phrase onto which it is projected as the target, namely a noun phrase functioning as the object, with an additional relative clause in the case of the target.

(87) To do a tapestry, you needle the wool you can get. (158)
*needle* -> *need all*, SVDetO -> SVDetDetO

Again, we have two different verb phrases, depending on how the punning domain is segmented, in case of the target providing an additional premodifying quantifier *all*. But these aren't examples of ambiguous syntactic patterns. It is merely the function of a coextensive segment of the joke that has two different possible segmentations, but its syntactic function, its position within the hierarchical phrase structure, is still the same in the pun and target.

(88) The Spartan mothers used to enjoin their sons: "Return with your shield—or pawn it." (172)
*pawn* -> *upon*, VPAdjPo&PPo ->VPAdjPo&VO, Po&Po ->V&V

This example of true structural ambiguity employs the potential of coordination and ellipsis, the combination of which yields a rich harvest of syntactic patterns that can be understood in two ways (cf. Oaks 1990: 117ff). Of this latter type, I encountered 23 in the sample corpus, mostly employing coordination of elliptical phrases. The other cases involved different types of pre- and postmodification of NPs and VPs between the target and pun and are subsumed under the constraints on word class interchangeability discussed in the previous section.

The following are further examples of punning with additional structural ambiguity, largely facilitated by coordination and ellipsis in connection.

(89) The poet became unable to scan anapest. (13)
*anapest* -> *and a pest*, PdjToVO->PdjTo&DetO coordination/ellipsis

(90) Go to Lebanon and cedar Lebanon. (44)
*cedar* -> *see the*, VPPo&RPo->VPPo&VDetO coordination/ellipsis

(91) You can't live by bread and loaf. (140)
*and loaf* -> *alone*, SAuxVPPo&Po/V[50] -> SAuxVPPoAdv (coordination)

(92) She spent her time
A lot alone
And never sad
Upon the throne. (201)
*sad* -> *sat*, SVOAdv&AdvPDetPo ->SVOAdv&VPDetPo coordination/ellipsis.

## 6.10 Definition Puns: Less Semantics, Less Joke

Let me finally turn to one statistically significant class of puns, whose syntactic grammaticality and, consequently, syntactic function and lexical word class are irrelevant. A total of 92 of the 1182 puns (7.78%) in the sample corpus are of this "definition" type, most of them neither embedding the pun nor the target syntactically (see above). Rather, the pun is presented unembedded into context in the fashion of a lexicon entry, and then just defined such that the target can be arrived at from the second script triggered by the definition. Often these puns are so semantically ill-formed that to call them jokes is actually straining the category to the point of breaking (see, again, section 2.3). In the following example, the second script triggered by the definition (*itch*), namely SKIN IRRITATION, is only marginally overlapping with weak first script of SMALLNESS (triggered by a grammatical lexeme *each*) as it should be provided by the meaning of the unembedded pun:

[50] I'm grateful to Shaun Hughes who pointed out to me that within the pun, *loaf* is also ambiguous as a noun denoting "bread loaf" thus reinforcing the FOOD script, and—more plausible in the context—as a verb denoting "pass time at leisure."

(93) each
minor irritation (73)
*each -> itch*

The meaning of *each* is only marginally supporting the SMALLNESS of the irritation, in that it denotes single iteration or instance of whatever it is the quantifier of. Thus it isn't as bad a joke as many other definition puns, and should not be considered purely wordplay, in contrast to the following one. Although this example has word-class identity for pun and target, I challenge the reader to unpack a logical mechanism (LM) creating overlap beyond the sound similarity or identify the scripts behind that could connect *maggot* to *magnet* in this joke-like text.

(94) magnet
To some, it is what you find in a bad apple. (145)
*magnet -> maggot*

These definition puns are also an extreme in terms of the interaction of semantic, phonological, and syntactic interaction towards recoverability of the target. There is zero syntactic support for the target, hence the semantic and phonological forces must be either maximal or the text will fail as a joke, despite its success in making a target recoverable from a pun (see section 2.3). And this illustrates another assumption we can derive from the theoretical model outlined in that section: Because the LM of punning is the analogical extension of cratylism, if there are too many supporting factors compensating for low phonological similarity, this LM is negatively affected, despite the recoverability of the target. Since we assume the LM to be an essential element in the joke, its functioning—responsible for its funniness potential—should be affected. And I argue that it indeed is.

# 7. SUMMARY AND OUTLOOK

In the present study, a model for the complex phenomenon of punning, and heterophonic punning, in particular has been described, at all levels of linguistic and humor theoretical relevance. The level of formalization that was attainable for the different domains that this model pertains to depends strongly on the state of the art of the particular theory underlying it, as well as to what degree it was possible to advance that state here. Thus, it was possible to provide more detail to the humor theoretical model of punning, most crucially from a semantic perspective, and describe its intricate interactions with other linguistically-relevant factors, in particular the phonological concept of sound similarity as it operates in a specific way in imperfect punning and interacts with other linguistic factors. It was also possible to evaluate the limits of Optimality Theory (OT) with a view to its application and extend models that overcome these limits while retaining the essential advantages of an underlying theory inspired by OT. Further significant results for phonology include a feature hierarchy based on the assumed influence of different features and feature classes on perceived similarity. In this view, the present study provides relevant insights beyond the data in its purview, namely for those theories that were used and adapted to provide models for the description and explanation of those data.

From the opposite perspective of application and implementation, the complexity and multifaceted nature of the phenomenon of punning itself provides a criterion with which the level of abstraction—or, inversely, detail—of the model can be decided. In particular, the implementation of the current model for computational generation demands the full description of the relevant aspects, namely semantics and phonology to produce the promised output, namely ranked selection of pun candidates for an input target. For this reason the focus of the present study was directed towards the development of present theories in these areas towards the description of imperfect punning.

The phonological analysis of possible puns for a given target can be automatized and refined as part of a generator, now that the edit distance computation has been made available by the present research. This method to evaluate and select phonologically possible and better imperfect puns can thus be integrated into larger natural language processing project as a module to generate imperfect puns. Future extensions and applications of the results presented here in this direction will also lead to further refinement of the violation cost calculation presented in section 5.7. Such a module can function as a complement to a existing automatized pun generator (cf. Binsted and Ritchie 1997, Stock and Strapparava 2002) that are currently only capable to produce homophonic, perfect puns.

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# APPENDICES

## Appendix A: CLAWS Tag Set

The following is the CLAWS tag set from Garside (1997) that was used for the word-class identification.

AJ0 Adjective (general or positive) (e.g. *good, old, beautiful*)

AJC Comparative adjective (e.g. *better, older*)

AJS Superlative adjective (e.g. *best, oldest*)

AT0 Article (e.g. *the, a, an*, *no*) [N.B. *no* is included among articles, which are defined here as determiner words which typically begin a noun phrase, but which cannot occur as the head of a noun phrase.]

AV0 General adverb: an adverb not subclassified as AVP or AVQ (see below) (e.g. *often, well, longer* (adv.), *furthest*. [Note that adverbs, unlike adjectives, are not tagged as positive, comparative, or superlative. This is because of the relative rarity of comparative and superlative adverbs.]

AVP Adverb particle (e.g. *up, off, out*) [N.B. AVP is used for such "prepositional adverbs", whether or not they are used idiomatically in a phrasal verb: e.g. in 'Come *out* here' and 'I can't hold *out* any longer', the same AVP tag is used for *out*.

AVQ *Wh*-adverb (e.g. *when, where, how, why, wherever*) [The same tag is used, whether the word occurs in interrogative or relative use.]

CJC Coordinating conjunction (e.g. *and, or, but*)

CJS Subordinating conjunction (e.g. *although, when*)

CJT The subordinating conjunction *that* [N.B. *that* is tagged CJT when it introduces not only a nominal clause, but also a relative clause, as in 'the day *that* follows Christmas'. Some theories treat *that* here as a relative pronoun, whereas others treat it as a conjunction. We have adopted the latter analysis.]

CRD Cardinal number (e.g. *one, 3, fifty-five, 3609*)

DPS Possessive determiner (e.g. *your, their, his*)

DT0 General determiner: i.e. a determiner which is not a DTQ. [Here a determiner is defined as a word which typically occurs either as the first word in a noun phrase, or as the head of a noun phrase. E.g. *This* is tagged DT0 both in '*This* is my house' and in '*This* house is mine'.]

DTQ *Wh*-determiner (e.g. *which, what, whose, whichever*) [The category of determiner here is defined as for DT0 above. These words are tagged as *wh*-determiners whether they occur in interrogative use or in relative use.]

ITJ Interjection or other isolate (e.g. *oh, yes, mhm, wow*)

NN0 Common noun, neutral for number (e.g. *aircraft, data, committee*) [N.B. Singular collective nouns such as *committee* and *team* are tagged NN0, on the grounds that they are capable of taking singular or plural agreement with the following verb: e.g. 'The *committee* disagrees/disagree'.]

NN1 Singular common noun (e.g. *pencil, goose, time, revelation*)

NN2 Plural common noun (e.g. *pencils, geese, times, revelations*)

NP0 Proper noun (e.g. *London, Michael, Mars*, *IBM*) [N.B. the distinction between singular and plural proper nouns is not indicated in the tagset, plural proper nouns being a comparative rarity.]

ORD Ordinal numeral (e.g. *first, sixth, 77th, last*) . [N.B. The ORD tag is used whether these words are used in a nominal or in an adverbial role. *Next* and *last,* as "general ordinals", are also assigned to this category.]

PNI Indefinite pronoun (e.g. *none, everything, one* [as pronoun], *nobody*) [N.B. This tag applies to words which always function as [heads of] noun phrases. Words like *some* and *these*, which can also occur before a noun head in an article-like function, are tagged as determiners (see DT0 and AT0 above).]

PNP Personal pronoun (e.g. *I, you, them, ours*) [Note that possessive pronouns like *ours* and *theirs* are tagged as personal pronouns.]

PNQ *Wh*-pronoun (e.g. *who, whoever, whom*) [N.B. These words are tagged as *wh*-pronouns whether they occur in interrogative or in relative use.]

PNX Reflexive pronoun (e.g. *myself, yourself, itself, ourselves*)

POS The possessive or genitive marker *'s* or *'* (e.g. for 'Peter*'s* or somebody else*'s*', the sequence of tags is: NP0 POS CJC PNI AV0 POS)

PRF The preposition *of*. Because of its frequency and its almost exclusively postnominal function, *of* is assigned a special tag of its own.

PRP Preposition (except for *of*) (e.g. *about, at, in, on, on behalf of, with*)

TO0 Infinitive marker *to*

UNC Unclassified items which are not appropriately classified as items of the English lexicon. [Items tagged UNC include foreign (non-English) words, special typographical symbols, formulae, and (in spoken language) hesitation fillers such as *er* and *erm*.]

VBB The present tense forms of the verb BE, except for *is, 's*: i.e. *am, are, 'm, 're* and *be* [subjunctive or imperative]

VBD The past tense forms of the verb BE: *was* and *were*

VBG The *-ing* form of the verb BE: *being*

VBI The infinitive form of the verb BE: *be*

| | |
|---|---|
| VBN | The past participle form of the verb BE: *been* |
| VBZ | The *-s* form of the verb BE: *is, 's* |
| VDB | The finite base form of the verb BE: *do* |
| VDD | The past tense form of the verb DO: *did* |
| VDG | The *-ing* form of the verb DO: *doing* |
| VDI | The infinitive form of the verb DO: *do* |
| VDN | The past participle form of the verb DO: *done* |
| VDZ | The *-s* form of the verb DO: *does, 's* |
| VHB | The finite base form of the verb HAVE: *have, 've* |
| VHD | The past tense form of the verb HAVE: *had, 'd* |
| VHG | The *-ing* form of the verb HAVE: *having* |
| VHI | The infinitive form of the verb HAVE: *have* |
| VHN | The past participle form of the verb HAVE: *had* |
| VHZ | The *-s* form of the verb HAVE: *has, 's* |
| VM0 | Modal auxiliary verb (e.g. *will, would, can, could*, *'ll*, *'d*) |
| VVB | The finite base form of lexical verbs (e.g. *forget, send, live, return*) [Including the imperative and present subjunctive] |
| VVD | The past tense form of lexical verbs (e.g. *forgot, sent, lived, returned*) |
| VVG | The *-ing* form of lexical verbs (e.g. *forgetting, sending, living, returning*) |
| VVI | The infinitive form of lexical verbs (e.g. *forget, send, live, return*) |
| VVN | The past participle form of lexical verbs (e.g. *forgotten, sent, lived, returned*) |
| VVZ | The *-s* form of lexical verbs (e.g. *forgets, sends, lives, returns*) |
| XX0 | The negative particle *not* or *n't* |
| ZZ0 | Alphabetical symbols (e.g. *A, a, B, b, c, d*) |

# Appendix B: Syntactic Function Tag Set

**nouns**

| | |
|---|---|
| N | not syntactically embedded noun, or ungrammatically used (usually in the pun) |
| S | subject |
| O | object |
| Po | object of a preposition |
| R | premodifying noun in a compound noun, either spelled together, hyphenated or in two words |
| C | noun that is a comparative complement |
| PropX | e.g., PropN, PropR; proper name [if I'm distinguishing this, should I do morphological analysis in terms of deverbal noun, deadjectival noun, etc.? Yes, in the long run, if I have a full pun generator in mind and I can't fit a verb where I need a certain stem semantically, I can adjectivalize it, nominalize it, etc. as needed; but that later] |
| Rposs | possessive premodifying noun |
| Wh | interrogative/relative pronoun |

**adjectives**

| | |
|---|---|
| Adj | attributive adjective |
| Pdj | predicative adjective |

**verbs**[51]

| | |
|---|---|
| V | finite verb |
| Ven | past participle |
| Ving | present participle |
| Aux | auxiliary |
| Inf | infinitive |

**other**

| | |
|---|---|
| Adv | adverbial |
| & | conjunction |
| P | preposition |
| excl. | exclamation (not syntactically embedded) |
| Pt | particle of phrasal verbs |
| to | to (Inf) |
| Det | determiner |
| ? | indeterminable |

[51] Further distinctions are available at the level of the CLAWS-based word class analysis, so that these three V types were only used to highlight central differences.

# Appendix C: Consonant Distributions and Frequency

The following table lists the frequencies of consonants in three different positions as extracted from the 127,070 entries of the CMUDict: word-initial (x_), word-final (_x) and word-medial (_x_). These figures were used to assess if the consonants were subject to change in certain environments overproportionately to their regular occurrence.

**[b]**

| | |
|---|---|
| x_ | 9,087 |
| _x | 416 |
| _x_ | 10,403 |
| *sum* | *19,906* |

**[p]**

| | |
|---|---|
| x_ | 7,377 |
| _x | 1,075 |
| _x_ | 10,108 |
| *sum* | *18,560* |

**[d]**

| | |
|---|---|
| x_ | 7,452 |
| _x | 8,149 |
| _x_ | 14,918 |
| *sum* | *30,519* |

**[t]**

| | |
|---|---|
| x_ | 5,266 |
| _x | 8,890 |
| _x_ | 29,613 |
| *sum* | *32,050* |

**[g]**

| | |
|---|---|
| x_ | 4,794 |
| _x | 1.032 |
| _x_ | 7,085 |
| *sum* | *12,911* |

**[k]**

| | |
|---|---|
| x_ | 12,412 |
| _x | 5,125 |
| _x_ | 22,845 |
| *sum* | *40,382* |

**[v]**

| | |
|---|---|
| x_ | 2,322 |
| _x | 824 |
| _x_ | 7,034 |
| *sum* | *10,180* |

**[f]**

| | |
|---|---|
| x_ | 5,294 |
| _x | 969 |
| _x_ | 6,673 |
| *sum* | *12,936* |

**[z]**

| | |
|---|---|
| x_ | 918 |
| _x | 18,810 |
| _x_ | 6,019 |
| *sum* | *25,747* |

**[s]**

| | |
|---|---|
| x_ | 11,877 |
| _x | 11,035 |
| _x_ | 24,571 |
| *sum* | *47,483* |

**[ʃ]**

| | |
|---|---|
| x_ | 2,369 |
| _x | 685 |
| _x_ | 5,197 |
| *sum* | *8,251* |

**[ʒ]**

| | |
|---|---|
| x_ | 85 |
| _x | 21 |
| _x_ | 431 |
| *sum* | *537* |

**[θ]**

| | |
|---|---|
| x_ | 612 |
| _x | 637 |
| _x_ | 1,518 |
| *sum* | *2,767* |

**[ð]**

| | |
|---|---|
| x_ | 65 |
| _x | 40 |
| _x_ | 450 |
| *sum* | *555* |

**[tʃ]**

| | |
|---|---|
| x_ | 1,195 |
| _x | 611 |
| _x_ | 2,896 |
| *sum* | *4,702* |

**[dʒ]**

| | |
|---|---|
| x_ | 2,039 |
| _x | 634 |
| _x_ | 3,259 |
| *sum* | *5,932* |

**[h]**

| | |
|---|---|
| x_ | 6,438 |
| _x | 26 |
| _x_ | 2,446 |
| *sum* | *8,910* |

**[w]**

| | |
|---|---|
| x_ | 3,659 |
| _x | 5 |
| _x_ | 4,860 |
| *sum* | *8,524* |

**[l]**

| | |
|---|---|
| x_ | 5,301 |
| _x | 7,153 |
| _x_ | 34,763 |
| *sum* | *47,217* |

**[r]**

| | |
|---|---|
| x_ | 7,107 |
| _x | 1,747 |
| _x_ | 34,763 |
| *sum* | *43,619* |

**[j]**

| | |
|---|---|
| x_ | 1,277 |
| _x | 7 |
| _x_ | 3,523 |
| *sum* | *4,807* |

**[m]**

| | |
|---|---|
| x_ | 9,029 |
| _x | 2,476 |
| _x_ | 16,433 |
| *sum* | *27,938* |

**[n]**

| | |
|---|---|
| x_ | 3,068 |
| _x | 14,402 |
| _x_ | 40,221 |
| *sum* | *57,691* |

**[ŋ]**

| | |
|---|---|
| x_ | 0 |
| _x | 5,526 |
| _x_ | 3,842 |
| *sum* | *9,368* |

## Appendix D: Non-Corresponding Segments

The following table lists the non-corresponding segments in the main corpus of target-pun pairs listed in Appendix E, including the number of the pair in the database, the pair itself, the immediate segmental environment, and the cost incurred by the non-correspondence violation according to the preliminary cost table. The leading numbers correspond to those in Appendix E, where the full target-pun domain of the examples is listed.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | z-s | n_# | 0.07 | 26 | E-7 | C_r | 0.29 | 47 | .-t | ._# | 0.07 |
| 2 | E-i | n_D | 0.28 | 27 | C-S | #_i | 0.15 | 48 | l-r | f_4 | 0.13 |
| 3 | .-n | 0_l | 0.1 | 28 | 1-3 | k_n | 0.28 | 49 | .-r | f_a | 0.03 |
| 3 | n-f | 5_# | 0.66 | 29 | E-a | k_m | 0.27 | 50 | C-f | #_. | 1 |
| 4 | I-^ | d_n | 0.29 | 30 | n-. | 0_t | 0.1 | 50 | .-r | C_5 | 0.03 |
| 5 | &-a | k_m | 0.18 | 30 | t-k | n_r | 0.14 | 51 | r-. | f_0 | 0.04 |
| 5 | l-. | 0_# | 0.08 | 31 | &-0 | k_n | 0.24 | 51 | 0-^ | r_m | 0.28 |
| 6 | s-T | I_# | 0.11 | 32 | ^-5 | k_v | 0.28 | 51 | m-n | 0_D | 0.14 |
| 7 | h-. | i_2 | 0.07 | 32 | 0-9 | v_r | 0.29 | 51 | D-d | m_0 | 0.05 |
| 8 | d-. | n_# | 0.09 | 32 | .-t | r_# | 0.07 | 51 | &-E | m_n | 0.2 |
| 9 | j-. | p_u | 0.09 | 33 | p-k | #_9 | 0.23 | 52 | t-d | r_# | 0.09 |
| 9 | u-8 | j_r | 0.29 | 34 | s-k | #_9 | 0.27 | 53 | E-a | h_l | 0.27 |
| 10 | E-& | v_s | 0.19 | 35 | D-d | #_I | 0.05 | 54 | O-0 | p_r | 0.25 |
| 11 | .-d | b_a | 0.11 | 36 | E-I | d_s | 0.2 | 54 | r-. | O_? | 0.04 |
| 11 | 0-. | n_b | 0.07 | 36 | s-z | E_I | 0.07 | 54 | ?-t | r_0 | 0.17 |
| 11 | b-. | 0_l | 0.21 | 36 | I-. | s_m | 0.11 | 55 | E-^ | s_p | 0.26 |
| 12 | 1-0 | #_s | 0.2 | 37 | .-d | #_2 | 0.11 | 55 | p-f | E_0 | 0.23 |
| 12 | i-I | s_d | 0.15 | 38 | &-E | #_l | 0.2 | 56 | .-I | #_. | 0.1 |
| 13 | j-. | k_u | 0.09 | 39 | &-a | r_? | 0.18 | 56 | .-n | ._v | 0.1 |
| 14 | d-t | n_# | 0.11 | 40 | a-5 | r_J | 0.27 | 57 | &-u | J_v | 0.3 |
| 15 | 1-0 | #_l | 0.2 | 40 | J-. | a_0 | 0.52 | 57 | .-0 | v_l | 0.04 |
| 16 | E-& | #_l | 0.19 | 40 | 0-. | J_n | 0.07 | 57 | l-n | ._I | 0.23 |
| 17 | .-r | 0_t | 0.03 | 40 | .-i | n_0 | 0.13 | 57 | I-1 | l_n | 0.28 |
| 17 | z-Z | i_0 | 0.38 | 41 | I-i | #_n | 0.1 | 57 | n-l | I_# | 0.31 |
| 18 | h-. | #_O | 0.07 | 41 | n-. | I_t | 0.1 | 58 | t-. | E_s | 0.07 |
| 18 | O-0 | w_r | 0.25 | 42 | I-E | #_f | 0.21 | 58 | s-z | t_b | 0.07 |
| 19 | O-0 | w_r | 0.25 | 42 | f-v | I_0 | 0.17 | 59 | h-m | #_& | 0.38 |
| 20 | O-5 | k_z | 0.26 | 42 | d-n | 0_I | 0.38 | 60 | .-m | #_i | 0.14 |
| 20 | z-s | O_# | 0.07 | 42 | I-E | d_z | 0.21 | 61 | I-E | m_n | 0.21 |
| 21 | v-b | #_E | 0.18 | 42 | z-s | I_0 | 0.07 | 62 | .-m | #_. | 0.14 |
| 21 | r-l | E_I | 0.11 | 43 | h-. | #_i | 0.07 | 62 | .-0 | ._r | 0.04 |
| 21 | l-. | k_5 | 0.08 | 43 | w-v | i_I | 0.08 | 62 | z-s | 5_# | 0.07 |
| 22 | i-I | b_n | 0.15 | 44 | E-& | f_l | 0.19 | 63 | v-z | 4_0 | 0.52 |
| 23 | z-s | 3_t | 0.07 | 45 | s-f | #_E | 0.27 | 64 | O-& | n_? | 0.27 |
| 23 | .-r | 0_0 | 0.03 | 45 | E-i | s_k | 0.28 | 65 | .-k | I_. | 0.1 |
| 24 | j-b | #_a | 0.66 | 46 | .-l | f_7 | 0.06 | 65 | .-0 | ._. | 0.04 |
| 25 | .-r | b_i | 0.03 | 47 | .-0 | n_. | 0.04 | 65 | .-l | ._# | 0.06 |

| | | | |
|---|---|---|---|
| 66 | a-i | n_n | 0.29 |
| 66 | n-. | a_# | 0.1 |
| 67 | m-n | #_I | 0.14 |
| 68 | d-n | #_^ | 0.38 |
| 69 | 5-a | #_l | 0.25 |
| 69 | l-. | 5_d | 0.08 |
| 70 | r-0 | p_0 | 1 |
| 70 | 0-. | r_t | 1 |
| 71 | 0-O | #_r | 0.27 |
| 71 | 4-I | r_n | 0.28 |
| 72 | a-& | p_s | 0.23 |
| 73 | 1-0 | n_l | 0.2 |
| 74 | .-p | #_. | 0.16 |
| 74 | .-l | ._. | 0.06 |
| 74 | .-0 | ._t | 0.04 |
| 75 | .-p | #_. | 0.16 |
| 75 | .-0 | ._l | 0.04 |
| 75 | ?-t | 1_I | 0.17 |
| 75 | I-. | ?_d | 0.11 |
| 75 | d-. | I_# | 0.09 |
| 76 | .-t | s_0 | 0.07 |
| 76 | k-t | 0_j | 0.16 |
| 77 | .-j | p_^ | 0.1 |
| 77 | ^-u | ._b | 0.28 |
| 77 | l-. | b_I | 0.08 |
| 78 | k-p | #_j | 0.24 |
| 79 | .-k | #_. | 0.1 |
| 79 | .-w | ._4 | 0.11 |
| 80 | s-k | #_. | 0.27 |
| 80 | .-w | s_I | 0.11 |
| 81 | .-k | #_w | 0.1 |
| 82 | p-r | #_7 | 0.66 |
| 83 | d-r | #_I | 0.44 |
| 84 | n-m | 1_d | 0.11 |
| 85 | E-I | r_d | 0.2 |
| 86 | i-1 | r_l | 0.3 |
| 87 | 5-u | r_d | 0.27 |
| 88 | I-. | u_n | 0.11 |
| 89 | s-S | #_O | 0.09 |
| 90 | p-. | s_I | 0.24 |
| 90 | .-I | n_s | 0.1 |
| 91 | S-s | #_. | 0.17 |
| 91 | .-n | S_4 | 0.1 |
| 92 | 0-. | #_s | 0.07 |
| 92 | t-d | r_I | 0.09 |
| 93 | .-s | #_2 | 0.08 |
| 94 | 0-. | S_n | 0.07 |
| 94 | .-7 | n_. | 1 |
| 94 | .-r | ._. | 0.03 |
| 94 | .-I | ._# | 0.1 |
| 95 | T-t | #_9 | 0.18 |
| 95 | z-s | r_# | 0.07 |
| 96 | E-I | t_n | 0.2 |
| 97 | T-t | #_O | 0.18 |
| 97 | t-r | O_S | 0.34 |
| 97 | S-C | t_i | 0.19 |
| 97 | i-u | S_w | 0.3 |
| 97 | w-. | i_0 | 0.13 |
| 97 | z-s | 0_# | 0.07 |
| 98 | 2-8 | t_r | 0.3 |
| 99 | .-r | t_a | 0.03 |
| 100 | b-. | #_^ | 0.21 |
| 101 | r-v | #_& | 0.44 |
| 102 | w-v | #_E | 0.08 |
| 102 | E-& | w_s | 0.19 |
| 103 | d-t | s_# | 0.11 |
| 104 | w-v | #_1 | 0.08 |
| 104 | I-i | r_0 | 0.1 |
| 105 | w-v | #_I | 0.08 |
| 105 | z-s | 0_# | 0.07 |
| 106 | l-v | #_5 | 0.44 |
| 107 | a-^ | v_l | 0.26 |
| 107 | .-r | 0_# | 0.03 |
| 108 | d-v | #_1 | 0.44 |
| 109 | 9-i | w_r | 0.3 |
| 110 | s-r | #_p | 0.66 |
| 110 | p-. | s_& | 0.24 |
| 112 | O-a | n_? | 0.24 |
| 112 | ?-t | O_I | 0.17 |
| 112 | I-i | ?_# | 0.1 |
| 113 | .-l | 5_. | 0.06 |
| 113 | .-d | ._b | 0.11 |
| 113 | 5-3 | b_z | 0.29 |
| 114 | .-i | d_0 | 0.13 |
| 114 | .-n | 0_p | 0.1 |
| 115 | t-k | s_5 | 0.14 |
| 116 | 5-& | p_s | 0.29 |
| 116 | 0-& | m_n | 0.23 |
| 117 | .-0 | k_r | 0.04 |
| 117 | I-i | t_# | 0.1 |
| 118 | s-S | r_0 | 0.09 |
| 118 | 0-i | s_r | 0.3 |
| 119 | 1-0 | #_m | 0.2 |
| 119 | .-i | b_0 | 0.13 |
| 119 | N-n | 0_# | 0.14 |
| 120 | .-r | a_D | 0.03 |
| 121 | f-. | I_T | 0.44 |
| 121 | T-t | f_# | 0.18 |
| 122 | D-j | n_0 | 1 |
| 122 | 0-u | D_w | 0.26 |
| 122 | I-E | w_n | 0.21 |
| 123 | .-n | 0_t | 0.1 |
| 124 | 0-I | 1_n | 0.01 |
| 124 | n-N | 0_# | 0.19 |
| 125 | n-r | #_1 | 0.31 |
| 126 | t-d | &_# | 0.09 |
| 127 | 0-I | l_n | 0.01 |
| 127 | n-. | 0_t | 0.1 |
| 128 | r-w | #_2 | 0.14 |
| 130 | 4-1 | m_0 | 0.27 |
| 130 | 0-. | 4_n | 0.07 |
| 130 | 4-1 | n_z | 0.27 |
| 131 | .-l | b_1 | 0.06 |
| 132 | l-d | #_I | 0.44 |
| 133 | .-E | #_s | 0.38 |
| 134 | .-r | a_# | 0.03 |
| 135 | I-i | #_C | 0.1 |
| 136 | r-. | a_m | 0.04 |
| 136 | r-. | 0_# | 0.04 |
| 137 | r-l | 0_u | 0.11 |
| 138 | p-f | m_# | 0.23 |
| 139 | 4-0 | #_? | 0.28 |
| 139 | ?-t | 4_I | 0.17 |
| 139 | I-i | ?_d | 0.1 |
| 140 | a-5 | g_s | 0.27 |
| 141 | ^-a | w_n | 0.21 |
| 142 | h-. | t_5 | 0.07 |
| 143 | a-u | g_n | 0.29 |
| 144 | 4-3 | r_d | 0.29 |
| 145 | 2-u | b_t | 0.29 |
| 146 | l-n | 0_5 | 0.23 |
| 147 | 1-0 | #_w | 0.2 |
| 147 | w-v | 1_a | 0.08 |
| 147 | a-O | w_n | 0.25 |
| 148 | g-b | #_0 | 0.44 |

| | | | |
|---|---|---|---|
| 148 | m-g | 0_O | 0.66 |
| 149 | h-w | #_2 | 0.38 |
| 150 | t-p | #_I | 0.18 |
| 151 | d-. | #_r | 0.09 |
| 152 | T-j | #_& | 1 |
| 153 | h-j | #_E | 0.44 |
| 154 | T-z | #_I | 0.66 |
| 155 | d-b | &_0 | 0.21 |
| 156 | 0-4 | #_k | 0.28 |
| 156 | 9-0 | k_r | 0.29 |
| 157 | m-. | #_& | 0.19 |
| 157 | t-k | &_r | 0.14 |
| 158 | .-k | &_l | 0.1 |
| 158 | l-r | ._I | 0.13 |
| 159 | h-. | #_& | 0.07 |
| 160 | h-. | #_E | 0.07 |
| 160 | E-4 | h_l | 0.26 |
| 161 | 0-9 | t_r | 0.29 |
| 161 | 4-0 | n_t | 0.28 |
| 162 | 1-& | #_m | 0.22 |
| 162 | &-0 | n_s | 0.24 |
| 163 | 0-5 | t_# | 0.23 |
| 164 | r-. | a_s | 0.04 |
| 165 | O-a | #_r | 0.24 |
| 165 | 0-. | r_g | 0.07 |
| 166 | h-. | #_O | 0.07 |
| 166 | O-a | h_r | 0.24 |
| 167 | k-p | s_I | 0.24 |
| 167 | I-0 | k_n | 0 |
| 168 | g-. | #_r | 0.38 |
| 168 | r-. | g_& | 0.04 |
| 169 | E-& | #_k | 0.19 |
| 170 | .-r | 0_# | 0.03 |
| 171 | 4-a | n_J | 0.29 |
| 171 | J-Z | 4_# | 0.31 |
| 172 | ^-0 | g_l | 0.27 |
| 173 | I-0 | b_n | 0 |
| 173 | E-& | n_n | 0.19 |
| 173 | I-0 | n_# | 0 |
| 174 | 9-a | b_r | 0.29 |
| 175 | 4-0 | g_n | 0.28 |
| 176 | &-E | b_k | 0.2 |
| 177 | I-i | g_n | 0.1 |
| 178 | .-0 | b_r | 0.04 |
| 179 | 9-E | b_r | 0.29 |
| 180 | .-t | I_# | 0.07 |
| 181 | 1-0 | m_. | 0.2 |
| 181 | .-r | 1_# | 0.03 |
| 182 | O-5 | b_r | 0.26 |
| 182 | r-. | O_n | 0.04 |
| 183 | h-. | d_E | 0.07 |
| 184 | a-9 | b_r | 0.29 |
| 185 | T-n | r_I | 1 |
| 186 | a-& | k_r | 0.23 |
| 186 | O-0 | r_t | 0.25 |
| 187 | a-O | k_r | 0.25 |
| 187 | r-. | a_k | 0.04 |
| 188 | h-. | t_O | 0.07 |
| 189 | i-7 | C_r | 0.29 |
| 190 | a-7 | C_r | 0.29 |
| 190 | I-0 | m_N | 0 |
| 190 | N-n | I_# | 0.14 |
| 191 | C-S | #_& | 0.15 |
| 191 | ?-d | n_0 | 0.12 |
| 191 | k-. | 0_l | 0.18 |
| 192 | .-l | 0_r | 0.06 |
| 193 | k-C | #_a | 0.38 |
| 194 | S-C | #_5 | 0.19 |
| 194 | 5-2 | S_d | 0.29 |
| 195 | S-C | #_^ | 0.19 |
| 195 | v-b | ^_# | 0.18 |
| 196 | ^-a | k_m | 0.21 |
| 197 | d-v | n_0 | 0.44 |
| 197 | n-r | 0_s | 0.31 |
| 198 | h-k | #_2 | 0.38 |
| 199 | .-r | k_& | 0.03 |
| 200 | l-r | k_& | 0.13 |
| 201 | .-r | k_i | 0.03 |
| 202 | i-I | r_m | 0.15 |
| 202 | I-0 | m_n | 0 |
| 202 | O-0 | n_l | 0.25 |
| 203 | O-^ | k_r | 0.28 |
| 203 | r-. | O_J | 0.04 |
| 204 | p-b | m_0 | 0.14 |
| 205 | a-& | d_l | 0.23 |
| 205 | r-. | 0_z | 0.04 |
| 205 | z-s | r_# | 0.07 |
| 206 | ^-& | d_n | 0.27 |
| 207 | b-d | #_i | 0.38 |
| 208 | w-d | #_E | 1 |
| 209 | r-d | #_I | 0.29 |
| 210 | D-d | #_I | 0.05 |
| 210 | s-S | I_I | 0.09 |
| 211 | 1-& | v_n | 0.22 |
| 212 | 0-& | m_n | 0.23 |
| 212 | n-. | 0_t | 0.1 |
| 213 | .-r | d_u | 0.03 |
| 213 | t-d | I_# | 0.09 |
| 214 | I-0 | n_T | 0 |
| 215 | t-k | s_# | 0.14 |
| 216 | D-d | #_0 | 0.05 |
| 216 | 0-I | D_b | 0.01 |
| 216 | U-0 | b_k | 0.28 |
| 217 | k-g | i_w | 0.1 |
| 217 | w-. | k_0 | 0.13 |
| 218 | h-. | #_6 | 0.07 |
| 219 | w-. | #_i | 0.13 |
| 220 | j-. | #_u | 0.09 |
| 220 | u-i | j_s | 0.3 |
| 220 | .-r | 0_# | 0.03 |
| 221 | I-E | #_t | 0.21 |
| 221 | t-. | I_s | 0.07 |
| 221 | s-S | t_0 | 0.09 |
| 221 | N-n | a_# | 0.14 |
| 222 | k-t | s_0 | 0.16 |
| 222 | 0-I | k_. | 0.01 |
| 222 | .-k | 0_# | 0.1 |
| 223 | 0-i | #_j | 0.24 |
| 223 | j-. | 0_O | 0.09 |
| 223 | O-0 | j_n | 0.25 |
| 224 | 9-E | d_r | 0.29 |
| 224 | r-. | 9_m | 0.04 |
| 225 | g-t | 0_r | 0.66 |
| 225 | r-. | g_& | 0.04 |
| 225 | m-f | &_# | 0.44 |
| 226 | J-g | r_# | 0.66 |
| 227 | .-0 | k_l | 0.04 |
| 228 | I-E | #_f | 0.21 |
| 229 | .-f | #_4 | 0.27 |
| 230 | a-& | f_r | 0.23 |
| 230 | r-. | a_m | 0.04 |
| 230 | N-n | I_# | 0.14 |
| 231 | I-1 | l_n | 0.28 |
| 232 | I-. | n_S | 0.11 |
| 232 | S-C | I_# | 0.19 |

| | | | |
|---|---|---|---|
| 233 | T-f | #_I | 0.24 |
| 234 | .-j | f_O | 0.1 |
| 235 | r-l | f_E | 0.11 |
| 236 | 9-5 | l_r | 0.3 |
| 236 | r-. | 9_t | 0.04 |
| 237 | 0-. | f_r | 0.07 |
| 237 | r-. | 0_5 | 0.04 |
| 238 | 2-a | f_n | 0.27 |
| 238 | d-t | n_# | 0.11 |
| 239 | d-. | n_z | 0.09 |
| 239 | i-I | z_# | 0.15 |
| 240 | r-. | g_2 | 0.04 |
| 241 | 0-1 | t_l | 0.29 |
| 242 | t-b | a_# | 0.44 |
| 243 | a-I | g_? | 0.28 |
| 243 | ?-t | a_0 | 0.17 |
| 243 | 0-a | ?_. | 0.24 |
| 243 | .-r | 0_# | 0.03 |
| 244 | z-C | l_# | 1 |
| 245 | f-p | l_# | 0.21 |
| 246 | E-4 | h_l | 0.26 |
| 247 | E-4 | h_l | 0.26 |
| 248 | .-h | #_& | 0.08 |
| 249 | .-h | #_a | 0.08 |
| 249 | a-& | ._m | 0.23 |
| 250 | .-r | a_m | 0.03 |
| 251 | t-? | r_. | 0.21 |
| 251 | .-0 | t_b | 0.04 |
| 251 | .-s | i_t | 0.08 |
| 252 | .-l | E_m | 0.06 |
| 253 | k-h | #_O | 0.34 |
| 254 | 2-O | h_. | 0.3 |
| 254 | .-r | 2_s | 0.03 |
| 255 | I-i | 1_n | 0.1 |
| 256 | 4-1 | #_k | 0.27 |
| 256 | O-a | k_r | 0.24 |
| 256 | r-. | O_n | 0.04 |
| 257 | h-. | #_1 | 0.07 |
| 258 | 1-I | #_m | 0.28 |
| 258 | m-g | 1_g | 0.66 |
| 258 | g-w | m_a | 1 |
| 259 | I-E | s_s | 0.21 |
| 260 | d-t | a_# | 0.11 |
| 261 | E-0 | k_t | 0.23 |
| 262 | C-J | #_i | 0.18 |
| 263 | ^-E | J_s | 0.29 |
| 264 | r-J | #_I | 0.38 |
| 264 | k-g | I_S | 0.1 |
| 264 | S-s | k_O | 0.17 |
| 265 | ^-a | J_g | 0.21 |
| 266 | z-s | u_# | 0.07 |
| 267 | I-. | l_p | 0.11 |
| 267 | r-. | 0_# | 0.04 |
| 268 | .-0 | g_r | 0.04 |
| 269 | u-I | b_t | 0.29 |
| 270 | &-I | k_n | 0.28 |
| 271 | s-S | r_# | 0.09 |
| 272 | &-I | k_C | 0.28 |
| 273 | E-& | l_? | 0.19 |
| 274 | r-. | 0_# | 0.04 |
| 275 | C-J | E_0 | 0.18 |
| 276 | s-k | 0_I | 0.27 |
| 276 | I-O | s_. | 0.3 |
| 276 | .-n | I_# | 0.1 |
| 277 | t-. | E_s | 0.07 |
| 278 | U-I | l_k | 0.29 |
| 278 | k-g | U_w | 0.1 |
| 278 | w-. | k_0 | 0.13 |
| 279 | 2-0 | m_s | 0.29 |
| 280 | w-l | #_I | 0.44 |
| 281 | 9-0 | k_r | 0.29 |
| 281 | r-. | 9_s | 0.04 |
| 281 | .-t | s_# | 0.07 |
| 282 | s-l | #_a | 0.66 |
| 283 | .-n | g_0 | 0.1 |
| 284 | .-m | #_& | 0.14 |
| 285 | r-l | 0_I | 0.11 |
| 286 | ^-a | w_n | 0.21 |
| 286 | .-0 | n_# | 0.04 |
| 287 | ^-a | m_. | 0.21 |
| 287 | .-r | ^_m | 0.03 |
| 287 | O-0 | m_t | 0.25 |
| 288 | ^-& | m_s | 0.27 |
| 288 | r-. | 0_d | 0.04 |
| 289 | d-m | #_4 | 0.66 |
| 290 | s-z | I_0 | 0.07 |
| 291 | 0-5 | m_m | 0.23 |
| 291 | 5-0 | ?_. | 0.25 |
| 291 | .-m | 5_# | 0.14 |
| 292 | .-0 | n_s | 0.04 |
| 292 | 0-7 | t_r | 0.29 |
| 293 | &-a | m_n | 0.18 |
| 293 | n-N | &_g | 0.19 |
| 294 | ^-u | m_s | 0.28 |
| 295 | ?-t | r_I | 0.17 |
| 295 | I-a | ?_. | 0.28 |
| 295 | .-r | I_f | 0.03 |
| 296 | ^-a | m_s | 0.21 |
| 296 | s-T | ^_# | 0.11 |
| 297 | .-l | ^_C | 0.06 |
| 298 | w-z | ^_I | 1 |
| 298 | I-0 | w_l | 0 |
| 299 | I-. | u_t | 0.11 |
| 300 | &-I | n_n | 0.28 |
| 301 | 5-a | #_z | 0.25 |
| 301 | z-s | 5_0 | 0.07 |
| 301 | a-0 | l_t | 0.26 |
| 302 | 1-3 | #_l | 0.28 |
| 303 | &-a | #_m | 0.18 |
| 303 | j-. | m_u | 0.09 |
| 303 | u-. | j_l | 1 |
| 304 | d-n | a_0 | 0.38 |
| 304 | w-m | 0_a | 1 |
| 304 | a-& | w_n | 0.23 |
| 304 | n-? | a_0 | 1 |
| 304 | .-0 | i_# | 0.04 |
| 305 | h-. | #_5 | 0.07 |
| 305 | 1-0 | p_l | 0.2 |
| 306 | p-. | #_O | 0.24 |
| 306 | g-J | r_I | 0.44 |
| 307 | E-0 | v_r | 0.23 |
| 309 | 4-I | r_J | 0.28 |
| 310 | I-0 | t_l | 0 |
| 311 | s-T | I_# | 0.11 |
| 312 | 4-1 | l_0 | 0.27 |
| 313 | f-p | #_0 | 0.21 |
| 313 | 0-a | f_r | 0.24 |
| 313 | r-. | 0_s | 0.04 |
| 313 | ^-0 | s_m | 0.27 |
| 314 | ^-a | s_m | 0.21 |
| 314 | b-. | m_0 | 0.21 |
| 315 | z-S | I_m | 0.31 |
| 315 | E-0 | m_n | 0.23 |
| 316 | .-0 | 1_r | 0.04 |
| 316 | s-. | 0_# | 0.1 |

| | | | |
|---|---|---|---|
| 317 | .-w | k_a | 0.11 |
| 318 | .-k | #_w | 0.1 |
| 318 | ^-a | w_n | 0.21 |
| 318 | &-0 | d_m | 0.24 |
| 319 | h-. | r_& | 0.07 |
| 319 | &-4 | h_p | 0.27 |
| 320 | I-i | r_p | 0.1 |
| 321 | k-g | N_0 | 0.1 |
| 322 | I-i | r_f | 0.1 |
| 322 | 9-0 | f_r | 0.29 |
| 323 | d-l | i_I | 0.34 |
| 324 | .-j | f_0 | 0.1 |
| 324 | 0-U | ._r | 0.29 |
| 324 | r-J | 0_i | 0.38 |
| 325 | v-b | I_0 | 0.18 |
| 325 | .-d | l_r | 0.11 |
| 326 | .-0 | k_S | 0.04 |
| 326 | O-4 | S_# | 0.29 |
| 327 | S-s | ^_t | 0.17 |
| 328 | 5-0 | s_f | 0.25 |
| 328 | .-I | r_# | 0.1 |
| 329 | ^-a | s_m | 0.21 |
| 330 | .-s | #_k | 0.08 |
| 330 | .-r | k_O | 0.03 |
| 331 | t-k | s_r | 0.14 |
| 332 | i-0 | d_m | 0.26 |
| 332 | E-0 | m_n | 0.23 |
| 333 | 4-E | s_m | 0.28 |
| 333 | b-. | m_0 | 0.21 |
| 334 | t-n | 0_7 | 0.34 |
| 335 | .-0 | n_t | 0.04 |
| 335 | O-0 | t_r | 0.25 |
| 336 | i-. | S_& | 0.29 |
| 337 | i-I | S_E | 0.15 |
| 337 | E-. | i_v | 1 |
| 338 | s-S | #_5 | 0.09 |
| 338 | a-0 | f_r | 0.26 |
| 339 | .-t | r_# | 0.07 |
| 340 | a-O | S_. | 0.25 |
| 340 | .-r | a_t | 0.03 |
| 341 | 5-a | S_. | 0.25 |
| 341 | .-t | 5_g | 0.07 |
| 342 | .-I | s_m | 0.1 |
| 342 | 1-0 | m_l | 0.2 |
| 342 | .-i | l_# | 0.13 |
| 343 | d-t | l_# | 0.11 |
| 344 | D-d | 5_0 | 0.05 |
| 345 | O-a | s_D | 0.24 |
| 345 | D-d | O_0 | 0.05 |
| 346 | .-w | s_a | 0.11 |
| 346 | I-4 | r_# | 0.28 |
| 347 | E-a | s_l | 0.27 |
| 347 | l-. | E_f | 0.08 |
| 348 | .-s | #_. | 0.08 |
| 348 | .-p | ._E | 0.16 |
| 348 | s-. | E_k | 0.1 |
| 348 | .-j | k_0 | 0.1 |
| 349 | 5-9 | t_. | 0.29 |
| 349 | .-r | 5_n | 0.03 |
| 351 | w-. | m_^ | 0.13 |
| 351 | ^-0 | w_n | 0.27 |
| 352 | 0-i | t_b | 0.24 |
| 353 | d-t | n_. | 0.11 |
| 353 | .-r | d_0 | 0.03 |
| 354 | D-t | #_7 | 0.18 |
| 354 | 7-9 | D_r | 0.29 |
| 355 | I-. | 5_t | 0.11 |
| 356 | T-t | #_I | 0.18 |
| 357 | r-. | a_g | 0.04 |
| 358 | ^-a | t_g | 0.21 |
| 359 | d-t | #_a | 0.11 |
| 360 | ^-a | t_n | 0.21 |
| 360 | u-0 | S_r | 0.3 |
| 361 | O-0 | 1_l | 0.25 |
| 362 | .-t | #_. | 0.07 |
| 362 | .-r | ._2 | 0.03 |
| 363 | J-C | r_I | 0.2 |
| 364 | u-U | j_r | 0.29 |
| 365 | w-v | #_i | 0.08 |
| 366 | w-v | #_E | 0.08 |
| 366 | E-& | w_n | 0.19 |
| 367 | m-v | #_0 | 1 |
| 368 | l-v | #_& | 0.44 |
| 369 | f-v | #_i | 0.17 |
| 370 | .-v | #_. | 0.34 |
| 370 | .-0 | ._. | 0.04 |
| 370 | .-r | ._m | 0.03 |
| 371 | J-Z | r_0 | 0.31 |
| 372 | w-v | #_1 | 0.08 |
| 373 | w-v | #_a | 0.08 |
| 373 | t-d | a_k | 0.09 |
| 374 | t-. | 4_f | 0.07 |
| 375 | h-w | #_I | 0.38 |
| 376 | E-i | w_n | 0.28 |
| 377 | n-w | #_I | 0.52 |
| 378 | E-I | w_n | 0.2 |
| 379 | I-E | r_C | 0.21 |
| 379 | 0-I | C_r | 0.01 |
| 379 | r-. | 0_d | 0.04 |
| 380 | ?-D | 1_I | 1 |
| 381 | h-j | #_i | 0.44 |
| 381 | i-. | h_O | 0.29 |
| 381 | O-a | i_t | 0.24 |
| 382 | u-a | j_r | 0.29 |
| 382 | a-. | r_n | 0.66 |
| 383 | h-j | #_E | 0.44 |
| 384 | d-k | 5_0 | 0.34 |
| 385 | s-z | #_E | 0.07 |
| 386 | s-z | #_I | 0.07 |
| 387 | s-z | #_^ | 0.07 |
| 387 | ^-a | s_m | 0.21 |
| 388 | s-z | #_2 | 0.07 |
| 390 | 0-O | #_l | 0.27 |
| 390 | .-r | 0_# | 0.03 |
| 404 | k-t | #_r | 0.16 |
| 405 | s-. | b_0 | 0.1 |
| 406 | .-d | &_m | 0.11 |
| 406 | j-. | m_u | 0.09 |
| 406 | u-0 | j_n | 0.28 |
| 407 | I-0 | #_l | 0 |
| 408 | a-5 | m_n | 0.27 |
| 408 | E-0 | j_t | 0.23 |
| 408 | t-. | E_# | 0.07 |
| 409 | 0-& | #_n | 0.23 |
| 410 | .-k | s_E | 0.1 |
| 411 | s-. | #_0 | 0.1 |
| 411 | v-. | r_l | 0.17 |
| 412 | .-p | s_# | 0.16 |
| 413 | s-b | 0_u | 0.66 |
| 414 | .-r | 0_E | 0.03 |
| 414 | E-I | ._t | 0.2 |
| 415 | ^-O | b_b | 0.28 |
| 416 | d-b | #_4 | 0.21 |
| 417 | p-b | #_i | 0.14 |
| 418 | N-n | i_z | 0.14 |

| | | | |
|---|---|---|---|
| 419 | a-i | b_r | 0.3 |
| 420 | ^-I | b_g | 0.27 |
| 421 | 1-a | l_n | 0.23 |
| 422 | E-4 | r_d | 0.26 |
| 423 | 0-a | r_z | 0.24 |
| 423 | z-Z | 0_6 | 0.38 |
| 423 | i-0 | z_r | 0.29 |
| 424 | d-. | E_T | 0.09 |
| 425 | d-b | #_r | 0.21 |
| 426 | s-. | E_t | 0.1 |
| 426 | t-T | s_s | 0.2 |
| 427 | k-g | 5_0 | 0.1 |
| 428 | l-r | b_u | 0.13 |
| 429 | n-N | ^_d | 0.19 |
| 429 | d-g | n_0 | 0.44 |
| 430 | I-U | b_C | 0.3 |
| 431 | m-k | #_& | 0.66 |
| 432 | t-p | r_# | 0.18 |
| 433 | p-m | I_i | 0.66 |
| 433 | d-? | i_. | 0.18 |
| 433 | .-0 | d_. | 0.04 |
| 433 | .-r | ._# | 0.03 |
| 434 | .-m | I_p | 0.14 |
| 435 | &-I | C_n | 0.28 |
| 435 | .-t | n_s | 0.07 |
| 436 | r-l | k_2 | 0.11 |
| 437 | d-. | l_# | 0.09 |
| 438 | d-t | l_# | 0.11 |
| 439 | m-n | a_p | 0.14 |
| 439 | p-d | m_l | 1 |
| 439 | l-. | p_I | 0.08 |
| 440 | .-0 | k_. | 0.04 |
| 440 | .-n | ._w | 0.1 |
| 440 | w-J | ._E | 0.66 |
| 441 | h-k | #_5 | 0.38 |
| 442 | C-k | #_a | 0.52 |
| 442 | a-O | C_r | 0.25 |
| 442 | g-s | r_0 | 1 |
| 442 | 0-I | g_z | 0.01 |
| 442 | z-t | 0_# | 1 |
| 443 | s-t | r_a | 0.44 |
| 443 | a-E | s_Z | 0.29 |
| 444 | g-k | #_r | 0.11 |
| 445 | k-? | I_I | 0.66 |
| 445 | t-k | I_# | 0.14 |

| | | | |
|---|---|---|---|
| 446 | C-k | #_. | 0.52 |
| 446 | .-r | C_u | 0.03 |
| 447 | O-^ | r_l | 0.28 |
| 448 | d-b | ^_# | 0.21 |
| 449 | J-z | I_# | 1 |
| 450 | O-9 | k_r | 0.29 |
| 451 | D-d | #_0 | 0.05 |
| 451 | 0-I | D_l | 0.01 |
| 452 | D-d | #_0 | 0.05 |
| 452 | 0-I | D_p | 0.01 |
| 453 | E-I | d_n | 0.2 |
| 454 | I-1 | d_n | 0.28 |
| 454 | r-. | 0_s | 0.04 |
| 455 | u-5 | d_# | 0.27 |
| 456 | l-d | #_a | 0.44 |
| 457 | t-d | #_2 | 0.09 |
| 458 | .-r | d_& | 0.03 |
| 459 | O-u | r_l | 0.29 |
| 460 | n-N | ^_# | 0.19 |
| 461 | 3-9 | #_. | 0.3 |
| 461 | .-r | 3_l | 0.03 |
| 462 | j-. | #_6 | 0.09 |
| 463 | h-. | #_i | 0.07 |
| 464 | r-l | I_E | 0.11 |
| 465 | k-f | 0_w | 0.44 |
| 465 | w-. | k_0 | 0.13 |
| 466 | &-E | #_m | 0.2 |
| 467 | 0-i | #_p | 0.24 |
| 467 | t-. | s_0 | 0.07 |
| 468 | I-E | #_C | 0.21 |
| 469 | D-T | i_0 | 0.23 |
| 470 | .-r | 6_# | 0.03 |
| 471 | p-f | #_a | 0.23 |
| 472 | &-O | f_s | 0.29 |
| 473 | D-v | r_0 | 0.38 |
| 474 | w-f | #_1 | 0.34 |
| 475 | .-n | I_S | 0.1 |
| 475 | S-C | ._# | 0.19 |
| 476 | g-S | I_j | 1 |
| 476 | j-. | g_0 | 0.09 |
| 477 | v-f | #_. | 0.14 |
| 477 | .-l | v_1 | 0.06 |
| 478 | h-f | #_5 | 0.52 |
| 479 | 4-3 | f_b | 0.29 |
| 480 | T-t | r_# | 0.18 |

| | | | |
|---|---|---|---|
| 481 | O-2 | f_l | 0.29 |
| 482 | u-2 | f_l | 0.29 |
| 483 | E-a | r_n | 0.27 |
| 484 | .-f | #_j | 0.27 |
| 485 | .-m | 4_# | 0.14 |
| 486 | 0-3 | g_l | 0.3 |
| 487 | f-g | #_u | 0.52 |
| 488 | d-g | #_. | 0.44 |
| 488 | .-l | d_& | 0.06 |
| 489 | .-g | #_r | 0.18 |
| 489 | r-l | ._u | 0.11 |
| 490 | r-. | a_d | 0.04 |
| 491 | w-g | #_9 | 0.66 |
| 491 | 9-O | w_r | 0.29 |
| 492 | 4-1 | r_p | 0.27 |
| 493 | k-g | #_. | 0.1 |
| 493 | .-r | k_3 | 0.03 |
| 494 | 5-2 | r_s | 0.29 |
| 495 | k-h | #_4 | 0.34 |
| 496 | 4-& | h_s | 0.27 |
| 496 | s-S | 4_t | 0.09 |
| 496 | t-. | s_# | 0.07 |
| 497 | S-h | #_i | 0.66 |
| 498 | 7-E | h_r | 0.28 |
| 498 | 1-I | r_s | 0.28 |
| 498 | i-I | s_# | 0.15 |
| 499 | l-h | #_I | 1 |
| 500 | 5-O | h_. | 0.28 |
| 500 | .-r | 5_z | 0.03 |
| 500 | z-s | ._I | 0.07 |
| 501 | E-^ | h_l | 0.26 |
| 502 | n-r | 0_# | 0.31 |
| 503 | I-9 | h_. | 0.3 |
| 503 | .-r | I_? | 0.03 |
| 504 | b-. | #_1 | 0.21 |
| 505 | m-. | #_I | 0.19 |
| 506 | .-I | #_. | 0.1 |
| 506 | .-m | ._p | 0.14 |
| 507 | .-r | 0_d | 0.03 |
| 507 | .-t | k_# | 0.07 |
| 508 | .-I | #_. | 0.1 |
| 508 | .-n | ._v | 0.1 |
| 509 | w-. | #_9 | 0.13 |
| 510 | h-. | k_E | 0.07 |
| 510 | E-0 | h_l | 0.23 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 511 | r-J | #_& | 0.38 | 550 | f-p | #_u | 0.21 | 581 | .-k | S_r | 0.1 |
| 512 | t-J | #_I | 1 | 551 | 0-u | p_r | 0.26 | 582 | u-a | r_d | 0.3 |
| 513 | b-J | #_^ | 1 | 551 | I-i | r_# | 0.1 | 583 | C-S | #_E | 0.15 |
| 514 | d-t | l_# | 0.11 | 552 | a-E | r_p | 0.29 | 584 | a-5 | S_t | 0.27 |
| 515 | s-. | #_k | 0.1 | 553 | n-m | 0_# | 0.11 | 585 | J-s | #_I | 1 |
| 516 | ^-0 | d_m | 0.27 | 554 | g-p | #_^ | 0.66 | 586 | T-s | #_I | 0.25 |
| 517 | p-k | #_I | 0.23 | 555 | b-p | #_^ | 0.16 | 587 | 0-a | ?_r | 0.24 |
| 518 | &-E | J_s | 0.2 | 556 | .-r | 1_. | 0.03 | 588 | S-s | #_. | 0.17 |
| 519 | &-I | l_m | 0.28 | 556 | .-5 | ._m | 0.24 | 588 | .-n | S_4 | 0.1 |
| 520 | .-d | n_0 | 0.11 | 557 | .-w | k_4 | 0.11 | 589 | 7-O | n_r | 0.29 |
| 521 | t-p | s_# | 0.18 | 558 | b-k | #_. | 0.52 | 590 | .-s | #_. | 0.08 |
| 522 | l-. | 0_m | 0.08 | 558 | .-w | b_& | 0.11 | 590 | .-p | ._1 | 0.16 |
| 523 | E-a | l_J | 0.27 | 558 | &-O | ._r | 0.29 | 591 | a-O | p_. | 0.25 |
| 524 | m-l | #_u | 0.38 | 559 | .-k | #_w | 0.1 | 591 | .-r | a_t | 0.03 |
| 525 | a-^ | l_s | 0.26 | 560 | i-7 | w_r | 0.29 | 592 | .-s | #_k | 0.08 |
| 526 | t-k | I_4 | 0.14 | 560 | .-I | r_# | 0.1 | 592 | .-w | k_I | 0.11 |
| 527 | h-. | n_u | 0.07 | 561 | .-k | #_w | 0.1 | 593 | ^-a | t_k | 0.21 |
| 527 | u-0 | h_p | 0.28 | 562 | .-k | #_w | 0.1 | 594 | .-s | #_w | 0.08 |
| 528 | 1-I | m_l | 0.28 | 563 | g-k | #_. | 0.11 | 595 | O-& | t_. | 0.27 |
| 529 | &-I | m_r | 0.28 | 563 | .-w | g_I | 0.11 | 595 | .-l | O_k | 0.06 |
| 529 | I-a | r_J | 0.28 | 564 | h-r | #_& | 0.66 | 596 | m-t | #_& | 1 |
| 529 | J-Z | I_# | 0.31 | 565 | .-r | #_. | 0.03 | 597 | p-t | #_4 | 0.31 |
| 530 | I-. | 5_n | 0.11 | 565 | .-& | ._. | 0.52 | 598 | 1-i | t_m | 0.28 |
| 531 | .-t | 5_s | 0.07 | 565 | .-k | ._m | 0.1 | 599 | 0-. | t_i | 0.07 |
| 532 | &-a | m_n | 0.18 | 565 | ^-O | n_f | 0.28 | 600 | s-z | n_# | 0.07 |
| 533 | .-k | s_# | 0.1 | 566 | T-f | i_# | 0.24 | 601 | I-O | r_l | 0.3 |
| 534 | I-^ | m_s | 0.29 | 567 | v-z | E_0 | 0.52 | 602 | r-t | #_1 | 0.52 |
| 535 | .-r | a_k | 0.03 | 568 | p-b | I_a | 0.14 | 603 | n-t | #_1 | 0.66 |
| 536 | z-s | i_# | 0.07 | 569 | 5-a | b_t | 0.25 | 603 | n-m | 1_# | 0.11 |
| 537 | l-n | #_1 | 0.23 | 570 | b-r | #_U | 0.66 | 604 | n-m | 0_# | 0.11 |
| 538 | t-d | 5_# | 0.09 | 571 | t-. | #_r | 0.07 | 605 | b-t | #_^ | 0.38 |
| 539 | w-n | #_^ | 0.52 | 572 | &-^ | r_p | 0.28 | 606 | k-f | 1_u | 0.44 |
| 540 | h-n | #_O | 0.52 | 573 | 5-u | r_z | 0.27 | 607 | r-. | #_^ | 0.04 |
| 541 | 0-& | v_n | 0.23 | 574 | I-^ | r_s | 0.29 | 607 | .-r | 0_# | 0.03 |
| 542 | 7-& | p_r | 0.26 | 575 | &-E | #_s | 0.2 | 608 | O-u | j_r | 0.29 |
| 542 | t-k | 0_I | 0.14 | 576 | .-I | l_v | 0.1 | 609 | .-t | I_# | 0.07 |
| 542 | I-i | t_t | 0.1 | 577 | .-0 | s_r | 0.04 | 610 | b-v | #_4 | 0.44 |
| 543 | .-t | 0_s | 0.07 | 578 | t-k | s_a | 0.14 | 611 | b-v | #_1 | 0.44 |
| 544 | n-. | 0_t | 0.1 | 579 | .-s | #_h | 0.08 | 611 | .-t | k_# | 0.07 |
| 545 | ^-O | p_n | 0.28 | 579 | h-k | ._a | 0.38 | 612 | s-. | #_p | 0.1 |
| 546 | 5-E | p_s | 0.29 | 579 | 0-I | l_t | 0.01 | 612 | p-v | s_1 | 0.66 |
| 547 | .-r | f_4 | 0.03 | 580 | S-s | #_. | 0.17 | 613 | 0-. | 1_1 | 0.07 |
| 548 | n-. | 0_t | 0.1 | 580 | .-k | S_9 | 0.1 | 613 | I-. | l_n | 0.11 |
| 548 | i-I | t_# | 0.15 | 580 | 9-7 | ._r | 0.3 | 613 | n-. | I_z | 0.1 |
| 549 | w-p | #_I | 1 | 581 | S-s | #_. | 0.17 | 614 | w-v | #_I | 0.08 |

| | | | |
|---|---|---|---|
| 615 | f-v | #_a | 0.17 |
| 616 | f-v | #_O | 0.17 |
| 616 | O-5 | f_l | 0.26 |
| 617 | 9-O | w_r | 0.29 |
| 618 | t-h | #_8 | 1 |
| 618 | u-O | t_r | 0.29 |
| 619 | l-w | #_1 | 0.25 |
| 620 | v-w | #_1 | 1 |
| 621 | w-r | #_I | 0.21 |
| 622 | s-T | u_# | 0.11 |
| 623 | s-z | #_i | 0.07 |
| 623 | i-I | s_n | 0.15 |
| 631 | .-s | #_t | 0.08 |
| 632 | 0-E | t_r | 0.26 |
| 632 | r-l | 0_# | 0.11 |
| 633 | .-h | 0_E | 0.08 |
| 633 | v-f | E_0 | 0.14 |
| 634 | h-. | p_I | 0.07 |
| 635 | h-. | #_I | 0.07 |
| 635 | I-& | h_m | 0.26 |
| 636 | .-O | g_r | 0.52 |
| 636 | I-0 | r_# | 0 |
| 637 | ^-a | b_. | 0.21 |
| 637 | .-r | ^_? | 0.03 |
| 638 | .-l | b_& | 0.06 |
| 639 | I-1 | d_l | 0.28 |
| 639 | 1-4 | l_? | 0.26 |
| 640 | .-d | #_r | 0.11 |
| 641 | &-^ | r_g | 0.28 |
| 642 | n-. | #_E | 0.1 |
| 642 | s-m | E_0 | 1 |
| 642 | 0-I | s_s | 0.01 |
| 643 | u-3 | f_l | 0.3 |
| 644 | T-f | #_r | 0.24 |
| 645 | .-g | #_& | 0.18 |
| 646 | r-. | 0_z | 0.04 |
| 646 | z-s | r_# | 0.07 |
| 647 | k-. | #_0 | 0.18 |
| 647 | 0-I | k_n | 0.01 |
| 648 | g-t | I_4 | 0.66 |
| 649 | .-z | E_b | 0.25 |
| 649 | .-i | b_0 | 0.13 |
| 649 | i-. | n_z | 0.29 |
| 649 | z-. | i_# | 0.21 |
| 650 | O-5 | #_f | 0.26 |
| 650 | f-v | O_0 | 0.17 |
| 651 | r-w | k_4 | 0.14 |
| 651 | I-1 | z_# | 0.28 |
| 652 | .-k | #_. | 0.1 |
| 652 | .-w | ._i | 0.11 |
| 653 | d-k | #_. | 0.34 |
| 653 | .-w | d_6 | 0.11 |
| 654 | 5-u | r_m | 0.27 |
| 654 | n-. | &_? | 0.1 |
| 655 | h-t | #_a | 0.44 |
| 656 | s-S | n_E | 0.09 |
| 657 | z-D | 5_d | 0.44 |
| 658 | E-I | m_n | 0.2 |
| 659 | E-^ | m_s | 0.26 |
| 660 | b-p | #_O | 0.16 |
| 661 | ^-& | r_f | 0.27 |
| 662 | 4-i | r_p | 0.27 |
| 663 | l-n | E_0 | 0.23 |
| 663 | ?-d | 4_I | 0.12 |
| 664 | ^-E | S_t | 0.29 |
| 664 | t-d | ^_# | 0.09 |
| 665 | .-J | n_d | 0.34 |
| 666 | ^-O | f_. | 0.28 |
| 666 | .-r | ^_k | 0.03 |
| 667 | I-i | k_l | 0.1 |
| 668 | .-0 | #_k | 0.04 |
| 669 | d-. | #_I | 0.09 |
| 669 | I-0 | d_n | 0 |
| 669 | n-b | I_a | 0.52 |
| 670 | E-4 | #_g | 0.26 |
| 670 | g-k | E_z | 0.11 |
| 670 | z-s | g_# | 0.07 |
| 671 | E-O | #_l | 0.3 |
| 672 | E-& | #_l | 0.19 |
| 672 | 0-I | l_v | 0.01 |
| 672 | v-g | 0_4 | 0.66 |
| 673 | &-4 | #_n | 0.27 |
| 674 | &-4 | #_N | 0.27 |
| 674 | N-n | &_g | 0.14 |
| 674 | g-J | N_0 | 0.44 |
| 675 | l-. | #_& | 0.08 |
| 676 | m-. | #_& | 0.19 |
| 677 | n-b | #_i | 0.52 |
| 678 | r-l | b_E | 0.11 |
| 679 | p-b | #_l | 0.14 |
| 679 | l-r | p_4 | 0.13 |
| 680 | J-b | #_^ | 0.66 |
| 681 | U-^ | b_S | 0.28 |
| 681 | S-s | U_# | 0.17 |
| 682 | r-b | #_1 | 0.66 |
| 683 | h-. | S_u | 0.07 |
| 684 | l-. | O_z | 0.08 |
| 685 | v-. | l_z | 0.17 |
| 686 | 7-a | C_r | 0.29 |
| 687 | k-C | #_4 | 0.38 |
| 687 | 4-& | k_. | 0.27 |
| 687 | .-s | 4_a | 0.08 |
| 687 | a-i | ._s | 0.29 |
| 687 | s-. | a_# | 0.1 |
| 688 | m-C | #_& | 1 |
| 689 | .-l | k_I | 0.06 |
| 690 | g-k | #_5 | 0.11 |
| 691 | 5-a | k_m | 0.25 |
| 692 | .-k | #_I | 0.1 |
| 692 | I-0 | ._n | 0 |
| 693 | z-s | I_# | 0.07 |
| 694 | .-r | O_z | 0.03 |
| 695 | O-a | k_r | 0.24 |
| 695 | .-0 | r_n | 0.04 |
| 696 | t-k | #_. | 0.14 |
| 696 | .-r | t_l | 0.03 |
| 697 | .-r | k_O | 0.03 |
| 697 | O-^ | ._l | 0.28 |
| 697 | z-. | r_# | 0.21 |
| 698 | .-k | #_j | 0.1 |
| 698 | .-i | n_0 | 0.13 |
| 699 | 9-1 | s_r | 0.29 |
| 699 | r-. | 9_k | 0.04 |
| 700 | .-d | #_I | 0.11 |
| 701 | .-d | #_I | 0.11 |
| 701 | I-i | ._n | 0.1 |
| 701 | n-. | I_v | 0.1 |
| 701 | v-t | n_E | 0.66 |
| 702 | .-d | #_2 | 0.11 |
| 703 | t-d | #_^ | 0.09 |
| 704 | w-. | #_i | 0.13 |
| 705 | I-E | #_l | 0.21 |
| 706 | h-. | #_E | 0.07 |
| 707 | i-E | #_l | 0.29 |
| 707 | E-0 | l_k | 0.23 |

| | | | |
|---|---|---|---|
| 707 | t-. | k_r | 0.07 |
| 707 | r-. | t_0 | 0.04 |
| 707 | 0-. | r_k | 0.07 |
| 707 | k-. | 0_j | 0.18 |
| 708 | m-. | #_E | 0.19 |
| 709 | .-i | #_m | 0.13 |
| 710 | 0-E | #_h | 0.26 |
| 710 | h-n | 0_& | 0.52 |
| 711 | b-. | #_1 | 0.21 |
| 711 | 1-E | b_. | 0.28 |
| 711 | .-n | 1_s | 0.1 |
| 711 | .-l | k_. | 0.06 |
| 711 | .-I | ._. | 0.1 |
| 711 | .-k | ._0 | 0.1 |
| 712 | i-E | #_r | 0.29 |
| 712 | .-r | 0_# | 0.03 |
| 713 | s-. | #_0 | 0.1 |
| 713 | 0-E | s_k | 0.26 |
| 714 | t-d | 4_# | 0.09 |
| 715 | O-a | f_r | 0.24 |
| 716 | .-n | E_D | 0.1 |
| 716 | D-d | ._0 | 0.05 |
| 717 | D-? | E_0 | 0.23 |
| 718 | .-l | f_& | 0.06 |
| 719 | 9-a | f_r | 0.29 |
| 719 | r-. | 9_D | 0.04 |
| 719 | D-d | r_0 | 0.05 |
| 720 | J-f | #_. | 1 |
| 720 | .-j | J_U | 0.1 |
| 721 | 9-& | g_r | 0.29 |
| 721 | r-. | 9_l | 0.04 |
| 722 | &-E | J_m | 0.2 |
| 723 | I-. | n_t | 0.11 |
| 723 | t-? | I_0 | 0.21 |
| 723 | 0-1 | t_l | 0.29 |
| 724 | r-g | #_I | 0.52 |
| 725 | b-g | #_l | 0.31 |
| 726 | .-r | g_4 | 0.03 |
| 727 | k-g | #_l | 0.1 |
| 727 | l-r | k_& | 0.13 |
| 728 | k-g | #_r | 0.1 |
| 729 | t-d | l_# | 0.09 |
| 730 | f-h | #_7 | 0.38 |
| 731 | .-m | l_# | 0.14 |
| 732 | 2-5 | h_s | 0.29 |
| 732 | s-z | 2_# | 0.07 |
| 733 | n-h | #_5 | 0.52 |
| 734 | d-l | I_0 | 0.34 |
| 735 | r-s | 0_# | 0.44 |
| 736 | &-^ | h_N | 0.28 |
| 737 | l-. | f_0 | 0.08 |
| 737 | .-r | 0_m | 0.03 |
| 738 | C-J | #_E | 0.18 |
| 739 | l-J | #_I | 1 |
| 740 | 1-a | n_t | 0.23 |
| 741 | v-b | &_. | 0.18 |
| 741 | .-r | v_0 | 0.03 |
| 741 | t-d | 0_O | 0.09 |
| 741 | I-. | r_z | 0.11 |
| 742 | b-. | #_r | 0.21 |
| 742 | r-l | b_i | 0.11 |
| 743 | v-n | I_I | 1 |
| 743 | I-0 | v_N | 0 |
| 743 | N-n | I_# | 0.14 |
| 744 | w-l | #_u | 0.44 |
| 745 | .-r | O_# | 0.03 |
| 746 | n-m | #_4 | 0.11 |
| 746 | m-n | 4_# | 0.14 |
| 747 | z-s | n_# | 0.07 |
| 748 | &-i | m_? | 0.3 |
| 749 | .-0 | n_. | 0.04 |
| 749 | .-r | ._I | 0.03 |
| 749 | I-E | ._t | 0.21 |
| 750 | n-l | a_0 | 0.31 |
| 750 | 0-I | n_k | 0.01 |
| 750 | .-j | k_0 | 0.1 |
| 750 | 0-u | ._l | 0.26 |
| 751 | ^-5 | m_n | 0.28 |
| 751 | I-4 | n_# | 0.28 |
| 752 | m-n | ^_I | 0.14 |
| 753 | 0-5 | m_n | 0.23 |
| 753 | ?-g | a_0 | 0.66 |
| 753 | n-m | 0_I | 0.11 |
| 754 | E-I | n_s | 0.2 |
| 754 | t-. | s_# | 0.07 |
| 755 | g-n | #_& | 1 |
| 756 | b-n | #_& | 0.66 |
| 758 | .-n | #_1 | 0.1 |
| 758 | 1-a | ._d | 0.23 |
| 758 | d-n | 1_E | 0.38 |
| 759 | 0-5 | #_d | 0.23 |
| 759 | O-0 | d_r | 0.25 |
| 760 | .-h | p_0 | 0.08 |
| 760 | 0-5 | ._l | 0.23 |
| 761 | r-p | #_I | 0.52 |
| 761 | I-0 | r_. | 0 |
| 761 | .-r | I_z | 0.03 |
| 761 | z-s | ._I | 0.07 |
| 762 | .-0 | i_n | 0.04 |
| 763 | .-0 | k_. | 0.04 |
| 763 | .-r | ._0 | 0.03 |
| 764 | 0-5 | l_r | 0.23 |
| 764 | r-. | 0_# | 0.04 |
| 765 | k-. | I_C | 0.18 |
| 766 | s-p | #_I | 1 |
| 767 | f-p | #_. | 0.21 |
| 767 | .-l | f_4 | 0.06 |
| 768 | .-p | #_. | 0.16 |
| 768 | .-l | ._& | 0.06 |
| 768 | l-. | &_? | 0.08 |
| 769 | .-l | p_a | 0.06 |
| 770 | &-u | p_d | 0.3 |
| 771 | I-. | 5_. | 0.11 |
| 771 | .-l | I_t | 0.06 |
| 772 | z-s | u_# | 0.07 |
| 773 | s-r | #_i | 0.66 |
| 774 | z-s | i_0 | 0.07 |
| 774 | n-s | 0_# | 1 |
| 775 | C-J | I_I | 0.18 |
| 775 | .-d | I_z | 0.11 |
| 776 | u-5 | r_m | 0.27 |
| 777 | E-^ | r_n | 0.26 |
| 778 | .-k | s_& | 0.1 |
| 779 | t-k | s_a | 0.14 |
| 780 | p-k | s_. | 0.23 |
| 780 | .-r | p_i | 0.03 |
| 781 | .-n | E_d | 0.1 |
| 781 | d-? | ._0 | 0.18 |
| 782 | .-s | #_i | 0.08 |
| 783 | a-& | S_k | 0.23 |
| 784 | I-& | v_n | 0.26 |
| 785 | .-r | S_I | 0.03 |
| 786 | .-s | #_r | 0.08 |
| 786 | r-l | ._^ | 0.11 |
| 787 | n-m | s_& | 0.11 |

| | | | |
|---|---|---|---|
| 788 | .-I | 4_n | 0.1 |
| 788 | n-N | ._# | 0.19 |
| 789 | .-s | #_t | 0.08 |
| 789 | t-p | ._r | 0.18 |
| 790 | a-7 | t_r | 0.29 |
| 791 | .-s | #_k | 0.08 |
| 791 | k-t | ._I | 0.16 |
| 792 | m-k | r_# | 0.66 |
| 793 | E-2 | r_s | 0.3 |
| 794 | k-t | s_1 | 0.16 |
| 795 | t-d | i_# | 0.09 |
| 796 | E-I | s_l | 0.2 |
| 797 | O-a | t_l | 0.24 |
| 797 | ^-U | m_d | 0.29 |
| 798 | d-T | #_r | 0.66 |
| 798 | r-. | d_O | 0.04 |
| 799 | 4-1 | t_l | 0.27 |
| 800 | m-n | 1_# | 0.14 |
| 801 | 1-4 | r_0 | 0.26 |
| 801 | 0-. | 1_l | 0.07 |
| 802 | .-r | t_E | 0.03 |
| 802 | t-d | n_# | 0.09 |
| 803 | .-v | #_E | 0.34 |
| 803 | E-& | ._m | 0.19 |
| 804 | f-v | #_O | 0.17 |
| 805 | w-v | #_I | 0.08 |
| 805 | I-E | w_s | 0.21 |
| 806 | w-v | #_4 | 0.08 |
| 806 | 4-i | w_1 | 0.27 |
| 807 | r-v | #_I | 0.44 |
| 807 | k-t | I_u | 0.16 |
| 808 | p-. | #_1 | 0.24 |
| 808 | l-w | p_4 | 0.25 |
| 809 | h-w | #_E | 0.38 |
| 809 | m-d | E_l | 0.44 |
| 810 | .-w | #_i | 0.11 |
| 811 | p-k | s_0 | 0.23 |
| 812 | a-O | h_r | 0.25 |
| 812 | 0-. | r_s | 0.07 |
| 813 | z-f | 1_# | 1 |
| 814 | .-r | d_5 | 0.03 |
| 815 | l-j | #_9 | 0.25 |
| 816 | d-b | r_0 | 0.21 |
| 819 | E-U | p_l | 0.3 |
| 819 | .-k | l_0 | 0.1 |
| 819 | 0-5 | ._# | 0.23 |
| 820 | h-. | #_i | 0.07 |
| 820 | .-I | i_d | 0.1 |
| 821 | 1-& | #_g | 0.22 |
| 821 | a-I | g_t | 0.28 |
| 822 | 0-& | #_n | 0.23 |
| 822 | I-0 | d_l | 0 |
| 823 | E-0 | g_s | 0.23 |
| 824 | 1-a | #_. | 0.23 |
| 824 | .-r | 1_m | 0.03 |
| 824 | ?-d | E_I | 0.12 |
| 824 | I-0 | ?_n | 0 |
| 825 | 0-& | #_t | 0.23 |
| 825 | &-0 | l_s | 0.24 |
| 826 | h-. | #_& | 0.07 |
| 826 | &-1 | h_v | 0.29 |
| 826 | I-0 | v_n | 0 |
| 827 | .-0 | 4_l | 0.04 |
| 828 | &-a | b_N | 0.18 |
| 828 | D-g | N_. | 0.44 |
| 828 | .-l | D_0 | 0.06 |
| 828 | I-E | d_S | 0.21 |
| 829 | .-0 | k_r | 0.04 |
| 830 | .-l | p_4 | 0.06 |
| 831 | C-S | #_a | 0.15 |
| 831 | a-& | C_m | 0.23 |
| 831 | .-l | p_I | 0.06 |
| 831 | I-4 | ._N | 0.28 |
| 831 | N-n | I_# | 0.14 |
| 832 | .-i | k_& | 0.13 |
| 832 | &-a | ._n | 0.18 |
| 832 | j-. | t_E | 0.09 |
| 832 | E-i | j_# | 0.28 |
| 833 | s-z | E_t | 0.07 |
| 833 | t-d | s_I | 0.09 |
| 833 | I-0 | t_n | 0 |
| 834 | &-^ | d_n | 0.28 |
| 835 | &-E | #_s | 0.2 |
| 835 | 4-0 | s_k | 0.28 |
| 836 | a-& | h_n | 0.23 |
| 836 | n-l | a_0 | 0.31 |
| 836 | l-j | u_u | 0.25 |
| 836 | u-0 | 1_# | 0.28 |
| 837 | d-v | r_0 | 0.44 |
| 837 | .-d | r_# | 0.11 |
| 838 | E-0 | m_n | 0.23 |
| 838 | I-4 | n_# | 0.28 |
| 839 | 0-5 | k_r | 0.23 |
| 839 | r-d | 0_a | 0.29 |
| 839 | a-& | r_n | 0.23 |
| 839 | n-k | a_# | 0.66 |
| 840 | U-u | k_d | 0.29 |
| 840 | j-. | d_u | 0.09 |
| 841 | I-a | w_k | 0.28 |
| 841 | k-t | I_# | 0.16 |
| 842 | z-s | &_I | 0.07 |
| 843 | 4-E | m_k | 0.28 |
| 843 | r-. | 0_# | 0.04 |
| 844 | U-^ | t_k | 0.28 |
| 845 | .-5 | r_# | 0.24 |
| 846 | 4-9 | n_. | 0.3 |
| 846 | .-r | 4_C | 0.03 |
| 847 | &-a | p_. | 0.18 |
| 847 | .-r | &_s | 0.03 |
| 847 | s-T | ._I | 0.11 |
| 847 | I-0 | s_n | 0 |
| 848 | k-p | #_a | 0.24 |
| 848 | a-^ | k_n | 0.26 |
| 849 | d-. | l_# | 0.09 |
| 850 | s-T | #_I | 0.11 |
| 851 | 0-I | t_b | 0.01 |
| 852 | O-U | j_r | 0.29 |
| 852 | .-0 | r_. | 0.04 |
| 852 | .-g | ._w | 0.18 |
| 854 | 9-2 | f_r | 0.3 |
| 854 | r-. | 9_s | 0.04 |
| 855 | .-h | #_a | 0.08 |
| 855 | w-v | r_0 | 0.08 |
| 856 | C-J | #_3 | 0.18 |
| 857 | .-0 | k_l | 0.04 |
| 857 | u-8 | l_# | 0.29 |
| 858 | .-I | #_r | 0.1 |
| 858 | E-a | r_k | 0.27 |
| 859 | u-0 | n_. | 0.28 |
| 859 | .-w | u_I | 0.11 |
| 859 | I-0 | ._n | 0 |
| 860 | &-0 | k_r | 0.24 |
| 860 | r-. | 0_# | 0.04 |
| 861 | 9-O | #_r | 0.29 |
| 862 | t-. | #_r | 0.07 |

| | | | |
|---|---|---|---|
| 863 | &-4 | l_m | 0.27 |
| 864 | ^-& | #_? | 0.27 |
| 864 | ?-d | ^_0 | 0.12 |
| 865 | ?-d | &_I | 0.12 |
| 865 | .-t | k_# | 0.07 |
| 866 | r-. | a_m | 0.04 |
| 867 | .-I | b_j | 0.1 |
| 867 | j-v | ._0 | 1 |
| 868 | t-? | n_i | 0.21 |
| 868 | i-I | t_k | 0.15 |
| 869 | ^-O | #_D | 0.28 |
| 869 | D-T | ^_0 | 0.23 |
| 870 | i-0 | b_z | 0.26 |
| 871 | f-b | #_i | 0.66 |
| 872 | v-b | #_E | 0.18 |
| 872 | r-l | E_I | 0.11 |
| 873 | .-b | #_w | 0.21 |
| 873 | w-l | ._l | 0.44 |
| 874 | &-a | b_? | 0.18 |
| 875 | .-b | #_9 | 0.21 |
| 875 | 9-u | ._r | 0.3 |
| 876 | D-d | i_0 | 0.05 |
| 876 | .-r | 0_# | 0.03 |
| 877 | .-k | I_s | 0.1 |
| 878 | g-k | #_l | 0.11 |
| 879 | 5-a | k_l | 0.25 |
| 879 | l-. | 5_d | 0.08 |
| 880 | &-4 | r_S | 0.27 |
| 881 | w-r | s_9 | 0.21 |
| 881 | 9-5 | w_r | 0.3 |
| 881 | r-. | 9_d | 0.04 |
| 882 | ^-5 | r_g | 0.28 |
| 883 | b-d | #_l | 0.38 |
| 883 | l-. | b_u | 0.08 |
| 884 | h-. | #_6 | 0.07 |
| 885 | S-. | #_E | 0.52 |
| 886 | .-i | #_p | 0.13 |
| 887 | i-0 | n_k | 0.26 |
| 888 | i-E | #_r | 0.29 |
| 889 | k-f | #_& | 0.44 |
| 890 | s-. | #_p | 0.1 |
| 890 | p-f | s_i | 0.23 |
| 891 | b-f | #_I | 0.38 |
| 892 | v-f | #_1 | 0.14 |
| 893 | p-f | #_. | 0.23 |
| 893 | .-l | p_i | 0.06 |
| 894 | .-l | f_O | 0.06 |
| 895 | d-. | n_# | 0.09 |
| 896 | .-I | n_? | 0.1 |
| 896 | ?-t | ._0 | 0.17 |
| 897 | r-l | g_& | 0.11 |
| 898 | .-t | f_# | 0.07 |
| 899 | 5-^ | g_s | 0.29 |
| 900 | h-. | #_7 | 0.07 |
| 901 | a-9 | h_r | 0.29 |
| 902 | &-I | h_p | 0.28 |
| 903 | f-h | #_& | 0.38 |
| 903 | &-a | f_m | 0.18 |
| 904 | O-2 | h_r | 0.29 |
| 904 | r-. | O_s | 0.04 |
| 905 | a-9 | h_r | 0.29 |
| 906 | g-r | 0_r | 1 |
| 906 | r-v | g_0 | 0.44 |
| 907 | h-. | #_1 | 0.07 |
| 908 | d-J | #_& | 0.66 |
| 909 | .-J | #_E | 0.34 |
| 910 | O-2 | J_. | 0.29 |
| 910 | .-l | O_# | 0.06 |
| 911 | I-^ | J_N | 0.29 |
| 912 | E-^ | J_t | 0.26 |
| 913 | d-l | #_4 | 0.34 |
| 914 | 0-I | m_n | 0.01 |
| 914 | n-N | 0_# | 0.19 |
| 915 | t-? | n_I | 0.21 |
| 915 | I-0 | t_l | 0 |
| 916 | b-l | #_I | 0.66 |
| 917 | l-r | 0_# | 0.13 |
| 918 | b-l | #_I | 0.66 |
| 919 | a-0 | k_s | 0.26 |
| 920 | 5-O | l_0 | 0.28 |
| 920 | 0-. | 5_r | 0.07 |
| 921 | J-l | #_^ | 1 |
| 922 | n-N | I_t | 0.19 |
| 922 | t-k | n_# | 0.14 |
| 923 | 4-0 | n_z | 0.28 |
| 923 | z-s | 4_0 | 0.07 |
| 923 | 0-E | z_l | 0.26 |
| 924 | m-n | #_4 | 0.14 |
| 925 | t-p | i_# | 0.18 |
| 926 | E-I | n_t | 0.2 |
| 927 | I-0 | d_l | 0 |
| 928 | b-n | #_U | 0.66 |
| 929 | p-n | #_5 | 0.66 |
| 930 | f-n | #_^ | 1 |
| 931 | l-n | #_I | 0.23 |
| 932 | d-. | l_# | 0.09 |
| 933 | l-. | p_E | 0.08 |
| 933 | s-z | E_0 | 0.07 |
| 934 | p-f | #_E | 0.23 |
| 935 | r-l | p_I | 0.11 |
| 936 | u-5 | p_r | 0.3 |
| 936 | r-. | 8_# | 0.04 |
| 937 | l-w | k_I | 0.25 |
| 938 | p-b | &_I | 0.14 |
| 938 | d-t | I_# | 0.11 |
| 939 | E-& | r_k | 0.19 |
| 939 | 0-u | k_n | 0.26 |
| 940 | g-. | #_r | 0.38 |
| 940 | t-d | 4_# | 0.09 |
| 941 | i-4 | r_l | 0.29 |
| 942 | n-r | #_6 | 0.31 |
| 943 | .-r | #_. | 0.03 |
| 943 | .-I | ._m | 0.1 |
| 944 | d-b | u_# | 0.21 |
| 945 | t-. | 1_# | 0.07 |
| 946 | E-4 | s_l | 0.26 |
| 947 | ^-& | s_m | 0.27 |
| 948 | t-k | s_i | 0.14 |
| 949 | .-s | #_t | 0.08 |
| 949 | t-k | ._. | 0.14 |
| 949 | .-r | t_5 | 0.03 |
| 950 | I-i | s_k | 0.1 |
| 951 | s-S | #_& | 0.09 |
| 952 | .-r | a_k | 0.03 |
| 953 | J-S | #_4 | 0.38 |
| 954 | p-k | a_# | 0.23 |
| 955 | .-s | #_. | 0.08 |
| 955 | .-I | ._. | 0.1 |
| 955 | .-n | ._s | 0.1 |
| 956 | S-s | #_. | 0.17 |
| 956 | .-n | S_O | 0.1 |
| 957 | .-j | n_I | 0.1 |
| 957 | I-0 | ._S | 0 |
| 957 | S-l | I_# | 1 |
| 958 | 4-1 | p_s | 0.27 |

| | | | |
|---|---|---|---|
| 959 | I-i | t_l | 0.1 |
| 960 | a-O | t_r | 0.25 |
| 960 | t-k | r_# | 0.14 |
| 961 | .-w | s_i | 0.11 |
| 962 | S-s | #_. | 0.17 |
| 962 | .-w | S_I | 0.11 |
| 963 | d-. | r_# | 0.09 |
| 964 | b-T | #_1 | 1 |
| 965 | t-T | #_r | 0.2 |
| 966 | T-t | #_I | 0.18 |
| 967 | k-t | #_U | 0.16 |
| 967 | U-^ | k_N | 0.28 |
| 968 | r-. | a_? | 0.04 |
| 969 | h-t | #_O | 0.44 |
| 969 | O-8 | h_r | 0.29 |
| 970 | d-t | #_. | 0.11 |
| 970 | .-r | d_& | 0.03 |
| 971 | s-. | #_t | 0.1 |
| 972 | d-t | #_r | 0.11 |
| 973 | s-t | #_w | 0.44 |
| 974 | l-v | #_& | 0.44 |
| 975 | &-E | v_s | 0.2 |
| 976 | n-v | #_1 | 0.66 |
| 977 | D-v | #_i | 0.38 |
| 977 | r-. | 0_# | 0.04 |
| 978 | w-v | #_1 | 0.08 |
| 978 | z-s | 1_# | 0.07 |
| 979 | b-v | #_2 | 0.44 |
| 980 | 0-. | r_r | 0.07 |
| 980 | r-. | 0_# | 0.04 |
| 981 | h-j | #_a | 0.44 |
| 982 | d-j | #_a | 1 |
| 987 | .-d | 5_z | 0.11 |
| 987 | z-s | ._k | 0.07 |
| 987 | ^-a | k_l | 0.21 |
| 988 | &-4 | k_n | 0.27 |
| 988 | 0-U | C_# | 0.29 |
| 989 | .-h | #_1 | 0.08 |
| 989 | ^-a | k_p | 0.21 |
| 990 | I-. | 1_n | 0.11 |
| 990 | .-r | 0_p | 0.03 |
| 991 | 0-4 | #_C | 0.28 |
| 991 | .-h | C_i | 0.08 |
| 992 | .-0 | r_t | 0.04 |
| 993 | I-0 | s_J | 0 |
| 993 | 0-I | J_n | 0.01 |
| 994 | .-d | i_# | 0.11 |
| 995 | .-m | 0_d | 0.14 |
| 996 | .-0 | b_r | 0.04 |
| 997 | 0-. | k_l | 0.07 |
| 998 | .-l | k_a | 0.06 |
| 999 | g-k | #_. | 0.11 |
| 999 | .-l | g_a | 0.06 |
| 1000 | E-^ | b_g | 0.26 |
| 1001 | 0-I | p_r | 0.01 |
| 1001 | r-. | 0_z | 0.04 |
| 1002 | p-k | i_# | 0.23 |
| 1003 | m-n | i_s | 0.14 |
| 1004 | O-4 | #_l | 0.29 |
| 1005 | k-? | r_I | 0.66 |
| 1005 | t-C | I_E | 0.38 |
| 1005 | E-5 | t_k | 0.29 |
| 1005 | t-. | k_# | 0.07 |
| 1006 | s-. | #_t | 0.1 |
| 1006 | t-b | s_I | 0.44 |
| 1007 | .-l | b_5 | 0.06 |
| 1008 | E-1 | r_d | 0.3 |
| 1009 | d-p | r_# | 0.44 |
| 1010 | s-v | n_0 | 1 |
| 1010 | v-s | r_4 | 0.66 |
| 1011 | .-k | #_r | 0.1 |
| 1011 | .-z | n_# | 0.25 |
| 1012 | p-t | ^_# | 0.31 |
| 1013 | z-s | 4_# | 0.07 |
| 1014 | D-d | #_0 | 0.05 |
| 1014 | j-. | n_0 | 0.09 |
| 1014 | 0-i | j_. | 0.3 |
| 1014 | .-r | 0_# | 0.03 |
| 1015 | f-d | #_a | 1 |
| 1016 | E-i | #_r | 0.29 |
| 1016 | r-. | 0_# | 0.04 |
| 1017 | n-f | #_& | 0.66 |
| 1017 | &-9 | n_. | 0.29 |
| 1017 | .-r | &_C | 0.03 |
| 1017 | C-t | ._0 | 0.38 |
| 1017 | 0-. | C_r | 0.07 |
| 1017 | r-. | 0_0 | 0.04 |
| 1017 | 0-I | r_l | 0.01 |
| 1018 | .-l | f_4 | 0.06 |
| 1019 | r-l | f_u | 0.11 |
| 1020 | E-& | g_s | 0.19 |
| 1021 | b-g | #_r | 0.31 |
| 1022 | l-g | #_^ | 1 |
| 1023 | n-m | &_d | 0.11 |
| 1023 | d-. | n_z | 0.09 |
| 1024 | b-h | #_9 | 1 |
| 1025 | m-h | #_^ | 0.52 |
| 1026 | &-I | #_n | 0.28 |
| 1026 | I-0 | ?_. | 0 |
| 1026 | .-r | I_l | 0.03 |
| 1026 | .-0 | p_. | 0.04 |
| 1026 | .-r | ._# | 0.03 |
| 1027 | d-l | #_4 | 0.34 |
| 1028 | J-Z | i_0 | 0.31 |
| 1029 | O-u | l_r | 0.29 |
| 1029 | r-. | O_d | 0.04 |
| 1030 | t-. | 1_s | 0.07 |
| 1031 | 9-3 | l_r | 0.29 |
| 1031 | r-. | 9_n | 0.04 |
| 1032 | .-l | #_I | 0.06 |
| 1033 | I-0 | m_l | 0 |
| 1033 | .-s | 0_# | 0.08 |
| 1034 | .-v | 8_. | 0.34 |
| 1034 | .-0 | ._r | 0.04 |
| 1035 | d-. | n_z | 0.09 |
| 1036 | m-n | #_4 | 0.14 |
| 1037 | .-d | u_z | 0.11 |
| 1038 | J-. | #_5 | 0.52 |
| 1039 | r-p | #_4 | 0.52 |
| 1040 | ?-k | r_I | 0.66 |
| 1041 | l-r | 0_. | 0.13 |
| 1041 | .-z | l_# | 0.25 |
| 1042 | .-p | #_r | 0.16 |
| 1043 | k-p | #_^ | 0.24 |
| 1044 | ^-u | r_b | 0.28 |
| 1045 | U-^ | r_m | 0.28 |
| 1046 | n-. | 0_I | 0.1 |
| 1046 | I-. | n_N | 0.11 |
| 1046 | N-n | I_z | 0.14 |
| 1047 | p-v | r_0 | 0.66 |
| 1048 | t-s | #_r | 0.34 |
| 1048 | r-n | t_4 | 0.29 |
| 1049 | t-n | s_I | 0.34 |
| 1050 | r-. | O_k | 0.04 |
| 1051 | .-s | #_. | 0.08 |

| | | |
|---|---|---|
| 1051 .-t | ._r | 0.07 |
| 1052 4-i | t_l | 0.27 |
| 1053 k-. | N_# | 0.18 |
| 1054 f-t | #_u | 1 |
| 1055 .-t | f_. | 0.07 |
| 1055 .-s | ._# | 0.08 |
| 1056 &-^ | #_. | 0.28 |
| 1056 .-N | &_k | 0.38 |
| 1057 t-. | #_9 | 0.07 |
| 1058 E-& | v_s | 0.19 |
| 1059 l-v | #_I | 0.44 |
| 1060 9-I | v_r | 0.29 |
| 1060 r-. | 9_J | 0.04 |
| 1061 k-d | r_# | 0.52 |
| 1062 b-w | #_9 | 0.66 |
| 1063 f-j | #_u | 1 |
| 1064 0-1 | ?_# | 0.29 |
| 1065 w-v | i_i | 0.08 |
| 1066 h-. | l_i | 0.07 |
| 1067 .-t | k_# | 0.07 |
| 1068 &-4 | #_n | 0.27 |
| 1069 9-7 | #_r | 0.3 |
| 1070 .-d | n_z | 0.11 |
| 1071 i-4 | b_t | 0.28 |
| 1072 t-d | i_# | 0.09 |
| 1073 .-r | i_# | 0.03 |
| 1074 9-1 | g_r | 0.29 |
| 1074 r-. | 9_l | 0.04 |
| 1075 .-b | #_E | 0.21 |
| 1076 m-b | #_1 | 0.44 |
| 1077 t-s | k_# | 0.34 |
| 1078 r-l | b_i | 0.11 |
| 1079 5-2 | l_z | 0.29 |
| 1080 p-b | #_r | 0.14 |
| 1081 p-b | #_U | 0.14 |
| 1082 g-k | #_a | 0.11 |
| 1082 a-O | g_? | 0.25 |
| 1083 .-0 | k_w | 0.04 |
| 1083 w-v | ._O | 0.08 |
| 1084 S-C | #_& | 0.19 |
| 1085 l-k | #_a | 0.66 |
| 1086 p-k | #_r | 0.23 |
| 1087 g-k | #_. | 0.11 |
| 1087 .-r | g_5 | 0.03 |
| 1088 .-k | #_l | 0.1 |
| 1088 l-r | ._^ | 0.13 |
| 1089 O-^ | k_l | 0.28 |
| 1090 D-d | #_0 | 0.05 |
| 1090 0-I | D_p | 0.01 |
| 1091 D-d | #_0 | 0.05 |
| 1091 0-I | D_p | 0.01 |
| 1092 k-d | #_r | 0.52 |
| 1093 l-. | #_9 | 0.08 |
| 1094 b-. | #_i | 0.21 |
| 1095 .-i | #_l | 0.13 |
| 1096 1-E | #_l | 0.28 |
| 1097 .-i | #_l | 0.13 |
| 1098 I-E | #_n | 0.21 |
| 1098 D-. | 5_z | 0.13 |
| 1099 I-E | #_n | 0.21 |
| 1099 i-2 | d_d | 0.3 |
| 1099 d-. | i_# | 0.09 |
| 1100 h-. | #_& | 0.07 |
| 1100 &-E | h_v | 0.2 |
| 1100 0-I | v_d | 0.01 |
| 1100 &-0 | d_n | 0.24 |
| 1101 .-d | l_# | 0.11 |
| 1102 .-l | f_4 | 0.06 |
| 1103 9-3 | f_r | 0.29 |
| 1103 r-. | 9_s | 0.04 |
| 1104 0-O | f_r | 0.27 |
| 1104 g-k | r_. | 0.11 |
| 1104 .-l | g_I | 0.06 |
| 1104 v-f | I_. | 0.14 |
| 1104 .-t | v_# | 0.07 |
| 1105 t-f | #_r | 0.52 |
| 1106 l-r | g_5 | 0.13 |
| 1107 b-g | #_l | 0.31 |
| 1107 l-r | b_5 | 0.13 |
| 1108 t-d | r_# | 0.09 |
| 1109 .-h | #_j | 0.08 |
| 1110 .-I | #_w | 0.1 |
| 1110 w-m | ._9 | 1 |
| 1111 h-. | #_I | 0.07 |
| 1111 O-0 | m_r | 0.25 |
| 1111 r-. | O_l | 0.04 |
| 1112 n-m | I_p | 0.11 |
| 1113 E-4 | h_l | 0.26 |
| 1114 &-I | h_b | 0.28 |
| 1115 m-n | I_& | 0.14 |
| 1115 &-a | m_k | 0.18 |
| 1115 I-4 | l_t | 0.28 |
| 1116 0-I | #_. | 0.01 |
| 1116 .-n | 0_s | 0.1 |
| 1117 0-. | J_& | 0.07 |
| 1117 v-b | &_# | 0.18 |
| 1118 C-J | #_5 | 0.18 |
| 1119 1-& | l_k | 0.22 |
| 1120 f-T | &_# | 0.44 |
| 1121 v-s | i_# | 0.66 |
| 1122 m-l | #_E | 0.38 |
| 1123 t-l | #_a | 0.38 |
| 1124 n-m | #_4 | 0.11 |
| 1125 r-n | #_i | 0.29 |
| 1126 O-0 | d_l | 0.25 |
| 1127 t-d | a_# | 0.09 |
| 1128 .-p | #_4 | 0.16 |
| 1129 b-p | #_a | 0.16 |
| 1130 &-a | p_. | 0.18 |
| 1130 .-r | &_s | 0.03 |
| 1131 0-. | #_p | 0.07 |
| 1131 a-O | p_n | 0.25 |
| 1132 j-p | #_a | 1 |
| 1133 l-p | #_^ | 1 |
| 1134 p-. | #_r | 0.24 |
| 1135 .-r | #_4 | 0.03 |
| 1136 j-. | z_0 | 0.09 |
| 1137 w-r | #_i | 0.21 |
| 1138 m-r | #_i | 0.66 |
| 1139 k-p | &_s | 0.24 |
| 1140 E-i | p_n | 0.28 |
| 1140 n-. | E_t | 0.1 |
| 1141 u-3 | r_l | 0.3 |
| 1142 5-u | r_m | 0.27 |
| 1143 S-s | #_i | 0.17 |
| 1144 T-s | #_I | 0.25 |
| 1145 .-s | #_k | 0.08 |
| 1146 t-s | #_. | 0.34 |
| 1146 .-l | t_4 | 0.06 |
| 1147 .-l | s_I | 0.06 |
| 1148 O-5 | n_r | 0.26 |
| 1148 r-. | O_# | 0.04 |
| 1149 T-s | #_. | 0.25 |
| 1149 .-t | T_I | 0.07 |
| 1150 .-r | t_4 | 0.03 |

| | | |
|---|---|---|
| 1151 .-s | #_. | 0.08 |
| 1151 .-t | ._l | 0.07 |
| 1151 l-r | ._1 | 0.13 |
| 1152 4-& | t_k | 0.27 |
| 1153 s-T | #_I | 0.11 |
| 1154 s-T | #_^ | 0.11 |
| 1155 w-. | t_I | 0.13 |
| 1156 k-t | #_r | 0.16 |
| 1157 ^-I | r_s | 0.27 |
| 1158 a-^ | #_n | 0.26 |
| 1158 D-d | n_0 | 0.05 |
| 1159 0-^ | #_n | 0.28 |
| 1159 D-d | n_. | 0.05 |
| 1159 .-j | D_0 | 0.1 |
| 1160 w-v | #_E | 0.08 |
| 1160 t-? | n_I | 0.21 |
| 1160 I-0 | t_l | 0 |
| 1161 w-v | #_E | 0.08 |
| 1161 ?-C | n_0 | 0.66 |
| 1161 .-r | 0_# | 0.03 |
| 1162 t-d | n_# | 0.09 |
| 1163 r-w | #_4 | 0.14 |
| 1164 r-w | #_E | 0.14 |
| 1165 S-w | #_1 | 1 |
| 1166 .-t | l_# | 0.07 |
| 1167 O-0 | w_r | 0.25 |
| 1168 u-. | j_r | 1 |
| 1168 r-. | 8_a | 0.04 |
| 1168 a-O | r_n | 0.25 |
| 1169 .-j | #_9 | 0.1 |
| 1170 r-j | #_a | 0.66 |
| 1170 D-d | n_0 | 0.05 |
| 1171 s-z | #_I | 0.07 |
| 1172 .-d | n_s | 0.11 |
| 1173 s-S | #_E | 0.09 |
| 1173 E-7 | s_r | 0.29 |
| 1174 r-. | f_i | 0.04 |
| 1175 T-t | #_r | 0.18 |
| 1175 5-^ | r_s | 0.29 |
| 1175 .-0 | 5_n | 0.04 |
| 1176 ?-C | a_0 | 0.66 |
| 1177 .-r | O_k | 0.03 |
| 1178 .-l | b_5 | 0.06 |
| 1179 s-J | #_I | 0.38 |
| 1180 i-I | #_. | 0.15 |
| 1180 .-n | i_v | 0.1 |
| 1181 h-. | #_5 | 0.07 |
| 1181 I-0 | p_n | 0 |
| 1182 D-z | #_0 | 0.34 |
| 1182 0-i | D_b | 0.24 |
| 1182 a-0 | r_# | 0.26 |

# Appendix E: Main Corpus of Target-Pun Pairs

The following table lists the 1182 target pun pairs selected from Sobkowiak's (1992) corpus, including their transcription (p.phon, t.phon(, idiomaticity, page number (p.) form Crosbie (1977), grammaticality (gram.) of pun (P)/target (T)/both(B), notes, language/dialect peculiarities, CLAWS tagging for pun (C P) and target (C T), a marking field that ended up not being used (x), sum cost (sum) according to the preliminary cost table, sum cost per segments (sum/phon), stress shift (e=earlier in pun than in target, l=later), and syllable number (-1=one syllable less in pun than in target, +1=one more, +2=two more).

| no. | pun | targ. | p. phon | t. phon. | idiomaticity | p. | gram. | note | dialect | C P | C T | x | sum | sum/phon. | str. | syll # |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | hence | hens | hEns | hEnz | | 110 | T | what? | | CJS | NN2 | | 0.07 | 0.0175 | | |
| 2 | neither | nether | niD0r | nED0r | coll. nether world | 158 | T | | | PNI | NN1 | R | 0.28 | 0.056 | | |
| 3 | and loaf | alone | 0nl5f | 0.l5n | idiom live by bread alone | 140 | B | | | CJS NN1 | AV0 | E+ | 0.76 | 0.152 | | |
| 4 | dun her | dinner | d^n0r | dIn0r | title man who came to dinner (Moss) | 71 | B | | | VVB PNP | NN1 | Q+ | 0.29 | 0.058 | | |
| 5 | kama | camel | kam0. | k&m0l | coll. made of camel hair | 128 | T | | | UNC | NN1 | I | 0.26 | 0.052 | | |
| 6 | kith | kiss | kIT | kIs | idiom kissing cousins | 130 | T | | | NN1 | NN1 | C+ | 0.11 | 0.036666665 | | |
| 7 | miaow | me how | mi.2 | mih2 | | 149 | T | | | ITJ | PNP AVQ | | 0.07 | 0.0175 | | |
| 8 | N | end | En. | End | coll. end man | 156 | T | see also Nero | | ZZ0 | NN1 | R | 0.09 | 0.03 | | |
| 9 | spoorious | spurious | sp.8ri0s | spjuri0s | coll. spurious claim | 217 | B | | | AJ0 | AJ0 | C | 0.38 | 0.0475 | | |
| 10 | vasted | vested | v&stId | vEstId | coll. vested interest | 243 | T | | | AJ0 | AJ0 | C | 0.19 | 0.031666666 | | |
| 11 | abdominal | abominable | 0bdamIn..l | 0b.amIn0bl | coll. abominable snowman | 5 | B | | | AJ0 | AJ0 | C | 0.39 | 0.039 | | |
| 12 | acidic | I see Dick | 0sIdIk | 1sidIk | | 7 | ne | | | AJ0 | PNP VVB NP0 | | 0.35 | 0.058333334 | e | |
| 13 | acoustic | a cue stick | 0k.ustIk | 0kjustIk | coll. cue stick | 7 | ne | | | AJ0 | AT0 NN1 NN1 | R | 0.09 | 0.01125 | | |
| 14 | adamant | Adam and | &d0m0nt | &d0m0nd | coll. Adam and Eve | 7 | ne | | | AJ0 | NP0 CJC | B | 0.11 | 0.015714286 | | |
| 15 | alike | I like | 0l1k | 1l1k | idiom I like to think so | 10 | T | adnominatio | | AJ0 | PNP VVB | I+ | 0.2 | 0.05 | | |
| 16 | alimentary | elementary | &l0mEn?0rI | El0mEn?0rI | quote elementary, my dear watson | 10 | B | what? | | AJ0 | AJ0 | Q+ | 0.19 | 0.019 | | |
| 17 | artesian | a-teasin' | 0rtiZ0n | 0.tiz0n | | 16 | T | a-Xing prefix | | AJ0 | VVG | | 0.41 | 0.058571428 | | |
| 18 | awkward | hawk ward | .Okw0rd | hOkwOrd | _def. | 20 | ne | | | AJ0 | NN1 NN1 | | 0.32 | 0.045714285 | | |
| 19 | backward | back ward | b&kw0rd | b&kwOrd | _def. | 22 | ne | | | AJ0 | NN0 NN1 | | 0.25 | 0.035714287 | | |
| 20 | bellicose | belly 'cause | bElIk5s | bElIkOz | | 28 | T | | | AJ0 | NN1 CJC | | 0.33 | 0.047142856 | l | |
| 21 | bellicose | very close | bElIk.5s | vErIkl5s | _def. | 28 | ne | | Chinese | AJ0 | AV0 AJ0 | | 0.37 | 0.04625 | | |
| 22 | benign | be nine | bIn1n | bin1n | _def. | 28 | ne | | | AJ0 | VBI CRD | | 0.15 | 0.03 | | |
| 23 | boisterous | boys to us | b3st0r0s | b3zt0.0s | | 32 | T | | | AJ0 | NN2 PRP PNP | | 0.1 | 0.0125 | | |
| 24 | bonkers | yonkers | baNk0rz | jaNk0rz | _def. | 32 | ne | | | AJ0 | NP0 | | 0.66 | 0.09428571 | | |
| 25 | brief | beef | brif | b.if | coll. beefeater | 35 | B | | | AJ0 | NN0 | R | 0.03 | 0.0075 | | |
| 26 | chary | cherry | C7rI | CErI | coll. cherry picker | 46 | B | | | AJ0 | NN1 | R | 0.29 | 0.0725 | | |
| 27 | chic | cheek | Sik | Cik | idiom tongue in cheek | 47 | T | | | AJ0 | NN1 | I+ | 0.15 | 0.05 | | |
| 28 | coined | kind | k3nd | k1nd | idiom my kinda girl | 51 | T | | | AJ0 | NN1 | I+ | 0.28 | 0.07 | | |
| 29 | comical | chemical | kamIk0l | kEmIk0l | coll. chemical combination | 52 | B | | | AJ0 | AJ0 | C | 0.27 | 0.03857143 | | |
| 30 | consecrated | concentrated | kans0.kr4tId | kans0ntr4tId | coll. concentrated lye | 54 | B | | | AJ0 | AJ0 | C | 0.24 | 0.02 | | |
| 31 | contrite | can't write | k0ntr1t | k&ntr1t | | 54 | T | | | AJ0 | VM0 NN0 VVB | | 0.24 | 0.034285713 | | |
| 32 | covert | cover | k5v9rt | k^v0r. | idiom from cover to cover | 57 | T | eye-pun | | AJ0 | NN1 | E+ | 0.64 | 0.10666667 | l | |
| 33 | curly | pearly | k9rlI | p9rlI | coll. Pearly Gates | 60 | B | | | AJ0 | AJ0 | R | 0.23 | 0.046 | | |
| 34 | curtain | certain | k9r?0n | s9r?0n | idiom a certain something | 61 | B | | | AJ0 | AJ0 | T+ | 0.27 | 0.045 | | |
| 35 | disgusting | this gusting | dIsg^stIN | DIsg^stIN | | 67 | T | no 2nd script | | AJ0 | DT0 AJ0 | | 0.05 | 0.0055555557 | | |
| 36 | dismal | decimal | dIz.m0l | dEsIm0l | _def. | 68 | B | | | AJ0 | NN1 | | 0.38 | 0.054285713 | | |
| 37 | dour | our | d20r | .20r | title Oh God, our help... | 69 | B | | | AJ0 | DPS | Q+ | 0.11 | 0.0275 | | |
| 38 | elementary | alimentary | El0mEnt0rI | &l0mEnt0rI | coll. alimentary canal | 75 | B | | | AJ0 | AJ0 | C | 0.2 | 0.02 | | |
| 39 | erotic | erratic | 0ra?Ik | 0r&?Ik | coll. erratic behavior | 78 | B | | | AJ0 | AJ0 | C | 0.18 | 0.03 | | |
| 40 | erroneous | erogenous | 0r5..ni0s | 0raJ0n.0s | coll. erotic zones | 78 | B | little diff!!?? | | AJ0 | AJ0 | C | 0.99 | 0.11 | | |
| 41 | eternal | internal | i.t9rn0l | Int9rn0l | coll. internal medicine | 79 | B | | | AJ0 | AJ0 | C | 0.2 | 0.025 | | |
| 42 | evanescent | if it isn't | Ev0nEs0nt | If0dIz0nt | idiom if it isn't my old pal | 80 | T | | | AJ0 | CJS PNP VBZ XX0 | I+ | 1.04 | 0.115555555 | | |
| 43 | evil | he will | .ivIl | hiwIl | | 80 | T | | | AJ0 | PNP VM0 | | 0.15 | 0.03 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | fallow | fellow | f&l5 | fEl5 | coll. fellow Americans | 84 | B | | | AJ0 | AJ0 | C | 0.19 | 0.0475 | | |
| 45 | fecund | second | fik0nd | sEk0nd | coll. second nature | 85 | B | | | AJ0 | ORD | C | 0.55 | 0.09166667 | | |
| 46 | flair | fair | fl7r | f.7r | title my fair lady | 88 | B | | | AJ0 | AJ0 | Q+ | 0.06 | 0.015 | | |
| 47 | fortunate | fortune | fOrC0n0t | fOrC0n.. | coll. fortune cookie | 92 | B | | | AJ0 | NN1 | R | 0.11 | 0.01375 | | +1 |
| 48 | fragrant | flagrant | fr4gr0nt | fl4gr0nt | coll. flagrant error | 92 | B | | | AJ0 | AJ0 | C | 0.13 | 0.01625 | | |
| 49 | froggy | foggy | fragI | f.agI | title A Foggy Day in L. Town (Gershwin) | 93 | B | | | AJ0 | AJ0 | Q+ | 0.03 | 0.006 | | |
| 50 | frozen | chosen | fr5z0n | C.5z0n | idiom God's chosen people | 94 | B | | | AJ0 | AJ0 | Q+ | 1.03 | 0.17166667 | | |
| 51 | fundamental | from the mantel | f.^nd0mEn?0l | fr0mD0m&n?0l | | 94 | T | what? | | AJ0 | PRP AT0 NN1 | | 0.71 | 0.059166666 | | |
| 52 | hard | heart | hard | hart | proverb home is where the heart is | 107 | T | what? | | AJ0 | NN1 | S+ | 0.09 | 0.0225 | | |
| 53 | hollow | hello | hal5 | hEl5 | | 112 | ne | | | AJ0 | ITJ | | 0.27 | 0.0675 | | |
| 54 | impotent | important | Imp0.t0nt | ImpOr?0nt | idiom important moment in history | 118 | B | | | AJ0 | AJ0 | I+ | 0.46 | 0.05111111 | e | |
| 55 | insufferable | inseparable | Ins^f0r0b0l | InsEp0r0b0l | coll. inseperable friends | 120 | B | | | AJ0 | AJ0 | C | 0.49 | 0.044545453 | | |
| 56 | invisible | visible | InvIs0b0l | ..vIs0b0l | idiom no visible means of support | 121 | B | # of syll. diff. | | AJ0 | AJ0 | I+ | 0.2 | 0.022222223 | | +1 |
| 57 | juvenile | javelin | Juv0n1l | J&v.lIn | _def. | 127 | T | # of syll. diff. | | AJ0 | NN1 | | 1.16 | 0.16571428 | | |
| 58 | lesbian | let's be an | lE.zbi0n | lEtsbi0n | | 136 | T | | | AJ0 | VVB PNP VBI AT0 | | 0.14 | 0.0175 | | |
| 59 | marrowing | harrowing | m&r5wIN | h&r5wIN | coll. a harrowing experience | 147 | B | | | AJ0 | AJ0 | C | 0.38 | 0.054285713 | | |
| 60 | meager | eager | mig0r | .ig0r | proverb an early winter makes ... ? | 148 | B | | | AJ0 | AJ0 | S+ | 0.14 | 0.028 | | |
| 61 | menstrual | minstrel | mEnstr0l | mInstr0l | title lay of the last minstrel (Walter Scott) | 148 | T | | | AJ0 | NN1 | Q+ | 0.21 | 0.02625 | | +1 |
| 62 | morose | rose | m0r5s | ..r5z | coll. rose-colored glasses | 153 | T | # of syllables different | | AJ0 | NN1 | C | 0.25 | 0.05 | | +1 |
| 63 | nasal | naval | n4z0l | n4v0l | | 157 | B | | | AJ0 | AJ0 | | 0.52 | 0.104 | | |
| 64 | natty | naughty | n&?I | nO?I | coll. naughty boy | 157 | B | | | AJ0 | AJ0 | C | 0.27 | 0.0675 | | |
| 65 | nautical | naughty | nO?Ik0l | nO?I... | idiom that's very naughty of them | 157 | B | # of syllables different | | AJ0 | AJ0 | I+ | 0.2 | 0.028571429 | | +1 |
| 66 | nee | non | ni. | nan | coll. non plus ultra | 158 | T | morpheme only | | AJ0 | UNC | F | 0.39 | 0.13 | | |
| 67 | nixed | mixed | nIkst | mIkst | coll. mixed emotions | 160 | B | | | AJ0 | AJ0 | C | 0.14 | 0.028 | | |
| 68 | numb | dumb | n^m | d^m | coll. dumb blonde | 162 | B | | | AJ0 | AJ0 | C | 0.38 | 0.12666667 | | |
| 69 | odd | old | a.d | 5ld | proverb old soldiers never die | 164 | B | | | AJ0 | AJ0 | S+ | 0.33 | 0.11 | | |
| 70 | opportune | opera tune | ap0r.tjun | ap.r0tjun | coll. opera tune | 165 | ne | | | AJ0 | NN0 NN1 | R | 2 | 0.25 | l | |
| 71 | orange | arrange | OrInJ | 0r4nJ | coll. arrange one's life | 119 | T | see indigo | | AJ0 | VVB | I | 0.55 | 0.11 | e | |
| 72 | passable | possible | p&s0b0l | pas0b0l | proverb politics is the art of the possible | 171 | B | | | AJ0 | AJ0 | S+ | 0.23 | 0.032857142 | | |
| 73 | penal | penile | pin0l | pin1l | _def. | 173 | B | WS had penial-penal | | AJ0 | AJ0 | | 0.2 | 0.04 | | |
| 74 | platonic | tonic | pl0tanIk | ...tanIk | | 178 | T | odd, just σ inserted | | AJ0 | NN1 | | 0.26 | 0.0325 | | +1 |
| 75 | polite | lighted | p0l1t.. | ..l1?Id | to make a polite entrance | 178 | B | entrance: door vs. entering | | AJ0 | AJ0 | | 0.57 | 0.08142857 | l | |
| 76 | prostituting | prosecuting | prast0tjutIN | pras.0kjutIN | coll. prosecuting attorney | 183 | B | | | AJ0 | AJ0 | R | 0.23 | 0.019166667 | | |
| 77 | pubic | public | pjub.Ik | p.^blIk | coll. public-opinion poll | 184 | B | | | AJ0 | AJ0 | R | 0.46 | 0.065714285 | | |
| 78 | pubic | cubic | pjubIk | kjubIk | coll. cubic centimeter | 184 | B | sentimeter? | | AJ0 | AJ0 | C | 0.24 | 0.04 | | |
| 79 | quaint | ain't | kw4nt | ..4nt | idiom appears to be what it ain't | 188 | T | | | AJ0 | VBB XX0 | E+ | 0.21 | 0.042 | | |
| 80 | quibbling | sibling | kwIblIN | s.IblIN | coll. sibling rivalry | 188 | B | | | AJ0 | NN1 | R | 0.38 | 0.054285713 | | |
| 81 | quipping | whipping | kwIpIN | .wIpIN | coll. whipping boy | 189 | B | | | AJ0 | AJ0 | R | 0.1 | 0.016666668 | | |
| 82 | rare | pear | r7r | p7r | quote a partrigde in a pear tree | 218 | B | see spree | | AJ0 | NN1 | Q+ | 0.66 | 0.22 | | |
| 83 | reclining | declining | rIkl1nIN | dIkl1nIN | coll. the declining years | 193 | B | | | AJ0 | AJ0 | C | 0.44 | 0.055 | | |
| 84 | rhymed | rind | r1md | r1nd | coll. orange rind | 196 | B | | | AJ0 | NN1 | R | 0.11 | 0.0275 | | |
| 85 | rid | red | rId | rEd | coll. red-letter day | 197 | B | | | AJ0 | AJ0 | R | 0.2 | 0.06666667 | | |
| 86 | rile | real | r1l | ril | | 197 | B | | Irish | AJ0 | AJ0 | | 0.3 | 0.1 | | |
| 87 | rued | road | rud | r5d | | 199 | B | | | AJ0 | NN1 | | 0.27 | 0.09 | | |
| 88 | runed | ruined | ru.nd | ruInd | | 200 | B | | | AJ0 | AJ0 | | 0.11 | 0.022 | | |
| 89 | short | sort | SOrt | sOrt | coll. that sort of thing | 210 | T | *Ident(man) bad | | AJ0 | NN1 | I | 0.09 | 0.0225 | | |
| 90 | sinister | spinster | s.InIst0r | spIn.st0r | _def. | 211 | ne | | | AJ0 | NN1 | | 0.34 | 0.037777778 | | +1 |
| 91 | snaky | shaky | sn4kI | S.4kI | | 214 | B | | | AJ0 | AJ0 | | 0.27 | 0.054 | | |
| 92 | sordid | assorted | .sOrdId | 0sOrtId | coll. assorted flavors | 215 | B | | | AJ0 | AJ0 | C | 0.16 | 0.022857143 | | -1 |
| 93 | sour | our | s20r | .20r | idiom ... is our heritage | 216 | B | | | AJ0 | DPS | E+ | 0.08 | 0.02 | | |
| 94 | stationary | station | st4S.n7rI | st4S0n... | coll. station wagon | 219 | B | | | AJ0 | NN1 | R | 1.2 | 0.13333334 | | +2 |
| 95 | terse | Thurs(day) | t9rs | T9rz | | 229 | B | | dialect? | AJ0 | NP0 | | 0.25 | 0.0625 | | |
| 96 | tintative | tentative | tIn?0tIv | tEn?0tIv | | 119 | B | P non-word | | AJ0 | AJ0 | | 0.2 | 0.025 | | |
| 97 | tortuous | thought she was | tOrCu.0s | TOtSiw0z | | 234 | T | Ident(voic)-Sc/V_# | | AJ0 | VVD PNP VBD | | 1.21 | 0.15125 | | |
| 98 | touring | towering | t8rIN | t2rIN | idiom mountains towering among the clouds | 234 | B | | | AJ0 | AJ0 | E+ | 0.3 | 0.06 | | |
| 99 | tropical | topical | trapIk0l | t.apIk0l | coll. topical subject | 236 | B | what? | | AJ0 | AJ0 | C | 0.03 | 0.00375 | | |
| 100 | utter | butter | .^?0r | b^?0r | coll.s bread and butter utter nonsense | 241 | B | collocation interaction | | AJ0 | NP0 | B | 0.21 | 0.042 | | |
| 101 | vapid | rapid | v&pId | r&pId | coll. rapid transit system | 243 | B | | | AJ0 | AJ0 | R | 0.44 | 0.088 | | |
| 102 | vast | west | v&st | wEst | coll. West Point | 243 | B | | | AJ0 | NN1 | R | 0.27 | 0.0675 | | |
| 103 | half vast | half-assed | h&f&st | h&f&sd | coll. half-assed | 243 | B | | | AJ0 | AJ0 | R | 0.11 | 0.018333333 | | |
| 104 | vicarious | why carry us | v1k7ri0s | w1k7rI0s | | 245 | T | | | AJ0 | AVQ VVB PNP | | 0.18 | 0.0225 | | |
| 105 | vicious | wishes | vIS0s | wIS0z | idiom best wishes for a merry christmas | 245 | T | | | AJ0 | NN2 | I+ | 0.15 | 0.03 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 106 | vocal | local | v5k0l | l5k0l | coll. local anesthetic | 246 | B | | | AJ0 | AJ0 | C | 0.44 | 0.088 | | |
| 107 | vulgar | Volga | v^lg0r | valg0. | title the Volga boatman | 247 | B | | | AJ0 | NP0 | Q+ | 0.29 | 0.048333332 | | |
| 108 | vying | dying | v1IN | d1IN | coll. a dying breed | 247 | B | | | AJ0 | AJ0 | C | 0.44 | 0.11 | | |
| 109 | weird | word | w6rd | w9rd | idiom word of mouth | 251 | T | | | AJ0 | NN1 | I+ | 0.3 | 0.075 | | |
| 110 | wrangled | spangled | r.&Ng0ld | sp&Ng0ld | coll. star-spangled banner | 256 | B | | | AJ0 | AJ0 | C | 0.9 | 0.1125 | | |
| 111 | a cute | acute | 0kjut | 0kjut | | 186 | B | see pyorrhea | | AT0 AJ0 | AJ0 | | 0 | 0 | | |
| 112 | not T. | naughty | nati | nO?I | | 225 | B | | | XX0 ZZ0 | AJ0 | | 0.51 | 0.1275 | | |
| 113 | old boys | oboes | 5ldb3z | 5..b5z | | 245 | B | see vile | | AJ0 NN2 | NN2 | | 0.46 | 0.07666667 | | |
| 114 | Indian pendants | independence | Indi0npEnd0ns | Ind.0.pEnd0ns | coll. declaration of independence | 172 | B | see pendant | | AJ0 NN1 | NN1 | I | 0.23 | 0.017692307 | | |
| 115 | one's cone | one stone | w^nsk5n | w^nst5n | proverb kill two birds with one stone | 53 | B | | | PNP POS NN1 | CRD NN1 | S+ | 0.14 | 0.02 | | |
| 116 | past man | postman | p&stm&n | p5stm0n | title the postman always rings twice | 171 | B | | | AJ0 NN1 | NN1 | Q+ | 0.52 | 0.074285716 | | |
| 117 | carafe tea | crafty | k0r&fti | k.r&ftI | | 43 | B | | | AJ0 NN0 | AJ0 | | 0.14 | 0.02 | | |
| 118 | sore shearer | sorcerer | sOrS6r0r | sOrs0r0r | coll. sorcerer's apprentice | 215 | B | | | AJ0 NN1 | NN1 | R | 0.39 | 0.04875 | l | |
| 119 | amphibian | I'm fibbing | 0mfIbi0n | 1mfIb.0N | idiom you think I'm fibbing, do you? | 12 | B | Adv -> subordinate phrase | | AV0 | PNP VBB VVG | E+ | 0.47 | 0.05875 | | |
| 120 | farther | father | farD0r | fa.D0r | coll. step father | 84 | P | Target not synt□,3 ??? | | AV0 | NN1 | R | 0.03 | 0.005 | | |
| 121 | fit | fifth | fI.t | fIfT | | 88 | B | | | AV0 | AV0 | | 0.62 | 0.155 | | |
| 122 | innuendo | in the window | InjuwEnd5 | InD0wInd5 | | 120 | T | | | AV0 | PRP AT0 NN1 | | 1.47 | 0.16333333 | | |
| 123 | internal | eternal | 0nt9rn0l | 0.t9rn0l | title hope springs eternal | 121 | ne | | | AV0 | AV0 | Q+ | 0.1 | 0.0125 | | |
| 124 | lying | lion | l1IN | l10n | coll. Richard the Lionhearted | 256 | B | see wretched | | AV0 | NN1 | I | 0.2 | 0.05 | | |
| 125 | right | night | r1t | n1t | title I could have danced all night | 197 | B | | | AV0 | NN1 | Q+ | 0.31 | 0.10333333 | | |
| 126 | sad | sat | s&d | s&t | | 201 | B | | | AV0 | VVD | | 0.09 | 0.03 | | |
| 127 | violetly | violently | v10lI.tlI | v10l0ntlI | | 118 | B | see indigo | | AV0 | AV0 | | 0.11 | 0.012222222 | | |
| 128 | wound | round | w2nd | r2nd | idiom see you around | 255 | B | | | AV0 | AV0 | I+ | 0.14 | 0.035 | | |
| 129 | afire | of fire | 0f1r | Of1r | coll. pillar of fire | 176 | B | see pillow | | AV0 | PRP NN1 | I | 0 | 0 | | |
| 130 | mine eyes | mayonnaise | m1.n1z | m40n4z | _def. | 150 | ne | | | AJ0 NN2 | NN1 | | 0.61 | 0.10166667 | | |
| 131 | blight | bite | bl1t | b.1t | idiom his bark is worse than his bite | 31 | B | | | NN1 | NN1 | E+ | 0.06 | 0.015 | | |
| 132 | dink | link | dINk | lINk | coll. weakest link | 67 | B | | | NN1 | NN1 | C | 0.44 | 0.11 | | |
| 133 | estrangers | strangers | Estr4nJ0rz | .str4nJ0rz | title strangers in the night | 79 | B | | | NN2 | NN2 | Q+ | 0.38 | 0.038 | | +1 |
| 134 | par | pa | par | pa. | | 169 | B | WS had par-pear | | UNC | NN1 | | 0.03 | 0.01 | | |
| 135 | each | itch | iC | IC | _def. | 73 | ne | no 2nd script | | AT0 | NN1 | | 0.1 | 0.05 | | |
| 136 | a llama | alarm her | 0la.m0. | 0larm0r | | 140 | T | | | AT0 NN1 | VVB PNP | | 0.08 | 0.011428571 | | |
| 137 | aloof | a roof | 0luf | 0ruf | _def. | 11 | ne | | Chinese | UNC | AT0 NN1 | | 0.11 | 0.0275 | | |
| 138 | a nymph | (a)n imp | 0nImf | 0nImp | hare lip cleft palate talk | 162 | B | | | AT0 NN1 | AT0 NN1 | | 0.23 | 0.046 | | |
| 139 | a tea daze | 80 days | 0tid4z | 4?Id4z | title around the world in 80 days | 63 | B | | | AT0 NN0 NN1 | CRD NN2 | Q+ | 0.55 | 0.09166667 | l | |
| 140 | a ghost | aghast | 0g5st | 0gast | idiom be aghast at something | 97 | B | | | AT0 NN1 | AJ0 | I+ | 0.27 | 0.054 | | |
| 141 | a swan | as one | 0swan | 0sw^n | title two hearts that beat as one | 223 | B | word boundaries differ p->t | | AT0 NN1 | PRP PN1 | Q+ | 0.21 | 0.042 | | |
| 142 | a tome | at home | 0t.5m | 0th5m | idiom feel at home | 233 | B | word boundaries diff. p->t | | AT0 NN1 | PRP NN1 | I+ | 0.07 | 0.014 | | |
| 143 | a goon | a-gone | 0gun | 0gan | title Gone with the Wind | 100 | B | title mangled, ouch | | AT0 NN1 | VVN | Q+ | 0.29 | 0.0725 | | |
| 144 | a Freud | afraid | 0fr3d | 0fr4d | | 93 | T | | | AT0 NP0 | AJ0 | | 0.29 | 0.058 | | |
| 145 | a boot | about | 0but | 0b2t | idiom it's about time | 33 | T | | | AT0 NN1 | AV0 | E+ | 0.29 | 0.0725 | | |
| 146 | an oaf | a loaf | 0n5f | 0l5f | proverb half a loaf is better than none | 163 | B | | | AT0 NN1 | AT0 NN1 | S+ | 0.23 | 0.0575 | | |
| 147 | avaunt | I want | 0vOnt | 1want | | 19 | T | | French | ITJ | PNP VVB | | 0.53 | 0.106 | | |
| 148 | Begorra | Gomorrah | b0gOr0 | g0mOr0 | coll. Sodom and Gomorrah | 27 | T | #NAME? | | ITJ | NP0 | B | 1.1 | 0.18333334 | | |
| 149 | wow | how | w2 | h2 | quote how do I love thee | 256 | ne | | | ITJ | AVQ | Q+ | 0.38 | 0.19 | | |
| 150 | pickle | tickle | pIk0l | tIk0l | idiom tickle one's fancy | 175 | B | | | VVI | VVI | I+ | 0.18 | 0.036 | | |
| 151 | ream | dream | .rim | drim | title to sleep, perchance to dream | 192 | B | | | VVI | VVI | Q+ | 0.09 | 0.0225 | | |
| 152 | yank | thank | j&Nk | T&Nk | idiom have only oneself to thank | 259 | B | | | VVI | VVI | I+ | 1 | 0.25 | | |
| 153 | yell | hell | jEl | hEl | idiom go to hell | 259 | B | | | VVI | NN1 | E+ | 0.44 | 0.14666666 | | |
| 154 | zinc | think | zINk | TINk | idiom stop to think | 262 | B | | | VVI | VVI | I+ | 0.66 | 0.165 | | |
| 155 | aberration | adoration | &b0r4S0n | &d0r4S0n | coll. mutual adoration | 6 | B | | | NN1 | NN1 | C | 0.21 | 0.02625 | | |
| 156 | acre | a cur | 4k0r | 0k9r | _def. | 7 | ne | | | NN1 | AT0 NN1 | | 0.57 | 0.1425 | e | |
| 157 | acrimony | matrimony | .&krIm5nI | m&trIm5nI | _def. | 7 | ne | | | NN1 | NN1 | | 0.33 | 0.036666665 | | |
| 158 | acrimony | alimony | &krIm5nI | &.lIm5nI | _def. | 7 | ne | | | NN1 | NN1 | | 0.23 | 0.02875 | | |
| 159 | adder | had 'er | .&d0r | h&d0r | idiom I had her | 7 | T | see boa | | NN1 | VHD PNP | I+ | 0.07 | 0.014 | | |
| 160 | ale | hell | .4l | hEl | idiom what the hell | 10 | T | see ale-all, see rum | | NN1 | NN1 | I+ | 0.33 | 0.11 | | |
| 161 | alternative | altar native | Olt9rn0tIv | Olt0rn4tIv | | 11 | ne | | | NN1 | NN0 NN1 | | 0.57 | 0.057 | l | |
| 162 | amnesty | I'm nasty | &mn0stI | 1mn&stI | | 12 | ne | | | NN1 | PNP VBB AJ0 | | 0.46 | 0.065714285 | e | |
| 163 | antipasto | anti-pasta | &n?Ipast5 | &n?Ipast0 | _def. | 14 | ne | | Italian | NN1 | NN1 | | 0.23 | 0.025555555 | | |
| 164 | apostle | a parcel | 0pa.s0l | 0pars0l | _def. | 14 | ne | | | NN1 | AT0 NN1 | | 0.04 | 0.0057142857 | | |
| 165 | argon | Oregon | ar.g0n | Or0g0n | _def. | 15 | ne | | | NN1 | NP0 | | 0.31 | 0.051666666 | | |
| 166 | arson | horsin' | .ars0n | hOrs0n | idiom stop horsing around | 16 | T | | | NN1 | VVG | E+ | 0.31 | 0.051666666 | | |
| 167 | aspen | askin' | &sp0n | &skIn | | 17 | T | see poplar, alder | | NN1 | VVG | | 0.24 | 0.048 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 168 | ass | grass | ..&s | gr&s | title the green, green grass of home | 17 | B | | | NN1 | NN1 | Q+ | 0.42 | 0.105 | | |
| 169 | ax | X | &ks | Eks | _def. | 20 | ne | | | NN1 | ZZ0 | | 0.19 | 0.06333333 | | |
| 170 | badger | bad you | b&J0r | b&J0. | | 22 | T | | | NN1 | AV0 PNP | | 0.03 | 0.006 | | |
| 171 | badinage | bad in age | b&dInaZ | b&dIn4J | | 22 | T | | | NN1 | AV0 PRP NN1 | | 0.6 | 0.08571429 | | |
| 172 | bagel | bay gull | b4g0l | b4g^l | _def. | 22 | ne | | | NN1 | NN0 NN1 | | 0.27 | 0.054 | | |
| 173 | banana | been any | b0n&n0 | bInEnI | idiom been any messages for me | 23 | T | | | NN1 | VBN AT0 | I+ | 0.19 | 0.031666666 | l | |
| 174 | bard | bird | bard | b9rd | proverb birds of a feather ... | 24 | B | | | NN1 | NN1 | S+ | 0.29 | 0.0725 | | |
| 175 | bargain | bar gain | barg0n | barg4n | _def. | 24 | ne | | | NN1 | NN0 NN1 | | 0.28 | 0.046666667 | | |
| 176 | beck | back | bEk | b&k | | 26 | B | what? | | NN1 | NN1 | | 0.2 | 0.06666667 | | |
| 177 | beguine | begin | bIgin | bIgIn | idiom begin at the beginning | 28 | T | beguine=dance | | NN1 | VVI | S+ | 0.1 | 0.02 | | |
| 178 | beret | bray | b0r4 | b.r4 | _def. | 28 | ne | | | NN1 | NN1 | | 0.04 | 0.01 | | +1 |
| 179 | berry | bury | bErI | b9rI | title bury me on the lone prairie | 28 | T | | | NN1 | VVB | Q+ | 0.29 | 0.0725 | | |
| 180 | billet | Billy | bIlIt | bIlI. | coll. hill billy | 30 | ne | proper name | | NN1 | NP0 | R | 0.07 | 0.014 | | |
| 181 | bloomer | blew my | blum0r | blum1. | | 31 | T | | | NN1 | VVD DPS | | 0.23 | 0.038333334 | | |
| 182 | bone | born | b5.n | bOrn | | 32 | ne | | s. US | NN1 | VVB | | 0.3 | 0.075 | | |
| 183 | bordello | bored hello | bOrd.El5 | bOrdhEl5 | _def. | 33 | ne | | | NN1 | AJ0 NN1 | | 0.07 | 0.00875 | l | |
| 184 | burro | borrow | b9r5 | bar5 | | 38 | T | | | NN1 | VVI | | 0.29 | 0.0725 | | |
| 185 | Carnage | Carthage | karnIJ | karTIJ | | 0 | ne | where? | | NN1 | NP0 | | 1 | 0.16666667 | | |
| 186 | carrot | car ought | k&r0t | karOt | proverb put the cart before the horse | 43 | T | | | NN1 | NN1 VMB | S+ | 0.48 | 0.096 | | |
| 187 | caucus | carcass | kO.k0s | kark0s | _def. | 44 | ne | | | NN1 | NN1 | | 0.29 | 0.048333332 | | |
| 188 | centaur | cent whore | sEnt.Or | sEnthOr | _def. | 45 | ne | | | NN1 | NN0 NN1 | | 0.07 | 0.01 | | |
| 189 | chair | cheer | C7r | Cir | idiom three hearty cheers | 45 | B | | | NN1 | NN1 | I+ | 0.29 | 0.096666664 | | |
| 190 | chairman | charming | C7rm0n | CarmIN | idiom it's been charming | 45 | T | | | NN1 | AJ0 | I+ | 0.43 | 0.071666665 | | |
| 191 | chandelier | Chanticleer | S&nd0.l6r | C&n?0kl6r | _def. | 46 | ne | | | NN1 | NP0 | | 0.45 | 0.05 | | |
| 192 | chivalry | shivery | SIv0lrI | SIv0.rI | _def. | 48 | ne | | | NN1 | AJ0 | | 0.06 | 0.008571428 | | |
| 193 | chops | cops | Caps | kaps | | 48 | T | | | NN2 | NN2 | | 0.38 | 0.095 | | |
| 194 | chowder | showed her | C2d0r | S5d0r | | 48 | T | | | NN1 | VVD PNP | | 0.48 | 0.096 | | |
| 195 | chub | shove | C^b | S^v | idiom show someone around | 48 | T | | | NN1 | VVI | I+ | 0.37 | 0.123333335 | | |
| 196 | commonplace | come and place | kam0npl4s | k^m0npl4s | | 52 | T | | | NN1 | VVB CJC VVB | | 0.21 | 0.023333333 | | |
| 197 | conversation | condensation | kanv0rs4S0n | kand0ns4S0n | _def. | 54 | ne | | | NN1 | NN1 | | 0.75 | 0.06818182 | | |
| 198 | cow | how | k2 | h2 | quote how, shall I love thee | 57 | ne | | | NN1 | AVQ | Q+ | 0.38 | 0.19 | | |
| 199 | crash | cash | kr&S | k.&S | | 57 | B | what? | | NN1 | NN1 | | 0.03 | 0.0075 | | |
| 200 | crass | class | kr&s | kl&s | coll. middle-class | 57 | B | only morpheme | | NN1 | AJ0 | R | 0.13 | 0.0325 | | |
| 201 | creep | keep | krip | k.ip | coll. upkeep | 58 | B | only morpheme | | NN1 | NN1 | R | 0.03 | 0.0075 | | |
| 202 | criminal | cream in all | krIm0n0l | krimInOl | | 58 | T | | | NN1 | NN1 PRP AT0 | | 0.4 | 0.05 | | |
| 203 | cudgel | cordial | k^.J0l | kOrJ0l | | 60 | T | | | NN1 | AJ0 | | 0.32 | 0.053333335 | | |
| 204 | cymbal | simple | sImb0l | sImp0l | idiom not as simple as it looks | 61 | T | | | NN1 | AJ0 | E+ | 0.14 | 0.023333333 | | |
| 205 | Dallas | dollars | d&l0.s | dal0rz | | 229 | ne | see Texas | | NP0 | NN2 | | 0.34 | 0.05666667 | | |
| 206 | dance | dunce | d&ns | d^ns | _def. | 63 | ne | what? | | NN1 | NN1 | | 0.27 | 0.0675 | | |
| 207 | deacon | beacon | dik0n | bik0n | _def. | 63 | ne | | | NN1 | NN1 | | 0.38 | 0.076 | | |
| 208 | deadlock | wedlock | dEdlak | wEdlak | title holy wedlock | 63 | ne | WS has deadlock-bedlock | | NN1 | NN1 | Q+ | 1 | 0.16666667 | | |
| 209 | deceiving | receiving | dIsivIN | rIsivIN | | 63 | ne | | | NN1 | NN1 | | 0.29 | 0.04142857 | | |
| 210 | dishes | this is | dISIz | DIsIz | | 68 | B | knock-knock | | NN2 | DT0 VBB | | 0.14 | 0.028 | | |
| 211 | divan | divine | dIv&n | dIv1n | idiom look divine | 68 | T | | | NN1 | AJ0 | I+ | 0.22 | 0.044 | e | |
| 212 | doormat | dormant | dOrm&.t | dOrm0nt | coll. lie dormant | 69 | T | | | NN1 | AJ0 | I | 0.33 | 0.047142856 | | |
| 213 | druid | do it | druId | d.uIt | | 70 | T | | | NN1 | VDB PNP | | 0.12 | 0.024 | | |
| 214 | duenna thing | do anything | duEn0TIN | duEnITIN | | 71 | T | | | NN1 | VDI PNP | | 0 | 0 | | |
| 215 | dusk | dust | d^sk | d^st | _def. | 72 | ne | | | NN1 | NN1 | | 0.14 | 0.035 | | |
| 216 | dybbuk | the book | dIb0k | D0bUk | coll. book-of-the-month club | 72 | ne | | | NN1 | AT0 NN1 | C | 0.34 | 0.068 | e | |
| 217 | eagle | equal | ig.0l | ikw0l | idiom all men are created equal | 73 | T | | | NN1 | AJ0 | Q+ | 0.23 | 0.046 | | |
| 218 | ear | hear | .6r | h6r | coll. corn ear | 73 | T | | | NN1 | VVB | R | 0.07 | 0.023333333 | | |
| 219 | easel | weasel | .iz0l | wiz0l | coll. weasel out of a problem | 74 | T | | | NN1 | VVB | I | 0.13 | 0.026 | | |
| 220 | Easter | used to | .ist0r | just0. | | 74 | T | WS had Easter-ceased to | | NN1 | VVD TO0 | | 0.42 | 0.07 | | |
| 221 | echelon | it's a long | E.S0lan | Its0laN | title it's a long way to Tipperary | 74 | ne | | | NN1 | PNP VBZ AT0 AJ0 | Q+ | 0.51 | 0.07285714 | | |
| 222 | elastic | Alaska | 0l&stIk | 0l&sk0. | coll. Baked Alaska | 75 | B | | | NN1 | NP0 | C | 0.27 | 0.03857143 | | |
| 223 | eon | a yawn | i.0n | 0jOn | _def. | 78 | ne | | | NN1 | AT0 NN1 | | 0.58 | 0.145 | e | |
| 224 | epidemic | epidermic | Ep0dE.mIk | Ep0d9rmIk | _def. | 78 | ne | | | NN1 | NN1 | | 0.33 | 0.036666665 | | |
| 225 | epitaph | epigram | Ep0t.&f | Ep0gr&m | _def. | 78 | ne | | | NN1 | NN1 | | 1.14 | 0.16285715 | | |
| 226 | erg | urge | 9rg | 9rJ | coll. urge s.o. on (phrasal verb) | 78 | T | | | NN1 | VVB | P | 0.66 | 0.22 | | |
| 227 | eucalyptus | you clipped us | juk0lIpt0s | juk.lIpt0s | idiom you clipped us | 80 | ne | | | NN1 | PNP VVD PNP | I+ | 0.04 | 0.004 | | +1 |
| 228 | F | if | Ef | If | | 83 | T | | | NN1 | CJS | | 0.21 | 0.105 | | |
| 229 | faker | acre | f4k0r | .4k0r | coll. God's acre | 83 | B | | | NN1 | NN1 | R | 0.27 | 0.054 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | famine | farming | f&.mIn | farmIN | | 84 | B | | N. Engl. | NN1 | NN1 | | 0.41 | 0.068333335 | | |
| 231 | feline | feelin' | fil1n | filIn | idiom feeling one's oats | 85 | T | | | NN1 | VVG | E+ | 0.28 | 0.056 | | |
| 232 | finch | finished | fIn.C | fInIS | _def. | 87 | ne | | | NN1 | AJ0 | | 0.3 | 0.06 | | -1 |
| 233 | fink | think | fINk | TINk | quote I think, therefore I am | 87 | T | | | NN1 | VB | Q+ | 0.24 | 0.06 | | |
| 234 | fjord | Ford | fjOrd | f.Ord | _def. | 88 | ne | | | NN1 | NP0 | | 0.1 | 0.02 | | |
| 235 | flesh | fresh | flES | frES | quote the pause that refreshes | 89 | B | just morpheme | | NN1 | NN1 | Q+ | 0.11 | 0.0275 | | |
| 236 | flotation | flirtation | fl5.t4S0n | fl9rt4S0n | _def. | 89 | ne | | | NN1 | NN1 | | 0.34 | 0.037777778 | | |
| 237 | folder | for older | f..5ld0r | f0r5ld0r | idiom show respect for older people | 91 | T | no 2nd script | | NN1 | PRP AJC | E+ | 0.11 | 0.01375 | | |
| 238 | font | found | fant | f2nd | _def. | 91 | T | see agate | | NN1 | AJ0 | | 0.38 | 0.095 | | |
| 239 | frenzy | friends he | frEn.zI | frEndzi | | 93 | T | | | NN1 | NN1 PNP | | 0.24 | 0.034285713 | | |
| 240 | gaucho | Graucho | g.2C5 | gr2C5 | name Gaucho Marx | 96 | B | | | NN1 | NP0 | R | 0.04 | 0.008 | | |
| 241 | gentile | gentle | JEnt1l | JEnt0l | quote not go gentle into ... (D. Thomas) | 96 | B | | | NN1 | NN1 | Q+ | 0.29 | 0.048333332 | | |
| 242 | gob | got | gab | gat | idiom if you gotta go ... | 99 | T | | | NN1 | VMB | S+ | 0.44 | 0.14666666 | | |
| 243 | guitar | got to | gItar | ga?0. | idiom if you gotta go ... | 103 | T | | | NN1 | VVN | S+ | 0.72 | 0.144 | | |
| 244 | gulch | gulls | g^lC | g^lz | _def. | 103 | ne | no 2nd script | | NN1 | NN2 | | 1 | 0.25 | | |
| 245 | gulp | gulf | g^lp | g^lf | coll. gulf of Mexico | 103 | B | | | NN1 | NN1 | I | 0.21 | 0.0525 | | |
| 246 | hail | hell | h4l | hEl | | 105 | ne | | Southern | NN1 | NN1 | | 0.26 | 0.086666666 | | |
| 247 | halo | hello | h4l5 | hEl5 | idiom hello there | 106 | T | greeting hello | | NN1 | ITJ | I+ | 0.26 | 0.065 | | |
| 248 | ham | am | h&m | .&m | idiom I am what I am | 106 | T | | | NN1 | VBB | Q+ | 0.08 | 0.026666667 | | |
| 249 | hamlet | omelette | h&ml0t | .aml0t | _def. | 106 | ne | | | NN1 | NN1 | | 0.31 | 0.051666666 | | |
| 250 | harmony | hominy | harm0nI | ha.m0nI | _def. | 107 | ne | | | NN1 | NN1 | | 0.03 | 0.004285714 | | |
| 251 | hartebeest | heartbeat | har?0bist | hart.bi.t | idiom only a heartbeat away | 108 | B | | | NN1 | NN1 | E+ | 0.33 | 0.036666665 | | |
| 252 | helm | hem | hElm | hE.m | coll. hem and haw | 110 | T | | | NN1 | VVI | B | 0.06 | 0.015 | | |
| 253 | hornet | cornet | hOrn0t | kOrn0t | | 245 | B | see vile | | NN1 | NN1 | | 0.34 | 0.05666667 | | |
| 254 | horse | house | hOrs | h2.s | proverb a house divided against itself | 113 | ne | | | NN1 | NN1 | E+ | 0.33 | 0.0825 | | |
| 255 | hyena | high in a | h1in0 | h1In0 | | 115 | T | | | NN1 | AVO PRP AT0 | | 0.1 | 0.02 | l | |
| 256 | icon | acorn | 1ka.n | 4kOrn | _def. | 117 | ne | | | NN1 | NN1 | | 0.55 | 0.11 | | |
| 257 | icon | hike on | .1kan | h1kan | | 117 | T | | | NN1 | VVB AVP | | 0.07 | 0.014 | | |
| 258 | iguana | I ('m) gonna | Igwan0 | 1mgan0 | | 117 | T | distant, but syntax recov. | | NN1 | PNP VBB VMI TO0 | | 1.94 | 0.32333332 | | |
| 259 | incest | insist | InsEst | InsIst | idiom well, if you insist | 118 | T | | | NN1 | VVB | I+ | 0.21 | 0.035 | e | |
| 260 | ingot | in God | Ingat | Ingad | idiom in god we trust | 119 | T | | | NN1 | PRP NN1 | Q+ | 0.11 | 0.022 | e | |
| 261 | jacket | Jack ate | J&k0t | J&kEt | | 123 | T | | | NN1 | NP0 VVD | | 0.23 | 0.046 | e | |
| 262 | jeep | cheep | Jip | Cip | | 124 | T | | | NN1 | AJ0 | | 0.18 | 0.06 | | |
| 263 | jest | just | JEst | J^st | | 124 | T | | | NN1 | AV0 | | 0.29 | 0.0725 | | |
| 264 | jigsaw | rickshaw | JIgsO | rIkSO | _def. | 125 | ne | | | NN1 | NN1 | | 0.65 | 0.13 | | |
| 265 | jog | jug | Jag | J^g | _def. | 125 | B | 2nd script? | | NN1 | NN1 | | 0.21 | 0.07 | | |
| 266 | juice | Jews | Jus | Juz | _def. | 126 | ne | | | NN1 | NP0 | | 0.07 | 0.023333333 | | |
| 267 | kalpa | calliper | k&l.p0. | k&lIp0r | | 128 | ne | what? | | NN1 | NN1 | | 0.15 | 0.021428572 | | -1 |
| 268 | kangaroo | can grew | k&Ng0ru | k&Ng.ru | | 128 | T | | | NN1 | NN1 VVD | | 0.04 | 0.0057142857 | | +1 |
| 269 | kibbitz | kibbutz | kIbIts | kIbuts | | 129 | ne | | Heb./Yid. | NN1 | NN1 | | 0.29 | 0.048333332 | | |
| 270 | kindle | candle | kInd0l | k&nd0l | _def. | 129 | ne | | Yiddish | NN1 | NN1 | | 0.28 | 0.046666667 | | |
| 271 | kirsch | curse | k9rS | k9rs | _def. | 130 | ne | | | NN1 | NN1 | | 0.09 | 0.0225 | | |
| 272 | kitchen | catching | kIC0n | k&C0n | phrasal verb catch up | 130 | T | | | NN1 | VVG | P+ | 0.28 | 0.056 | | |
| 273 | Latin | lettin' | l&?In | lE?In | | 134 | T | | | NN1 | VVG | | 0.19 | 0.038 | | |
| 274 | lava | lover | lav0. | lav0r | title lover come back to me | 134 | ne | | | NN1 | PNP VHB PNP | Q+ | 0.04 | 0.008 | | |
| 275 | ledger | let your | lEJ0r | lEC0r | idiom let yourself go | 136 | T | | | NN1 | VVB DPS | I+ | 0.18 | 0.036 | | |
| 276 | leprechaun | leprosy | lEpr0kOn | lEpr0sI. | _def. | 136 | ne | | | NN1 | NN1 | | 0.67 | 0.08375 | | |
| 277 | lessee | let's see | lE.si | lEtsi | | 136 | T | | | NN1 | VMB PNP VVI | | 0.07 | 0.014 | | |
| 278 | ligature | look what you're | lIg.0C0r | lUkw0C0r | | 138 | T | | | NN1 | VVB AVQ PNP VBB | | 0.52 | 0.065 | | |
| 279 | litmus | lit mouse | lItm0s | lItm2s | _def. | 140 | ne | | | NN1 | AJ0 NN1 | | 0.29 | 0.048333332 | | |
| 280 | lizard | wizard | lIz0rd | wIz0rd | title the electrical wizard | 140 | B | | | NN1 | NN1 | Q+ | 0.44 | 0.07333333 | | |
| 281 | locust | low curse | l5k0.st | l5k9rs. | _def. | 141 | ne | | | NN1 | AJ0 NN1 | | 0.4 | 0.057142857 | e | |
| 282 | lorry | sorry | larI | sarI | title who's sorry now | 142 | T | | | NN1 | AJ0 | Q+ | 0.66 | 0.165 | | |
| 283 | magnet | maggot | m&gn0t | m&g.0t | _def. | 145 | B | no 2nd script | | NN1 | NN1 | | 0.1 | 0.016666668 | | |
| 284 | malice | Alice | m&lIs | .&lIs | title Alice in Wondeland | 145 | B | | | NN1 | NP0 | Q+ | 0.14 | 0.028 | | |
| 285 | mandolin | Mandarin | m&nd0lIn | m&nd0rIn | | 146 | ne | | Chinese? | NN1 | NN1 | | 0.11 | 0.01375 | | |
| 286 | marijuana | marry one | m&rIwan0 | m&rIw^n. | _def. | 146 | T | | | NN1 | VVB PN1 | | 0.25 | 0.03125 | l | +1 |
| 287 | marmot | mum ought | marm0t | m^.mOt | _def. | 147 | T | | | NN1 | NN1 VMD | | 0.49 | 0.08166666 | | |
| 288 | mastodon | mustard on | m&st0.dan | m^st0rdan | | 147 | T | | | NN1 | NN1 PRP | | 0.31 | 0.034444444 | | |
| 289 | May | day | m4 | d4 | idiom rare as a day in June | 147 | B | | | NN1 | NN1 | E+ | 0.66 | 0.33 | | |
| 290 | mizzen | missin' | mIz0n | mIs0n | | 151 | T | | | NN1 | VVG | | 0.07 | 0.014 | | |
| 291 | momentum | memento | m5mEn?0m | m0mEn?5. | _def. | 151 | ne | | | NN1 | NN1 | | 0.62 | 0.0775 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 292 | monastery | monstery | man0st7rI | man.st0rI | _def. | 152 | ne | | | NN1 | NN1 | | 0.33 | 0.036666665 | | +1 |
| 293 | mongoose | man-goose | maNgus | m&ngus | | 152 | B | | | NN1 | NN1 | | 0.37 | 0.061666667 | | |
| 294 | moose | must | mus | m^s | | 152 | T | | | NN1 | VMB | | 0.28 | 0.093333334 | | |
| 295 | mortarfied | mortified | mOrtarf1d | mOr?I.f1d | | 153 | T | | | NN1 | AJ0 | | 0.48 | 0.053333335 | | |
| 296 | moth | must | maT | m^s | | 153 | T | please! | | NN1 | VM0 | | 0.32 | 0.10666667 | | |
| 297 | mulch | much | m^lC | m^.C | idiom too much of a ... | 154 | T | | | NN1 | AV0 | E+ | 0.06 | 0.015 | | |
| 298 | muzzle | ma will | m^z0l | m^wIl | | 155 | T | | | NN1 | NN1 VMB | | 1 | 0.2 | e | |
| 299 | newt | knew it | nu.t | nuIt | idiom noone knew | 159 | T | | | NN1 | VVD PNP | I+ | 0.11 | 0.0275 | | -1 |
| 300 | ninny | nanny | nInI | n&nI | _def. | 159 | ne | | | NN1 | NN1 | | 0.28 | 0.07 | | |
| 301 | ocelot | owes a lot | as0l0t | 5z0lat | | 164 | T | | | NN1 | VVZ AT0 AJ0 | | 0.58 | 0.096666664 | | |
| 302 | oil | I'll | 3l | 1l | | 165 | T | | | NN1 | PNP AM0 | | 0.28 | 0.14 | | |
| 303 | omelet | amulet | am..l0t | &mjul0t | _def. | 165 | ne | | | NN1 | NN1 | | 1.27 | 0.18142857 | | |
| 304 | onomatopoeia | I don't want to pee | an0m&?0pi0 | ad0wan0pi. | _def. | 165 | T | | | NN1 | PNP VDB XX0 VVI TO0 | | 2.65 | 0.265 | | |
| 305 | opal | hope I'll | .5p0l | h5p1l | | 165 | T | | | NN1 | VVB PNP VMB | | 0.27 | 0.054 | | |
| 306 | orgy | Porgy | .OrJI | pOrgI | title Progy and Bess | 166 | ne | | | NN1 | NP0 | Q+ | 0.68 | 0.136 | | |
| 307 | ovary | oh, very | 5v0rI | 5vErI | | 167 | T | | | NN1 | ITJ AV0 | | 0.23 | 0.046 | e | |
| 308 | paranoia | pair annoy you | p&r0n30 | p&r0n30 | | 169 | T | homophonic | | NN1 | NN1 VVB PNP | | 0 | 0 | | |
| 309 | pasturage | past your age | p&sC0rIJ | p&sC0r4J | coll. past your age | 171 | T | | | NN1 | PRP DPS NN1 | I | 0.28 | 0.035 | | |
| 310 | pistol | pissed till | pIst0l | pIstIl | | 176 | T | | | NN1 | VVD PRP | | 0 | 0 | e | |
| 311 | pith | piss | pIT | pIs | | 177 | ne | | lisp | NN1 | VVI | | 0.11 | 0.036666665 | | |
| 312 | pliers | players | pl10rz | pl40rz | _def. | 178 | ne | | | NN2 | NN1 | | 0.27 | 0.045 | | |
| 313 | possum | for some | pa.s0m | f0rs^m | idiom play possum | 180 | T | | | NN1 | PRP AT0 | I+ | 0.76 | 0.12666667 | e | |
| 314 | psalmody | somebody | sam.0dI | s^mb0dI | | 184 | T | | | NN1 | NN1 | | 0.42 | 0.06 | | |
| 315 | punishment | pun is meant | p^nISm0nt | p^nIzmEnt | | 185 | T | | | NN1 | NN1 VBB AV0 | | 0.54 | 0.06 | | |
| 316 | pyorrhea | Piraeus | p10ri0. | p1.ri0s | _def. | 186 | ne | | | NN1 | NP0 | | 0.14 | 0.02 | | |
| 317 | qualm | calm | kwam | k.am | idiom the calm before the storm | 188 | B | | | NN1 | NN1 | E+ | 0.11 | 0.0275 | | |
| 318 | quondam | one damn | kwand0m | .w^nd&m | idiom one damn thing after another | 189 | T | | | NN1 | AT0 AVO | I+ | 0.55 | 0.07857143 | | |
| 319 | are rapier | are happier | 0r.4pi0r | 0rh&pi0r | | 192 | T | | | NN1 | VBB AV0 | | 0.34 | 0.0425 | | |
| 320 | reaper | ripper | rip0r | rIp0r | title Jack the Ripper | 192 | B | | | NN1 | NN1 | Q+ | 0.1 | 0.02 | | |
| 321 | rectangle | wrecked ankle | rEkt&Ng0l | rEkt&Nk0l | _def. | 193 | ne | | | NN1 | AJ0 NN1 | | 0.1 | 0.011111111 | e | |
| 322 | reefers | refers | rif0rz | rIf9rz | _def. | 194 | T | | | NN2 | VBZ | | 0.39 | 0.065 | e | |
| 323 | reeling | reading | rilIN | ridIN | coll. reading and writing | 257 | B | see writhe | | NN1 | NN1 | B | 0.34 | 0.068 | | |
| 324 | refugee | referee | rEfjUJi | rEf.0ri | _def. | 194 | ne | | | NN1 | NN1 | | 0.77 | 0.11 | | |
| 325 | ribaldry | rivalry | rIb0ldrI | rIv0l.rI | coll. sibling rivalry | 197 | B | | | NN1 | NN1 | R | 0.29 | 0.03625 | | |
| 326 | ricochet | rickshaw | rIk0S4 | rIk.SO | _def. | 197 | ne | | | NN1 | NN1 | | 0.33 | 0.055 | | +1 |
| 327 | rust | rushed | r^st | r^St | | 119 | T | see indigo | | NN1 | VVN | | 0.17 | 0.0425 | | |
| 328 | safari | so far | s0farI | s5far. | idiom so far so good | 201 | T | | | NN1 | AVO AVO | E+ | 0.35 | 0.058333334 | | |
| 329 | salmon | summon | sam0n | s^m0n | idiom summon one's strength | 202 | T | | | NN1 | VVI | I+ | 0.21 | 0.042 | | |
| 330 | scrawl | call | skrOl | .k.Ol | title the call of the wild (London) | 204 | B | | | NN1 | NN1 | Q+ | 0.11 | 0.022 | | |
| 331 | script | stripped | skrIpt | strIpt | | 205 | T | | | NN1 | VVN | | 0.14 | 0.023333333 | | |
| 332 | sediment | said he meant | sEd0m0nt | sEdimEnt | _def. | 205 | ne | | | NN1 | VVD PNP VVD | | 0.49 | 0.06125 | | |
| 333 | semaphore | same before | sEm.0fOr | s4mb0fOr | _def. | 206 | ne | | | NN1 | PN1 AV0 | | 0.49 | 0.06125 | | |
| 334 | seminary | cemetary | sEm0n7rI | sEm0t7rI | _def. | 206 | ne | | | NN1 | NN1 | | 0.34 | 0.0425 | | |
| 335 | senator | centaur | sEn0t0r | sEn.tOr | _def. | 206 | ne | | | NN1 | NN1 | | 0.29 | 0.04142857 | | +1 |
| 336 | shasta | she has to | S.&st0 | Si&st0 | | 208 | T | | | NN1 | PNP VMZ TO0 | | 0.29 | 0.048333332 | | -1 |
| 337 | shiver | she ever | SI.v0r | SiEv0r | | 209 | T | | | NN1 | PNP AV0 | | 1.15 | 0.19166666 | e | |
| 338 | shofar | so far | S5f0r | s5far | | 209 | T | | | NN1 | AV0 | | 0.35 | 0.07 | | |
| 339 | short | shore | SOrt | SOr. | coll. ship-to-shore radio | 210 | B | only morpheme | | NN1 | NN1 | R | 0.07 | 0.0175 | | |
| 340 | short | shot | SOrt | Sa.t | quote the shot heard round the world | 210 | B | | | NN1 | NN1 | Q+ | 0.28 | 0.07 | | |
| 341 | shotgun | shogun | Satg^n | S5.g^n | | 210 | ne | | | NN1 | NN1 | | 0.32 | 0.053333335 | | |
| 342 | simile | smile | sIm0li | s.m1l. | _def. | 211 | ne | | | NN1 | NN1 | | 0.43 | 0.071666665 | | +2 |
| 343 | smelt | smelled | smElt | smEld | | 213 | T | | | NN1 | VVD | | 0.11 | 0.022 | | |
| 344 | soda | so the | s5d0 | s5D0 | | 214 | T | | | NN1 | CJC AT0 | | 0.05 | 0.0125 | | |
| 345 | Sodom | saw them | sad0m | sOD0m | | 214 | T | | | NN1 | VVD PNP | | 0.29 | 0.058 | | |
| 346 | soiree | sorry | swar4 | s.arI | proverb love is never having to say you're sorry | 215 | T | | | NN1 | AJ0 | S+ | 0.39 | 0.078 | l | |
| 347 | sophomore | sell for more | sa.f0mOr | sElf0mOr | idiom sell for more | 215 | T | | | NN1 | VVB PNP AJC | I+ | 0.35 | 0.04375 | | |
| 348 | speculator | escalator | spE.kj0l4?0r | ..Esk.0l4?0r | _def. | 216 | ne | this could be Red plus Lin | | NN1 | NN1 | | 0.44 | 0.036666665 | | |
| 349 | stern | stone | st9rn | st5.n | coll. Rolling Stones | 219 | ne | | | NN1 | NN1 | R | 0.32 | 0.064 | | |
| 350 | strumpet | strum pet | str^mpIt | str^mpIt | _def. | 221 | ne | homophonic | | NN1 | NN0 NN1 | | 0 | 0 | | |
| 351 | summons | someone's | s^m.0nz | s^mw^nz | | 222 | T | | | NN2 | PNP POS | | 0.4 | 0.057142857 | | |
| 352 | T.b. | to be | tibi | t0bi | quote to be or not to be | 54 | B | | | NN1 | TO0 VBB | Q+ | 0.24 | 0.06 | | |
| 353 | tantrum | tandem | t&ntr0m | t&nd.0m | _def. | 226 | B | | | NN1 | NN1 | | 0.14 | 0.02 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 354 | termite | their might | t9rm1t | D7rm1t | coll. with all one's might | 229 | ne | | | NN1 | DPS NN1 | I | 0.47 | 0.07833333 | e | |
| 355 | throat | throw it | Tr5.t | Tr5It | idiom throw it out | 230 | T | | | NN1 | VVB PNP | I+ | 0.11 | 0.022 | | -1 |
| 356 | ticket | thicket | tIk0t | TIk0t | | 231 | ne | | lisp? | NN1 | NN1 | | 0.18 | 0.036 | | |
| 357 | toboggan | to bargain | t0ba.g0n | t0barg0n | _def. | 232 | ne | | | NN1 | TO0 VVI | | 0.04 | 0.005 | | |
| 358 | tog | tug | tag | t^g | idiom tug of war | 233 | ne | | | NN1 | NN1 | I+ | 0.21 | 0.07 | | |
| 359 | togs | dogs | tagz | dagz | coll. mad dogs | 232 | ne | | | NN2 | NN2 | C | 0.11 | 0.0275 | | |
| 360 | bit tonsure | bit unsure | bItanS0r | bIt^nS8r | idiom a bit unsure of oneself | 233 | T | | | NN1 | AV0 AJ0 | E+ | 0.51 | 0.06375 | | |
| 361 | trial | try all | tr10l | tr1Ol | | 235 | T | | | NN1 | VVI AV0 | | 0.25 | 0.05 | e | |
| 362 | trout | out | tr2t | ..2t | | 236 | T | | | NN1 | AVP | | 0.1 | 0.025 | | |
| 363 | urchin | urgin' | 9rCIn | 9rJIn | coll. urge someone on | 240 | T | | | NN1 | VVG | P | 0.2 | 0.04 | | |
| 364 | urination | you're a nation | jUr0n4S0n | j8r0n4S0n | idiom you're a nation of ... | 240 | T | | | NN1 | PNP VBB AT0 NN1 | Q+ | 0.29 | 0.032222223 | | |
| 365 | V | we | vi | wi | idiom where do we go from here | 242 | T | | | NN1 | NN1 | I+ | 0.08 | 0.04 | | |
| 366 | van | when | v&n | wEn | | 242 | T | syntactically | | NN1 | AVQ | | 0.27 | 0.09 | | |
| 367 | vanilla | Manilla | v0nIl0 | m0nIl0 | _def. | 242 | ne | | | NN1 | NP0 | | 1 | 0.16666667 | | |
| 368 | vast | last | v&st | l&st | title the last of the Mohican | 243 | T | | | NN1 | NN1 | Q+ | 0.44 | 0.11 | | |
| 369 | veal | feel | vil | fil | idiom only as young as you feel | 243 | T | | | NN1 | VVB | E+ | 0.17 | 0.05666667 | | |
| 370 | vermilion | million | v0rmIlj0n | ...mIlj0n | | 118 | T | see indigo | | NN1 | NN1 | | 0.41 | 0.045555554 | | +1 |
| 371 | version | virgin | v9rZ0n | v9rJ0n | | 244 | ne | | | NN1 | NN1 | | 0.31 | 0.051666666 | | |
| 372 | viscount | why count | v1k2nt | w1k2nt | | 246 | T | | | NN1 | AVQ VVB | | 0.08 | 0.013333334 | | |
| 373 | vodka | what ca(n) | vadk0 | watk0 | | 199 | T | see rum | | NN1 | AVQ VMB | | 0.17 | 0.034 | | |
| 374 | wafer | wait for | w4.f0r | w4tf0r | idom swallow one and wait for results | 248 | T | | | NN1 | VVB AVP | I | 0.07 | 0.011666667 | | |
| 375 | whittler | Hitler | wItl0r | hItl0r | coll. Heil Hitler | 252 | ne | | | NN1 | NP0 | F | 0.38 | 0.06333333 | | |
| 376 | wiener | when are | win0r | wEn0r | | 253 | T | | | NN1 | AVQ VBB | | 0.28 | 0.056 | | |
| 377 | wimble | nimble | wImb0l | nImb0l | quote Jack be nimble, Jack be quick ... | 253 | T | | | NN1 | AJ0 | Q+ | 0.52 | 0.086666666 | | |
| 378 | wind | when d(o) | wInd | wEnd | idiom run out of wind | 254 | T | | | NN1 | AVQ VDB | E+ | 0.2 | 0.05 | | |
| 379 | wretched | Richard | rECI.d | rIC0rd | coll. Richard the Lionhearted | 256 | B | | | NN1 | NP0 | I | 0.26 | 0.043333333 | | |
| 380 | writhing | writing | r1DIN | r1?IN | coll. reading and writing | 257 | B | | | NN1 | NN1 | B | 1 | 0.2 | | |
| 381 | yacht | he ought | j.at | hiOt | | 258 | T | | | NN1 | PNP VMB | | 0.97 | 0.2425 | | -1 |
| 382 | yarn | you're on | jar.n | j8ran | idiom you're on the wrong track | 259 | T | | | NN1 | PNP VBB AVP | E+ | 0.95 | 0.19 | | -1 |
| 383 | yelp | help | jElp | hElp | coll. helpless | 259 | B | just morpheme | | NN1 | NN1 | R | 0.44 | 0.11 | | |
| 384 | yokel | yodel | j5k0l | j5d0l | _def. | 260 | ne | | | NN1 | VVI | | 0.34 | 0.068 | | |
| 385 | zend | send | zEnd | sEnd | | 261 | T | what? | | VVN | VVN | | 0.07 | 0.0175 | | |
| 386 | zinc | sink | zINk | sINk | _def. | 262 | ne | | | NN1 | NN1 | | 0.07 | 0.0175 | | |
| 387 | zombie | some be | zambi | s^mbi | | 262 | T | | | NN1 | PNP VBB | | 0.28 | 0.056 | | |
| 388 | zounds | sounds | z2ndz | s2ndz | _def. | 262 | ne | what? | | NN2 | NN2 | | 0.07 | 0.014 | | |
| 389 | poplar | popular | pOp..l0r | pOpj0l0r | | 17 | T | see aspen | | NN1 | AJ0 | | 0 | 0 | | -1 |
| 390 | alder | all the | Old0r | 0ld0. | coll. all the time | 17 | T | see aspen | | NN1 | AV0 AT0 | I | 0.3 | 0.06 | | |
| 391 | nutmeg | not make | natmEg | nOtm4k | | 54 | T | see consecrated | | NN1 | XX0 VVB | | 0 | 0 | e | |
| 392 | camphor | came for | k&mf0r | k4mfOr | | 54 | T | see consecrated | | NN1 | VVD AVP | | 0 | 0 | | |
| 393 | sulphur | sell for | salf0r | sElfOr | | 54 | T | see consecrated | | NN1 | VVB AVP | | 0 | 0 | | |
| 394 | cinnamon | seen a man | sIn0m0n | sin0m&n | | 54 | T | see consecrated | | NN1 | VVN AT0 NN1 | | 0 | 0 | e | |
| 395 | ammonia | I'm only a | &m5n.6 | 1m5nl6 | | 54 | T | see consecrated | | NN1 | PNP VBB AV0 AT0 | | 0 | 0 | | |
| 396 | hair | heir | h&r | .ir | coll. heir apparent | 106 | ne | | | NN1 | NN1 | R | 0 | 0 | | |
| 397 | pun | pen | pan | pEn | idiom put pen to paper | 124 | B | see jest | | NN1 | NN1 | E+ | 0 | 0 | | |
| 398 | beer | be or | bi.r | biOr | | 199 | T | see rum | | NN1 | AV0 CJC | | 0 | 0 | | -1 |
| 399 | water | what do | wOd0r | wOt0. | | 199 | T | see rum | | NN1 | AVQ VDB | | 0 | 0 | | |
| 400 | wine | why | w1n | w1. | | 199 | T | see rum | | NN1 | AVQ | | 0 | 0 | | +1 |
| 401 | martini | are tiny | martini | .art1nI | | 199 | T | see rum | | NN1 | VBB AV0 | | 0 | 0 | | |
| 402 | chianti | can't you | kj&nt.I | k.&ntjU | | 199 | T | see rum | | NN1 | VM0 XX0 PNP | | 0 | 0 | l | |
| 403 | sop horrific | soporific | saph0rIfIk | sap.0rIfIk | | 215 | B | | | NN1 AV0 | NN1 | | 0 | 0 | | |
| 404 | tryer | cryer | tr10r | kr10r | coll. town cryer | 236 | B | | | NN1 | NN1 | R | 0.16 | 0.032 | | |
| 405 | abbess | abscess | &b.0s | &bs0s | | 5 | B | | | NN1 | NN1 | | 0.1 | 0.02 | | |
| 406 | admonition | ammunition | &dm.0nIS0n | &.mjunIS0n | title praise the lord and pass the ammunition | 8 | B | | | NN1 | NN1 | Q+ | 0.48 | 0.048 | | |
| 407 | allusion | illusion | 0luZ0n | IluZ0n | coll. optical illusion | 11 | B | | | NN1 | NN1 | C | 0 | 0 | | |
| 408 | ammonia | (th)em on yet | 0m5nj0. | 0manjEt | | 12 | B | should it be them on, ya? | | NN1 | NN1 PNP AV0 | | 0.57 | 0.08142857 | | |
| 409 | anapest | and a pest | &n0pEst | 0n0pEst | idiom become a pest | 13 | B | | | NN1 | CJC AT0 NN1 | I+ | 0.23 | 0.032857142 | e | |
| 410 | anti-skeptic | antiseptic | &n?0skEptIk | &n?0s.EptIk | coll. antispetic | 212 | ne | only morpheme | | NN1 | NN1 | R | 0.1 | 0.009090909 | | |
| 411 | arrival | survival | .0r.1v0l | s0rv1v0l | idiom survival of the fittest | 16 | B | much distance, but idiom | | NN1 | NN1 | Q+ | 0.27 | 0.03375 | | |
| 412 | asp | ass | &sp | &s. | idiom make an ass of oneself | 17 | B | | | NN1 | NN1 | E+ | 0.16 | 0.053333335 | | |
| 413 | baboons | bassoons | b0bunz | b0sunz | | 245 | B | see vile | | NN2 | NN2 | | 0.66 | 0.11 | | |
| 414 | barbiturate | bar bitch you ate | barbIC0rIt | barbIC0.Et | | 23 | B | oh, what a setup | | NN1 | NN0 NN1 PNP | | 0.23 | 0.023 | | |
| 415 | bauble | bubble | bOb0l | b^b0l | | 25 | B | what? | | NN1 | NN1 | | 0.28 | 0.056 | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 416 | bay | day | b4 | d4 | proverb every dog has his day | 25 | B | | | NN1 | NN1 | S+ | 0.21 | 0.105 | |
| 417 | beach | peach | biC | piC | | 25 | B | or 'bitch' [bIC], 3-way pun | | NN1 | NN1 | | 0.14 | 0.046666667 | |
| 418 | beans | beings | binz | biNz | coll. human beings | 26 | B | | | NN2 | NN2 | C | 0.14 | 0.035 | |
| 419 | beard | bard | b6rd | bard | coll. Bard of Avon | 26 | B | | | NN1 | NN1 | I | 0.3 | 0.075 | |
| 420 | biggie | buggy | bIgI | b^gI | coll. dune buggie | 29 | B | | | NN1 | NN1 | R | 0.27 | 0.0675 | |
| 421 | blond | blind | bland | bl1nd | coll. Venetian blind | 31 | B | | | NN1 | NN1 | C | 0.23 | 0.046 | |
| 422 | braid | bread | br4d | brEd | idiom cast one's bread upon the water | 34 | B | what? | | NN1 | NN1 | I+ | 0.26 | 0.065 | |
| 423 | braziers | brassiers | braZ0rz | br0z6rz | | 34 | B | | | NN2 | NN2 | | 0.91 | 0.13 | |
| 424 | breath | breadth | brE.T | brEdT | idiom by a hair's breadth | 34 | B | | | NN1 | NN1 | I+ | 0.09 | 0.018 | |
| 425 | bream | dream | brim | drim | idiom dream the impossible dream | 34 | B | adnominatio | | NN1 | NN1 | E+ | 0.21 | 0.0525 | |
| 426 | breaths | breasts | brE.Ts | brEsts | | 34 | B | | | NN2 | NN2 | | 0.3 | 0.05 | |
| 427 | brogan | broken | br5g0n | br5k0n | | 36 | B | | | NN1 | AJ0 | | 0.1 | 0.016666668 | |
| 428 | bruise | blues | bruz | bluz | | 36 | B | | Chinese | NN1 | NN1 | | 0.13 | 0.0325 | |
| 429 | bungle | bundle | b^Ng0l | b^nd0l | idiom bundle of joy | 38 | B | | | NN1 | NN1 | I+ | 0.63 | 0.105 | |
| 430 | butcher | bitch or | bUC0r | bIC0r | | 39 | T | | | NN1 | NN1 CJC | | 0.3 | 0.06 | |
| 431 | can | man | k&n | m&n | title a man for all seasons | 41 | B | | | NN1 | NN1 | Q+ | 0.66 | 0.22 | |
| 432 | carp | cart | karp | kart | idiom put the cart before the horse | 43 | B | | | NN1 | NN1 | E+ | 0.18 | 0.045 | |
| 433 | centimeter | centipede | sEn?Imi?0r | sEn?Ipid.. | | 45 | B | | | NN1 | NN1 | | 0.91 | 0.091 | +1 |
| 434 | chimps | chips | CImps | CI.ps | coll. fish and chips | 87 | B | see finch | | NN2 | NN2 | B | 0.14 | 0.028 | |
| 435 | chintzes | chances | CIntsIz | C&n.sIz | idiom take your chances | 48 | B | | | NN2 | NN2 | I+ | 0.35 | 0.05 | |
| 436 | clown | crown | kl2n | kr2n | quote Jack fell down and broke his crown ... | 50 | B | | | NN1 | NN1 | Q+ | 0.11 | 0.0275 | |
| 437 | coal | cold | k5l. | k5ld | coll. a bad cold | 50 | B | | | NN1 | NN1 | C | 0.09 | 0.0225 | |
| 438 | colt | cold | k5lt | k5ld | idiom feed a cold and starve a fever | 52 | B | | | NN1 | NN1 | E+ | 0.11 | 0.0275 | |
| 439 | condiment | complement | kand.Im0nt | kamplIm0nt | | 54 | B | see consecrated | | NN1 | NN1 | | 1.22 | 0.122 | |
| 440 | congestion | question | k0nJEsC0n | k..wEsC0n | quote to be or not to be ... | 54 | B | | | NN1 | NN1 | Q+ | 0.8 | 0.08888889 | +1 |
| 441 | cope | hope | k5p | h5p | proverb where there's life, there's hope | 55 | B | | | NN1 | NN1 | S+ | 0.38 | 0.12666667 | |
| 442 | corsets | charges | kOrsIts | CarJ0z | coll. charges without foundation | 56 | B | Ws had corsets-causes | | NN2 | NN2 | I | 2.78 | 0.46333334 | |
| 443 | cortege | corsage | kOrtEZ | kOrsaZ | | 56 | B | | | NN1 | NN1 | | 0.73 | 0.12166667 | |
| 444 | crab | grab | kr&b | gr&b | | 57 | B | | | NN1 | NN1 | | 0.11 | 0.0275 | |
| 445 | critic | cricket | krI?Ik | krIkIt | title cricket on the hearth (Dickens) | 58 | B | | | NN1 | NN1 | Q+ | 0.8 | 0.13333334 | |
| 446 | cruisers | choosers | kruz0rz | C.uz0rz | idiom beggars can't be choosers | 59 | B | | | NN2 | NN2 | S+ | 0.55 | 0.07857143 | |
| 447 | crullers | crawlers | kr^l0rz | krOl0rz | idiom night crawlers | 59 | B | | | NN2 | NN2 | R | 0.28 | 0.04 | |
| 448 | cub | cud | k^b | k^d | _def. | 60 | B | | | NN1 | NN1 | | 0.21 | 0.07 | |
| 449 | curries | courage | k9rIz | k9rIJ | idiom have the courage of your conviction | 60 | B | | | NN2 | NN1 | I+ | 1 | 0.2 | |
| 450 | curse | course | k9rs | kOrs | idiom let nature take its course | 61 | B | | | NN1 | NN1 | E+ | 0.29 | 0.0725 | |
| 451 | delight | the light | dIl1t | D0l1t | coll. lower the light | 64 | B | | | NN1 | AT0 NN1 | I | 0.06 | 0.012 | |
| 452 | dependants | the pendants | dIpEnd0nts | D0pEnd0nts | | 65 | B | | | NN2 | AT0 NN2 | | 0.06 | 0.006 | |
| 453 | din | den | dIn | dEn | idiom den of iniquity | 67 | B | | | NN1 | NN1 | E+ | 0.2 | 0.06666667 | |
| 454 | dinosaur | diner sore | d1n0.sOr | dIn0rsOr | | 67 | B | | | NN1 | NN1 AJ0 | | 0.32 | 0.04 | |
| 455 | doe | do | d5 | du | | 68 | B | what? | | NN1 | NN1 | | 0.27 | 0.135 | |
| 456 | dog | log | dag | lag | idiom throw a log on the fire | 68 | B | fire-log eskimo-sleddog | | NN1 | NN1 | E+ | 0.44 | 0.14666666 | |
| 457 | dowel | towel | d20l | t20l | idiom throw in the towel | 69 | B | | | NN1 | NN1 | E+ | 0.09 | 0.0225 | |
| 458 | dram | damn | dr&m | d.&m | coll. give a damn | 69 | B | | | NN1 | NN1 | T | 0.03 | 0.0075 | |
| 459 | drool | drawl | drul | drOl | coll. Southern drawl | 70 | B | | | NN1 | NN1 | C | 0.29 | 0.0725 | |
| 460 | dung | done | d^N | d^n | title when the works all done this fall | 72 | B | | | NN1 | VVN | Q+ | 0.19 | 0.06333333 | |
| 461 | earl | oil | 9rl | 3.1 | idiom pour oil on troubled water | 73 | B | | | NN1 | NN1 | E+ | 0.33 | 0.11 | |
| 462 | ears | years | .6rz | j6rz | idiom give the best years of one's life | 73 | B | | | NN2 | NN2 | I+ | 0.09 | 0.0225 | |
| 463 | eaves | heaves | .ivz | hivz | coll. have the heaves | 74 | B | | | NN2 | NN2 | T | 0.07 | 0.0175 | |
| 464 | election | erection | IlEkS0n | IrEkS0n | | 75 | B | | Chinese | NN1 | NN1 | | 0.11 | 0.015714286 | |
| 465 | elephants | eloquence | El0f.0ns | El0kw0ns | title well-timed silence... (M. F. Tupper) | 76 | B | | | NN2 | NN1 | Q+ | 0.57 | 0.07125 | |
| 466 | ember | amber | Emb0r | &mb0r | title Forever Amber (movie) | 76 | B | | | NN1 | NN1 | Q+ | 0.2 | 0.04 | |
| 467 | epistle | a pistol | ipIs.0l | 0pIst0l | | 78 | B | | | NN1 | AT0 NN1 | | 0.31 | 0.044285715 | |
| 468 | etch | itch | EC | IC | idiom scratch the itch | 79 | B | | | NN1 | NN1 | E+ | 0.21 | 0.105 | |
| 469 | ether | either | iT0r | iD0r | | 80 | B | either = pronoun | | NN1 | NN1 | | 0.23 | 0.0575 | |
| 470 | eye-deer | idea | 1d6r | 1d6. | coll. interesting idea | 81 | B | | | NN1 | NN1 | C | 0.03 | 0.0075 | |
| 471 | fart | part | fart | part | idiom part and parcel | 84 | B | | | NN1 | NN1 | B+ | 0.23 | 0.0575 | |
| 472 | faucet | facet | fOsIt | f&sIt | coll. facets of emotion | 84 | B | | | NN1 | NN1 | I | 0.29 | 0.058 | |
| 473 | fervor | further | f9rv0r | f9rD0r | idiom so far and no further | 86 | B | | | NN1 | AV0 | E+ | 0.38 | 0.06333333 | |
| 474 | fife | wife | f1f | w1f | | 86 | B | | | NN1 | NN1 | | 0.34 | 0.11333334 | |
| 475 | finch | fish | fInC | fI.S | coll. fish and chips | 87 | B | | | NN1 | NN1 | B | 0.29 | 0.0725 | |
| 476 | fissure | figure | fIS.0r | fIgj0r | quote after the figure of man (Isa 44:13) | 88 | B | | | NN1 | NN1 | Q+ | 1.09 | 0.18166667 | |
| 477 | flies | (ha)ve eyes | f1lz | v.1z | title I only have eyes for you | 90 | B | 1 syll lost | | NN2 | VHB NN1 | Q+ | 0.2 | 0.05 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 478 | focus | hocus | f5k0s | h5k0s | coll. hocus-pocus' | 90 | B | non-word | | NN1 | NN1 | R | 0.52 | 0.104 | | |
| 479 | foible | fable | f3b0l | f4b0l | | 90 | B | | | NN1 | NN1 | | 0.29 | 0.058 | | |
| 480 | fort | fourth | fOrt | fOrT | | 88 | B | see fit | AAVE | NN1 | NN1 | | 0.18 | 0.045 | | |
| 481 | fowl | fall | f2l | fOl | idiom fall of the law | 92 | B | | | NN1 | NN1 | E+ | 0.29 | 0.096666664 | | |
| 482 | fowl | fool | f2l | ful | proverb there's no fool like an old fool | 92 | B | | | NN1 | NN1 | S+ | 0.29 | 0.096666664 | | |
| 483 | fronds | friends | frandz | frEndz | idiom visit a sick friend | 93 | B | | | NN2 | NN2 | I+ | 0.27 | 0.045 | | |
| 484 | futility | utility | fjutIl0tI | .jutIl0tI | coll. public utility | 94 | B | | | NN1 | NN1 | C | 0.27 | 0.03 | | |
| 485 | game | gay | g4m | g4. | | 95 | B | | | NN1 | AJ0 | | 0.14 | 0.046666667 | | |
| 486 | gargoyles | gargles | garg3lz | garg0lz | | 96 | B | | | NN2 | NN2 | | 0.3 | 0.042857144 | | |
| 487 | ghoul | fool | gul | ful | proverb there's no fool like an old fool | 97 | B | see fowl | | NN1 | NN1 | S+ | 0.52 | 0.17333333 | | |
| 488 | glance | dance | gl&ns | d.&ns | idiom may I have the next dance | 98 | B | | | NN1 | NN1 | I+ | 0.5 | 0.1 | | |
| 489 | gloom | room | glum | .rum | coll. room for improvement | 98 | B | | | NN1 | NN1 | I | 0.29 | 0.0725 | | |
| 490 | God | gard | ga.d | gard | New England | 99 | B | | | NN1 | NN1 | | 0.04 | 0.01 | | |
| 491 | gourd | word | gOrd | w9rd | quote ... never heard a discouraging word ... | 100 | B | what? | | NN1 | NN1 | Q+ | 0.95 | 0.2375 | | |
| 492 | gripe | grape | gr1p | gr4p | | 102 | B | what? | | NN1 | NN1 | | 0.27 | 0.0675 | | |
| 493 | groin | coin | gr3n | k.3n | idiom toss a coin in the fountain | 102 | B | | | NN1 | NN1 | E+ | 0.13 | 0.0325 | | |
| 494 | grouse | gross | gr2s | gr5s | proverb ... always tell a girl is game ... | 103 | B | what? | | NN1 | AJ0 | S+ | 0.29 | 0.0725 | | |
| 495 | hake | cake | h4k | k4k | quote let them eat cake (M. Antoinette) | 106 | B | | | NN1 | NN1 | Q+ | 0.34 | 0.11333334 | | |
| 496 | hash | haste | h&S. | h4st | proverb more speed, less haste | 108 | B | | | NN1 | NN1 | S+ | 0.43 | 0.1075 | | |
| 497 | heap | sheep | hip | Sip | proverb it doesn't take a smart girl ... | 109 | B | | | NN1 | NN1 | S+ | 0.66 | 0.22 | | |
| 498 | heresy | hair I see | hErIsI | h7r1si | idiom hair in the soup | 110 | B | | | NN1 | NN1 PNP VVB | E+ | 0.71 | 0.11833333 | e | |
| 499 | hip | lip | hIp | lIp | idiom stiff upper lip | 111 | B | | | NN1 | NN1 | C+ | 1 | 0.33333334 | | |
| 500 | horses | hoses | hOrsIz | h5.zIz | idiom firemen play their hoses | 113 | B | | | NN2 | NN2 | E+ | 0.38 | 0.06333333 | | |
| 501 | hull | hell | h^l | hEl | coll. hell of a place | 114 | B | WS had hull-whole | | NN1 | NN1 | I | 0.26 | 0.086666666 | | |
| 502 | humor | human | hjum0r | hjum0n | proverb to err is human | 114 | B | | | NN1 | NN1 | S+ | 0.31 | 0.051666666 | | |
| 503 | hurter | hitter | h9r?0r | hI.?0r | | 114 | B | what? | | NN1 | NN1 | | 0.33 | 0.055 | | |
| 504 | icicle | bicycle | .1sIk0l | b1sIk0l | _def. | 116 | B | | | NN1 | NN1 | | 0.21 | 0.03 | | |
| 505 | ilk | milk | .Ilk | mIlk | idiom milk of human kindness | 117 | B | | | NN1 | NN1 | E+ | 0.19 | 0.0475 | | |
| 506 | impotentate | potentate | Imp5?0nt4t | ..p5?0nt4t | | 118 | T | non-word in P, syllable loss | | NN1 | NN1 | | 0.24 | 0.024 | | +1 |
| 507 | interdict | into Dick | In?0rdIkt | In?0.dIk. | | 121 | T | | | NN1 | PRP NN1 | | 0.1 | 0.011111111 | e | |
| 508 | invoices | voices | Inv3sIz | ..v3sIz | idiom hear strange voices | 121 | B | | | NN2 | NN2 | I+ | 0.2 | 0.028571429 | | +1 |
| 509 | irk | work | .9rk | w9rk | proverb the devil finds work for idle hands | 122 | B | | | NN1 | NN1 | S+ | 0.13 | 0.0325 | | |
| 510 | jackal | Jack hell | J&k.0l | J&khEl | coll. give someone hell | 123 | B | | | NN1 | NP0 NN1 | I | 0.3 | 0.05 | | |
| 511 | jag | rag | J&g | r&g | idiom a rag, a bone, and a hank of hair | 123 | B | | | NN1 | NN1 | E+ | 0.38 | 0.12666667 | | |
| 512 | jilting | tilting | JIl?IN | tIl?IN | | 125 | B | jolting? | | NN1 | NN1 | | 1 | 0.16666667 | | |
| 513 | jugs | bugs | J^gz | b^gz | idiom get the bugs out | 126 | B | | | NN2 | NN2 | E+ | 1 | 0.25 | | |
| 514 | kilt | killed | kIlt | kIld | | 129 | B | | | NN1 | VVN | | 0.11 | 0.0275 | | |
| 515 | kin | skin | .kIn | skIn | quote skin you love to touch (Woodb. Soap) | 129 | B | | | NN1 | NN1 | Q+ | 0.1 | 0.025 | | |
| 516 | kingdom | king dumb | kINd0m | kINd^m | | 130 | B | | | NN1 | NN1 AJ0 | | 0.27 | 0.045 | | |
| 517 | kitty | pity | kI?I | pI?I | idiom more's the pity | 130 | B | | | NN1 | NN1 | E+ | 0.23 | 0.0575 | | |
| 518 | largesse | large ass | larJEs | larJ&s | | 134 | B | | | NN1 | AJ0 NN1 | | 0.2 | 0.033333335 | l | |
| 519 | limb | lamb | lIm | l&m | title Mary had a little lamb | 138 | B | | | NN1 | NN1 | Q+ | 0.28 | 0.093333334 | | |
| 520 | linden | linen | lInd0n | lIn.0n | proverb wash one's linen in public (chiefly BE) | 138 | B | | | NN1 | NN1 | S+ | 0.11 | 0.018333333 | | |
| 521 | lisp | Liszt | lIsp | lIst | | 139 | B | | | NN1 | NP0 | | 0.18 | 0.045 | | |
| 522 | locomotive | local motive | l5k0.m5?Iv | l5k0lm5?Iv | | 141 | B | | | NN1 | AJ0 NN1 | | 0.08 | 0.008 | | |
| 523 | lodger | ledger | laJ0r | lEJ0r | coll. dusty legder | 141 | B | | | NN1 | NN1 | C | 0.27 | 0.054 | | |
| 524 | loon | moon | lun | mun | coll. full moon | 142 | B | | | NN1 | NN1 | C | 0.38 | 0.12666667 | | |
| 525 | lust | lost | l^st | last | proverb it is better to have loved and lost ... | 143 | B | two diff synt. contexts | | NN1 | VVN | S+ | 0.26 | 0.065 | | |
| 526 | medication | meditation | mEdIk4S0n | mEdIt4S0n | coll. transcendental meditation | 148 | B | | | NN1 | NN1 | C | 0.14 | 0.015555556 | | |
| 527 | menopause | men who pause | mEn.0pOz | mEnhupOz | | 148 | B | | | NN1 | NN1 DTQ VVB | | 0.35 | 0.04375 | | |
| 528 | millstone | milestone | mIlst5n | m1lst5n | idiom a milestone on the road to ... | 150 | B | | | NN1 | NN1 | E+ | 0.28 | 0.04 | | |
| 529 | mirage | marriage | mIraZ | m&rIJ | idiom marriage of convenience | 150 | B | | | NN1 | NN1 | I+ | 0.87 | 0.174 | l | -1 |
| 530 | moan | mowin' | m5.n | m5In | idiom mowing of the grass | 151 | B | | | NN1 | NN1 | I+ | 0.11 | 0.0275 | | -1 |
| 531 | moats | most | m5ts | m5.s | idiom get the most for one's money | 151 | B | | | NN2 | NN1 | I+ | 0.07 | 0.0175 | | |
| 532 | monsoon | man soon | mansun | m&nsun | | 152 | B | | | NN1 | NN1 AV0 | | 0.18 | 0.03 | l | |
| 533 | mosque | moss | mask | mas. | proverb a rolling stone gathers no moss | 153 | B | | | NN1 | NN1 | S+ | 0.1 | 0.025 | | |
| 534 | muscle | missile | m^s0l | mIs0l | coll. guided missile | 154 | B | | | NN1 | NN1 | C | 0.29 | 0.058 | | |
| 535 | narc | knock | nark | na.k | idiom knock on the door | 157 | B | | | NN1 | NN1 | E+ | 0.03 | 0.0075 | | |
| 536 | niece | knees | nis | niz | | 159 | B | | | NN1 | NN2 | | 0.07 | 0.023333333 | | |
| 537 | night | light | n1t | l1t | quote let there be light ... | 159 | B | | | NN1 | NN1 | Q+ | 0.23 | 0.07666667 | | |
| 538 | node | note | n5d | n5t | coll. keep notes | 160 | B | | | NN1 | NN1 | I | 0.09 | 0.03 | | |
| 539 | none | one | n^n | w^n | idiom one in a million | 160 | B | | | NN1 | NN1 | E+ | 0.52 | 0.17333333 | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 540 | Norse | horse | nOrs | hOrs | idiom a horse of a different color | 161 | B | | NN1 | NN1 | E+ | 0.52 | 0.13 | |
| 541 | O-van | oven | 5v&n | 5v0n | | 242 | B | non-word | NN1 | NN1 | | 0.23 | 0.0575 | |
| 542 | parakeets | pair of tits | p&r0kits | p7r0tIts | coll. pair of tits | 169 | B | | NN2 | NN1 PRP NN1 | I | 0.5 | 0.0625 | |
| 543 | parrots | Paris | p&r0ts | p&r0.s | title I love Paris in the springtime | 170 | B | WS had parrots-carrots | NN2 | NP0 | Q+ | 0.07 | 0.011666667 | |
| 544 | parrots | parents | p&r0.ts | p&r0nts | quote love thy parents | 170 | B | | NN2 | NN2 | Q+ | 0.1 | 0.014285714 | |
| 545 | paunch | punch | pOnC | p^nC | idiom pull one's punches | 171 | B | | NN1 | NN1 | E+ | 0.28 | 0.07 | |
| 546 | pest | post | pEst | p5st | idiom desert one's post | 174 | B | | NN1 | NN1 | E+ | 0.29 | 0.0725 | |
| 547 | phrase | phase | fr4z | f.4z | idiom a phase one's passing through | 175 | B | | NN1 | NN1 | E+ | 0.03 | 0.0075 | |
| 548 | piety | pie & tea | p10.tI | p10nti | coll. pie and tea | 176 | B | | NN1 | NN1 CJC NN1 | B | 0.25 | 0.041666668 | |
| 549 | pill | will | pIl | wIl | proverb where there's a will, there's a way | 176 | B | | NN1 | NN1 | S+ | 1 | 0.33333334 | |
| 550 | pool | fool | pul | ful | proverb there's no fool like an old fool | 179 | B | | NN1 | NN1 | S+ | 0.21 | 0.07 | |
| 551 | potpourri | popery | p5puri | p5p0rI | | 180 | B | | NN1 | NN1 | | 0.36 | 0.06 | |
| 552 | preposition | proposition | prEp0zIS0n | prap0zIS0n | coll. make propositions | 181 | B | | NN1 | NN1 | I | 0.29 | 0.029 | |
| 553 | prism | prison | prIz0m | prIz0n | proverb iron bars do not a prism make | 182 | B | | NN1 | NN1 | S+ | 0.11 | 0.018333333 | |
| 554 | pun | gun | p^n | g^n | idiom point a gun | 184 | B | | NN1 | NN1 | I+ | 0.66 | 0.22 | |
| 555 | pun | bun | p^n | b^n | idiom throw hot, cross buns | 184 | B | | NN1 | NN1 | E+ | 0.16 | 0.053333335 | |
| 556 | pyromaniac | pie maniac | p1r5m4ni0k | p1..m4ni0k | | 187 | B | | NN1 | NN0 NN1 | | 0.27 | 0.027 | +1 |
| 557 | quake | cake | kw4k | k.4k | proverb you can't have your cake and eat it | 188 | B | | NN1 | NN1 | S+ | 0.11 | 0.0275 | |
| 558 | quarrel | barrel | kwOr0l | b.&r0l | title roll out the barrel | 188 | B | | NN1 | NN1 | Q+ | 0.92 | 0.15333334 | |
| 559 | quench | wench | kwEnC | .wEnC | coll. lusty wench | 188 | B | | NN1 | NN1 | C | 0.1 | 0.02 | |
| 560 | query | queer | kwirI | kwir. | | 188 | B | | NN1 | NN1 | | 0.39 | 0.078 | +1 |
| 561 | quill | will | kwIl | .wIl | proverb where there's a will there's a way | 189 | B | | NN1 | NN1 | S+ | 0.1 | 0.025 | |
| 562 | quirk | work | kw9rk | .w9rk | idiom all work and no pay | 189 | B | | NN1 | NN1 | S+ | 0.1 | 0.02 | |
| 563 | quiver | giver | kwIv0r | g.Iv0r | quote the Lord loveth a cheerful giver | 189 | B | | NN1 | NN1 | Q+ | 0.22 | 0.036666665 | |
| 564 | rabbit | habit | r&bIt | h&bIt | idiom kick the habit | 190 | B | | NN1 | NN1 | T+ | 0.66 | 0.132 | |
| 565 | Rachmaninov | man enough | r&km&nInOf | ...m&nIn^f | idiom not man enough | 190 | B | | NN1 | NN1 AV0 | E+ | 0.93 | 0.093 | +1 |
| 566 | reef | wreath | rif | riT | coll. coral reef | 193 | B | | NN1 | NN1 | C | 0.24 | 0.08 | |
| 567 | resolution | revolution | rEz0luS0n | rEv0luS0n | | 195 | B | | NN1 | NN1 | | 0.52 | 0.057777777 | |
| 568 | rib-off | ripoff | rIbaf | rIpaf | idiom that's a rip-off | 196 | B | | NN1 | NN1 | P+ | 0.14 | 0.028 | |
| 569 | robot | row boat | r5bat | r5b5t | | 198 | B | | NN1 | NN0 NN1 | | 0.25 | 0.05 | |
| 570 | rooks | books | rUks | bUks | | 198 | B | spoonerism | NN2 | NN2 | | 0.66 | 0.165 | |
| 571 | rubble | trouble | .r^b0l | tr^b0l | title nobody knows the trouble I've seen | 199 | B | | NN1 | NN1 | Q+ | 0.07 | 0.011666667 | |
| 572 | rupture | rapture | r^pC0r | r&pC0r | coll. sheer rapture | 200 | B | | NN1 | NN1 | C | 0.28 | 0.046666667 | |
| 573 | ruse | rose | ruz | r5z | quote a rose is a rose is a rose | 200 | B | | NN1 | NN1 | Q+ | 0.27 | 0.09 | |
| 574 | rusk | risk | r^sk | rIsk | idiom run the risk | 200 | B | | NN1 | NN1 | I+ | 0.29 | 0.0725 | |
| 575 | S | ass | Es | &s | idiom make an ass of oneself | 201 | B | | NN1 | NN1 | E+ | 0.2 | 0.1 | |
| 576 | salivation | salvation | s&lIv4S0n | s&l.v4S0n | | 202 | B | | NN1 | NN1 | | 0.1 | 0.011111111 | +1 |
| 577 | sarong | (what')s wrong | s0rON | s.rON | idiom what's wrong | 203 | ne | | NN1 | VBB AVO | I+ | 0.04 | 0.008 | |
| 578 | scar | star | skar | star | title stars and stripes forever | 203 | B | | NN1 | NN1 | Q+ | 0.14 | 0.035 | |
| 579 | scarlets | harlots | skarlIts | .harl0ts | coll. film starlet | 203 | B | | NN2 | NN2 | R | 0.47 | 0.05875 | |
| 580 | scherzo | shirt so | sk7rts5 | S.9rts5 | | 204 | B | | NN1 | NN1 AV0 | | 0.57 | 0.08142857 | |
| 581 | screw | shrew | skru | S.ru | title the taming of the shrew | 204 | B | | NN1 | NN1 | Q+ | 0.27 | 0.0675 | |
| 582 | scrod | screwed | skrad | skrud | coll. get screwed | 205 | B | | NN1 | VVN | I | 0.3 | 0.06 | |
| 583 | sherry | cherry | SErI | CErI | idiom cut wine | 209 | B | | NN1 | NN1 | I+ | 0.15 | 0.0375 | |
| 584 | shoat | shot | S5t | Sat | quote fired the shot heard round the world | 209 | B | | NN1 | NN1 | Q+ | 0.27 | 0.09 | |
| 585 | sin | gin | sIn | JIn | coll. gin and tonic | 211 | B | | NN1 | NN1 | B | 1 | 0.33333334 | |
| 586 | sing | thing | sIN | TIN | idiom it don't mean a thing | 211 | B | | NN1 | NN1 | E+ | 0.25 | 0.083333336 | |
| 587 | sitar | sitter | sI?ar | sI?0r | coll. baby sitter | 211 | B | | NN1 | NN1 | R | 0.24 | 0.048 | |
| 588 | snake | shake | sn4k | S.4k | coll. fair shake | 214 | B | | NN1 | NN1 | C | 0.27 | 0.0675 | |
| 589 | snore | snare | snOr | sn7r | coll. a snare and a delusion | 214 | B | | NN1 | NN1 | B | 0.29 | 0.0725 | |
| 590 | spies | eyes | sp1z | ..1z | title can't keep my eyes off of you | 218 | B | syllable to be important | NN2 | NN2 | Q+ | 0.24 | 0.06 | |
| 591 | sports | spots | spOrts | spa.ts | proverb a leopard can't change its spots | 217 | B | | NN1 | NN2 | S+ | 0.28 | 0.046666667 | |
| 592 | squid | kid | skwId | .k.Id | idiom a crazy mixed-up kid | 218 | B | | NN1 | NN1 | E+ | 0.19 | 0.038 | |
| 593 | stock | stuck | stak | st^k | | 220 | T | | NN1 | AJ0 | | 0.21 | 0.0525 | |
| 594 | swish | wish | swIS | .wIS | idiom grant your wish | 224 | B | | NN1 | NN1 | I+ | 0.08 | 0.02 | |
| 595 | talc | talk | t&lk | tO.k | idiom talk of the town | 226 | B | | NN1 | NN1 | E+ | 0.33 | 0.0825 | |
| 596 | tan | man | t&n | m&n | idiom richest man in town | 226 | B | | NN1 | NN1 | E+ | 1 | 0.33333334 | |
| 597 | taste | paste | t4st | p4st | coll. scissors and paste | 227 | B | | NN1 | NN1 | B | 0.31 | 0.0775 | |
| 598 | teams | times | timz | t1mz | proverb small minds can't handle great times | 227 | B | | NN2 | NN2 | S+ | 0.28 | 0.07 | |
| 599 | teat | to eat | t.it | t0it | idiom what's to eat | 228 | B | | NN1 | TO0 VVI | I+ | 0.07 | 0.0175 | |
| 600 | tens | tents | tEnz | tEns | idiom fold one's tents and steal away | 228 | B | | NN2 | NN2 | E+ | 0.07 | 0.0175 | |
| 601 | thrall | thrill | TrOl | TrIl | idiom the thrill of a lifetime | 230 | B | | NN1 | NN1 | I+ | 0.3 | 0.075 | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 602 | tight | right | t1t | r1t | idiom defend one's rights | 231 | B | | | NN1 | NN1 | I+ | 0.52 | 0.17333333 | | |
| 603 | time | nine | t1m | n1n | proverb a stitch in time saves nine | 214 | B | see snitch | | NN1 | NN1 | S+ | 0.77 | 0.25666666 | | |
| 604 | trillium | trillion | trIli0m | trIli0n | idiom make a million/trillion | 235 | B | | | NN1 | NN1 | I+ | 0.11 | 0.015714286 | | |
| 605 | tug | bug | t^g | b^g | idiom get the bugs out | 237 | B | | | NN1 | NN1 | E+ | 0.38 | 0.12666667 | | |
| 606 | typhoon | tycoon | t1fun | t1kun | coll. business tycoon | 238 | B | | | NN1 | NN1 | R | 0.44 | 0.088 | | |
| 607 | umber | rumba | .^mb0r | r^mb0. | idiom dance a rumba | 119 | T | WS had umber-number | | NN1 | NN1 | I+ | 0.07 | 0.011666667 | | |
| 608 | Uranus | your anus | jur4n0s | jOr4n0s | | 240 | B | | | NN2 | DPS NN1 | | 0.29 | 0.04142857 | e | |
| 609 | valet | valley | v&lIt | v&lI. | title how green was my valley | 242 | B | | | NN1 | NN1 | Q+ | 0.07 | 0.014 | | |
| 610 | veil | bail | v4l | b4l | quote old man river | 243 | B | | | NN1 | NN1 | Q+ | 0.44 | 0.14666666 | | |
| 611 | (a) viaduct | (to) buy a duck | v10d^kt | b10d^k. | | 244 | B | | | NN1 | VVI AT0 NN1 | | 0.51 | 0.07285714 | | |
| 612 | vice | spice | .v1s | sp1s | idiom the spice of life | 245 | B | | | NN1 | NN1 | E+ | 0.76 | 0.19 | | |
| 613 | viles | violins | v1.l..z | v10lInz | | 245 | B | | | NN2 | NN2 | | 0.28 | 0.04 | | -1 |
| 614 | villain | willin' | vIlIn | wIlIn | idiom ready, willing, and able | 245 | B | | | NN1 | AJ0 | B+ | 0.08 | 0.016 | | |
| 615 | volley | folly | vaII | faII | proverb war is folly | 246 | B | | | NN1 | NN1 | S+ | 0.17 | 0.0425 | | |
| 616 | volt | fault | v5lt | fOlt | idiom it wasn't my fault | 247 | B | | | NN1 | NN1 | I+ | 0.43 | 0.1075 | | |
| 617 | warm | worm | wOrm | w9rm | proverb the early bird gets the worm | 249 | B | | | NN1 | NN1 | S+ | 0.29 | 0.0725 | | |
| 618 | whore | tour | hOr | t8r | coll. tour de force | 252 | B | | | NN1 | NN1 | F | 1.29 | 0.43 | | |
| 619 | wine | line | w1n | l1n | idiom line of least resistance | 254 | B | | | NN1 | NN1 | E+ | 0.25 | 0.083333336 | | |
| 620 | wiper | viper | w1p0r | v1p0r | idiom take a viper to one's bosom | 254 | B | | | NN1 | NN1 | E+ | 1 | 0.2 | | |
| 621 | writs | wits | rIts | wIts | idiom have one's writs about one | 256 | B | | | NN2 | NN2 | E+ | 0.21 | 0.0525 | | |
| 622 | youth | use | juT | jus | idiom what's the use? | 261 | B | | | NN1 | NN1 | E+ | 0.11 | 0.036666665 | | |
| 623 | zinnia | seein' you | zInj0 | sinj0 | idiom I'll be seeing you | 262 | B | | | NN1 | VVG NN1 | I+ | 0.22 | 0.044 | | |
| 624 | boa | bore | b50 | bOr | | 7 | B | overlooked by WS | | NN1 | NN1 | | 0 | 0 | | |
| 625 | carps | cops | karps | kO.ps | coll. cops and robbers | 43 | B | | | NN2 | NN2 | B | 0 | 0 | | |
| 626 | fry | fly | fr1 | fl1 | idiom fly in the ointment | 94 | B | | | NN1 | NN1 | E+ | 0 | 0 | | |
| 627 | hair | here | h&r | hir | idiom here today, gone tomorrow | 106 | B | elliptical | | NN1 | AV0 | E+ | 0 | 0 | | |
| 628 | tequila | to kill ya | tEkil.0 | t0kIlj0 | | 199 | B | see rum | | NN1 | TO0 VVI PNP | | 0 | 0 | | |
| 629 | sheep | cheap | Sip | Cip | proverb buy cheap, sell dear | 209 | B | | | NN1 | NN1 | S+ | 0 | 0 | | |
| 630 | sheik | shreak | S.ik | Srik | coll. terrified shreak | 209 | B | | | NN1 | NN1 | C | 0 | 0 | | |
| 631 | strumpet | trumpet | str^mpIt | .tr^mpIt | | 245 | B | see vile | | NN1 | NN1 | | 0.08 | 0.01 | | |
| 632 | pastel | past her | p&stEl | p&st0r | | 118 | T | see indigo, that's pushing it | | AJ0 | PRP PNP | | 0.37 | 0.061666667 | | |
| 633 | for heifer | forever | f0hEf0r | f0.Ev0r | | 109 | B | | | PRP NN1 | AV0 | | 0.22 | 0.03142857 | | |
| 634 | up ill | uphill | ^p.Il | ^phIl | | 117 | T | what? | | PRP AJ0 | AV0 | | 0.07 | 0.014 | | |
| 635 | amorous | him or us | .&m0r0s | hIm0r0s | idiom it's them or us | 12 | B | | | AJ0 | PNP CJC PNP | E+ | 0.33 | 0.047142856 | | |
| 636 | angora | angry | &NgOr0 | &Ng.rI | idiom don't be angry | 16 | B | see artesian | | AJ0 | AJ0 | I+ | 0.52 | 0.086666666 | l | +1 |
| 637 | bartered | buttered | bar?0rd | b^.?0rd | idiom which side one's bread is buttered on | 25 | B | | | AJ0 | AJ0 | E+ | 0.24 | 0.034285713 | | |
| 638 | black | back | bl&k | b.&k | idiom back right where one begun | 119 | B | see indigo | | AJ0 | AJ0 | S+ | 0.06 | 0.015 | | |
| 639 | dilated | delighted | d1l4?Id | dIl1?Id | idiom delighted to meet you | 67 | B | | | AJ0 | AJ0 | I+ | 0.54 | 0.07714286 | | |
| 640 | draped | raped | dr4pt | .r4pt | | 69 | B | | | AJ0 | AJ0 | | 0.11 | 0.022 | | |
| 641 | drugged | dragged | dr^gd | dr&gd | | 70 | B | | | AJ0 | AJ0 | | 0.28 | 0.056 | | |
| 642 | emissary | necessary | .EmIsErI | nEs0sErI | | 76 | B | | | AJ0 | AJ0 | | 1.11 | 0.13875 | | |
| 643 | foiled | fooled | f3l | ful | | 90 | B | | | AJ0 | AJ0 | | 0.3 | 0.1 | | |
| 644 | free | three | fri | Tri | | 93 | B | | AAVE | AJ0 | AJ0 | | 0.24 | 0.08 | | |
| 645 | gastronomical | astronomical | g&str0namIk0l | .&str0namIk0l | coll. astronomical costs | 96 | B | | | AJ0 | AJ0 | C | 0.18 | 0.013846153 | | |
| 646 | gorgeous | gorgers | gOrJ0.s | gOrJ0rz | | 100 | B | | | AJ0 | NN2 | | 0.11 | 0.015714286 | | |
| 647 | insulted | consulted | .Ins^l?Id | k0ns^l?Id | coll. consult a doctor | 120 | B | | | AJ0 | AJ0 | I | 0.19 | 0.02111111 | | |
| 648 | irritated | irrigated | IrIt4?Id | IrIg4?Id | | 122 | B | | | AJ0 | AJ0 | | 0.66 | 0.0825 | | |
| 649 | lesbian | Lebanese | lEzbi0n.. | lE.b.0niz | | 136 | B | | | AJ0 | AJ0 | | 0.88 | 0.09777778 | | |
| 650 | oval | awful | 5v0l | Of0l | | 167 | B | | | AJ0 | AJ0 | | 0.43 | 0.1075 | | |
| 651 | quasi | crazy | kw4z1 | kr4zI | idiom crazy in the head | 188 | B | | | AJ0 | AJ0 | I+ | 0.42 | 0.084 | | |
| 652 | queasy | easy | kwizI | ..izI | | 188 | B | | | AJ0 | AJ0 | | 0.21 | 0.042 | | |
| 653 | queer | dear | kw6r | d.6r | idiom dear to my heart | 188 | B | | | AJ0 | AJ0 | I+ | 0.45 | 0.1125 | | |
| 654 | rheumatic | romantic | rum&.?Ik | r5m&n?Ik | idiom incurable romantic | 196 | B | | | AJ0 | AJ0 | C+ | 0.37 | 0.04625 | | |
| 655 | torrid | horrid | tarId | harId | quote was a little girl, who had a little... | 234 | B | | | AJ0 | AJ0 | Q+ | 0.44 | 0.088 | | |
| 656 | unshed | unsaid | ^nSEd | ^nsEd | idiom some things are better left unsaid | 209 | B | | | AJ0 | AJ0 | E+ | 0.09 | 0.018 | | |
| 657 | clothed | closed | kl5Dd | kl5zd | | 50 | B | | | AJ0 | AJ0 | | 0.44 | 0.088 | | |
| 658 | mint | meant | mInt | mEnt | idiom I meant well | 150 | B | | | VVD | VVD | I+ | 0.2 | 0.05 | | |
| 659 | must | messed | m^st | mEst | | 154 | B | | | VM0 | VVD | | 0.26 | 0.065 | | |
| 660 | porn | born | pOrn | bOrn | quote a star is born | 180 | B | | | NN1 | VVN | Q+ | 0.16 | 0.04 | | |
| 661 | raffled | ruffled | r&f0ld | r^f0ld | idiom have one's feathers ruffled | 190 | B | | | VVN | VVN | E+ | 0.27 | 0.045 | | |
| 662 | reaped | raped | ript | r4pt | | 192 | B | | | VVN | VVN | | 0.27 | 0.0675 | | |
| 663 | renegaded | relegated | rEn0g4dId | rEl0g4?Id | idiom relegated to the back seat | 195 | B | | | VVN | VVN | I+ | 0.35 | 0.03888889 | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 664 | shed | shut | SEd | S^t | idiom some things are better left unsaid | 209 | B | | | VVN | VVN | E+ | 0.38 | 0.12666667 | |
| 665 | singed | sinned | sInJd | sIn.d | quote forgive me, father, for I have sinned | 211 | B | | | VVN | VVN | Q+ | 0.34 | 0.068 | |
| 666 | forking | fucking | fOrkIN | f^.kIN | coll. fucking around | 91 | B | | | VVG | VVG | I | 0.31 | 0.051666666 | |
| 667 | keel | kill | kil | kIl | | 129 | B | | | VVG | VVG | | 0.1 | 0.033333335 | |
| 668 | accost | cost | 0kast | .kast | | 6 | B | | | VVI | VVI | | 0.04 | 0.008 | +1 |
| 669 | abomination | denomination | .0bamIn4S0n | dInamIn4S0n | idiom belong to a denomination | 6 | B | | | NN1 | NN1 | I+ | 0.61 | 0.055454545 | |
| 670 | aches | eggs | 4ks | Egz | coll. ham and eggs | 7 | B | | | NN2 | NN2 | B | 0.44 | 0.14666666 | |
| 671 | alder | elder | Old0r | Eld0r | idiom ceremony in front of an elder | 10 | B | | | NN1 | NN1 | E+ | 0.3 | 0.06 | |
| 672 | alligator | elevator | &lIg4?0r | El0v4?0r | | 10 | B | | | NN1 | NN1 | | 0.86 | 0.1075 | |
| 673 | anals | annals | 4n0lz | &n0lz | | 84 | B | see fart | | NN2 | NN2 | | 0.27 | 0.054 | |
| 674 | angel | angle | 4nJ0l | &Ng0l | coll. bisecting angles | 30 | B | see bisexing | | NN1 | NN1 | C | 0.85 | 0.17 | |
| 675 | apse | lapse | .&ps | l&ps | coll. lapse of memory | 14 | B | | | NN1 | NN1 | I | 0.08 | 0.02 | |
| 676 | asses | masses | .&sIz | m&sIz | quote religion is the opiate of the masses | 17 | B | | | NN2 | NN2 | Q+ | 0.19 | 0.038 | |
| 677 | bee | knee | bi | ni | title climb up on my knee, sonny boy | 27 | B | | | NN1 | NN1 | Q+ | 0.52 | 0.26 | |
| 678 | blekfast | breakfast | blEkf0st | brEkf0st | | 75 | B | see election | Chinese | NN1 | NN1 | | 0.11 | 0.01375 | |
| 679 | brain | plane | br4n | pl4n | quote the rain in Spain ... | 216 | B | see spay | | NN1 | NN1 | Q+ | 0.27 | 0.0675 | |
| 680 | bungle | jungle | b^Ng0l | J^Ng0l | idiom law of the jungle | 38 | B | | | NN1 | NN1 | E+ | 0.66 | 0.11 | |
| 681 | bus | bush | b^s | bUS | idiom a bird in the hand... | 39 | B | | | NN1 | NN1 | S+ | 0.45 | 0.15 | |
| 682 | buy | rye | b1 | r1 | title catcher in the rye | 39 | B | | | NN1 | NN1 | Q+ | 0.66 | 0.33 | |
| 683 | cashew | cash who | k&S.u | k&Shu | | 43 | T | | | NN1 | NN1 DTQ | | 0.07 | 0.014 | |
| 684 | caws | calls | kO.z | kOlz | coll. long-distance call | 44 | B | | | NN2 | NN2 | R | 0.08 | 0.02 | |
| 685 | cells | selves | sEl.z | sElvz | quote the fault, dear Brutus, is not ... | 45 | B | | | NN2 | NN1 | Q+ | 0.17 | 0.034 | |
| 686 | char | chair | Car | C7r | idiom legs over the arm of your chair | 46 | B | | | NN1 | NN1 | E+ | 0.29 | 0.096666664 | |
| 687 | chassis | chaos | C&si. | k4.as | quote the whole world is in a state of chaos | 46 | B | what? | | NN1 | NN2 | Q+ | 1.12 | 0.224 | |
| 688 | chatter | matter | C&?0r | m&?0r | idiom mind over matter | 46 | B | | | NN1 | NN1 | E+ | 1 | 0.2 | |
| 689 | clings | kings | klINz | k.INz | idiom sport of kings | 49 | B | | | NN2 | NN2 | I+ | 0.06 | 0.012 | |
| 690 | coat | goat | k5t | g5t | idiom sheep are separated from the goats | 50 | B | | | NN1 | NN1 | E+ | 0.11 | 0.036666665 | |
| 691 | comma | coma | kam0 | k5m0 | | 52 | B | what? | | NN1 | NN1 | | 0.25 | 0.0625 | |
| 692 | convention | invention | k0nvEnS0n | .InvEnS0n | proverb necessity is the mother of invention | 54 | B | | | NN1 | NN1 | S+ | 0.1 | 0.011111111 | |
| 693 | coppice | copies | kapIs | kapIz | | 55 | B | | | NN1 | NN2 | | 0.07 | 0.014 | |
| 694 | cores | cause | kOrz | kO.z | coll. cause and effect | 55 | B | | | NN2 | NN1 | B | 0.03 | 0.0075 | |
| 695 | coroner | corner | kar0n0r | kOr.n0r | proverb death is just around the corner | 56 | B | | | NN1 | NN1 | S+ | 0.28 | 0.04 | |
| 696 | crime | time | kr1m | t.1m | proverb a stitch in time saves nine | 214 | B | see snitch | | NN1 | NN1 | S+ | 0.17 | 0.0425 | |
| 697 | cruller | color | kr^l0r | k.Ol0r | idiom horse of a different color | 59 | B | | | NN1 | NN1 | E+ | 0.52 | 0.074285716 | |
| 698 | cuneiform | uniform | kjuni0fOrm | .jun.0fOrm | idiom stripped of one's uniform | 60 | B | | | NN1 | NN1 | E+ | 0.23 | 0.023 | |
| 699 | cycle | circle | s1.k0l | s9rk0l | idiom vicious circle | 61 | B | | | NN1 | NN1 | C+ | 0.33 | 0.055 | |
| 700 | defect | effect | dIfEkt | .IfEkt | coll. cause and effect | 55 | B | see core | | NN1 | NN1 | B | 0.11 | 0.018333333 | |
| 701 | detention | invention | di.tEnS0n | .InvEnS0n | idiom mother of invention | 66 | B | | | NN1 | NN1 | E+ | 0.97 | 0.107777774 | |
| 702 | dower | hour | d20r | .20r | coll. by the hour | 69 | B | | | NN1 | NN1 | I | 0.11 | 0.0275 | |
| 703 | dung | tongue | d^N | t^N | idiom speak with forked tongue | 72 | B | | | NN1 | NN1 | E+ | 0.09 | 0.03 | |
| 704 | eel | wheel | .il | wil | idiom put one's shoulder to the wheel | 75 | B | | | NN1 | NN1 | E+ | 0.13 | 0.043333333 | |
| 705 | elk | ilk | Elk | Ilk | | 76 | B | | | NN1 | NN1 | | 0.21 | 0.07 | |
| 706 | elm | helm | .Elm | hElm | coll. at the helm | 76 | B | double pun | | NN1 | NN1 | C | 0.07 | 0.0175 | |
| 707 | elocution | electrocution | El0k....juS0n | ilEktr0kjuS0n | _def. | 76 | B | | | NN1 | NN1 | | 0.88 | 0.06769231 | -1 |
| 708 | emery | memory | .Em0rI | mEm0rI | title Thanks for the Memory | 76 | B | | | NN1 | NN1 | Q+ | 0.19 | 0.031666666 | |
| 709 | emotion | motion | im5S0n | .m5S0n | | 77 | B | | | NN1 | NN1 | | 0.13 | 0.021666666 | +1 |
| 710 | enamor | a hammer | En&m0r | 0h&m0r | | 77 | B | what? | | NN1 | NN1 | | 0.78 | 0.13 | |
| 711 | encyclical | bicycle | .EnsIklIk0l | b1.sIk...0l | quote from Daisy Bell | 77 | B | | | NN1 | NN1 | Q+ | 0.85 | 0.07727273 | +1 |
| 712 | error | era | Er0r | ir0. | idiom dawn of an era | 79 | B | | | NN1 | NN1 | E+ | 0.32 | 0.08 | |
| 713 | excess | success | .EksEs | s0ksEs | idiom nothing succeeds like success | 81 | B | | | NN1 | NN2 | E+ | 0.36 | 0.06 | |
| 714 | fade | fate | f4d | f4t | idiom a fate worse than death | 83 | B | | | NN1 | NN1 | E+ | 0.09 | 0.03 | |
| 715 | farce | force | fars | fOrs | coll. tour de force | 84 | B | | | NN1 | NN1 | F | 0.24 | 0.06 | |
| 716 | fender | feather | fEnd0r | fE.D0r | idiom knock over with a feather | 85 | B | | | NN1 | NN1 | E+ | 0.15 | 0.025 | |
| 717 | fetter | feather | fE?0r | fED0r | proverb bards of a feather ... | 24 | B | see bard | | NN1 | NN1 | S+ | 0.23 | 0.046 | |
| 718 | flat | fat | fl&t | f.&t | idiom live on the fat of the land | 89 | B | | | NN1 | NN1 | E+ | 0.06 | 0.015 | |
| 719 | fodder | further | fa.d0r | f9rD0r | idiom be further ahead | 90 | B | | | NN1 | AV0 | I+ | 0.38 | 0.06333333 | |
| 720 | fury | jury | fjUrI | J.UrI | idiom trial by jury | 94 | B | | | NN1 | NN1 | I+ | 1.1 | 0.22 | |
| 721 | gal | girl | g&.l | g9rl | | 95 | B | abbreviation gal-gallon | | NN1 | NN1 | | 0.33 | 0.0825 | |
| 722 | gem | jam | JEm | J&m | | 96 | B | | | NN1 | NN1 | | 0.2 | 0.06666667 | |
| 723 | gentiles | genitals | JEn.?1lz | JEnIt0lz | quote will of a man ... genitals (Schopenh.) | 96 | B | | | NN2 | NN2 | Q+ | 0.61 | 0.07625 | -1 |
| 724 | gibbon | ribbon | gIb0n | rIb0n | quote he promised to buy ... blue ribbons | 97 | B | | | NN1 | NN1 | Q+ | 0.52 | 0.104 | |
| 725 | glue | blue | glu | blu | title Rhapsody in Blue | 98 | B | | | NN1 | NN1 | Q+ | 0.31 | 0.10333333 | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 726 | grains | gains | gr4nz | g.4nz | coll. ill-gotten gains | 100 | B | | NN2 | NN2 | C | 0.03 | 0.006 | | |
| 727 | grass | class | gr&s | kl&s | coll. cook with class | 101 | B | | NN1 | NN1 | I | 0.23 | 0.0575 | | |
| 728 | greed | creed | grid | krid | idiom regardless of race, color, and creed | 101 | B | | NN1 | NN1 | Q+ | 0.1 | 0.025 | | |
| 729 | guild | guilt | gIld | gIlt | coll. guilt by association | 103 | B | | NN1 | NN1 | I | 0.09 | 0.0225 | | |
| 730 | hair | fair | h7r | f7r | title Oh Dear what can the matter be... | 106 | B | | NN1 | NN1 | Q+ | 0.38 | 0.12666667 | | |
| 731 | helm | hell | hElm | hEl. | idiom to hell with you | 110 | B | | NN1 | NN1 | I+ | 0.14 | 0.035 | | |
| 732 | hose | house | h5z | h2s | proverb people who live in glass houses... | 113 | B | | NN1 | NN1 | S+ | 0.36 | 0.12 | | |
| 733 | hose | nose | h5z | n5z | idiom win by a nose | 113 | B | | NN1 | NN1 | E+ | 0.52 | 0.17333333 | | |
| 734 | humility | humidity | hjumIl0tI | hjumId0tI | idiom not the heat, but the humidity | 114 | B | | NN1 | NN1 | E+ | 0.34 | 0.037777778 | | |
| 735 | humus | humor | hjum0s | hjum0r | idiom lowest form of humor | 114 | B | | NN1 | NN1 | I+ | 0.44 | 0.07333333 | | |
| 736 | hunk | hank | h^Nk | h&Nk | coll. hank of game | 114 | B | | NN1 | NN1 | I | 0.28 | 0.07 | | |
| 737 | information | inflammation | Inf.0rm4S0n | Infl0.m4S0n | coll. inflammation in the appendix | 119 | B | | NN1 | NN1 | I | 0.11 | 0.01 | | |
| 738 | jest | chest | JEst | CEst | idiom play it close to one's chest | 124 | B | | NN1 | NN1 | E+ | 0.18 | 0.045 | | |
| 739 | jinx | links | JINks | lINks | | 125 | B | what? | NN1 | NN2 | | 1 | 0.2 | | |
| 740 | knot | night | nat | n1t | idiom the morning after the night before | 131 | B | | NN1 | NN1 | E+ | 0.23 | 0.07666667 | | |
| 741 | labradors | lavatories | l&br0dOr.z | l&v.0tOrIz | | 133 | B | | NN2 | NN2 | | 0.41 | 0.041 | | -1 |
| 742 | leeches | breeches | .liCIz | briCIz | idiom caught with one's breeches down | 136 | B | | NN2 | NN2 | S+ | 0.32 | 0.053333335 | | |
| 743 | linen | living | lIn0n | lIvIN | proverb it takes a lot of living ... | 138 | B | | NN1 | NN1 | S+ | 1.14 | 0.228 | | |
| 744 | loom | womb | lum | wum | idiom fruit of the womb | 142 | B | | NN1 | NN1 | E+ | 0.44 | 0.14666666 | | |
| 745 | lore | law | lOr | lO. | idiom possession is nine points of the law | 142 | B | | NN1 | NN1 | E+ | 0.03 | 0.01 | | |
| 746 | mane | name | m4n | n4m | idiom travel under an assumed name | 146 | B | | NN1 | NN1 | I+ | 0.25 | 0.083333336 | | |
| 747 | manse | man's | m&ns | m&nz | | 146 | B | abbr. | NN1 | NN1 | | 0.07 | 0.0175 | | |
| 748 | meter | matter | mi?0r | m&?0r | idiom mind over matter | 149 | B | | NN1 | NN1 | E+ | 0.3 | 0.06 | | |
| 749 | minaret | minute | mIn0rEt | mIn..It | idiom I'll be there in a minute | 150 | B | | NN1 | NN1 | I+ | 0.28 | 0.04 | | +1 |
| 750 | molecule | monocle | malIkjul | man0k.0l | | 151 | B | | NN1 | NN1 | | 0.68 | 0.085 | | |
| 751 | Monet | money | m5n4 | m^nI | idiom marry someone for their money | 152 | B | | NN1 | NN1 | I+ | 0.56 | 0.14 | l | |
| 752 | money | mummy | m^nI | m^mI | coll. mummy and daddy | 152 | B | | NN1 | NN1 | B | 0.14 | 0.035 | | |
| 753 | monogamy | monotony | m5nag0mI | m0na?0nI | coll. break the monogamy | 152 | B | | NN1 | NN1 | I | 1 | 0.125 | | |
| 754 | mulchness | mulch nest | m^lCnIs. | m^lCnEst | coll. mulch nest | 154 | T | | NN1 | NN0 NN1 | R | 0.27 | 0.03375 | | |
| 755 | nab | gab | n&b | g&b | idiom gift of the gab | 156 | B | | NN1 | NN1 | E+ | 1 | 0.33333334 | | |
| 756 | nag | bag | n&g | b&g | idiom it's in the bag | 156 | B | | NN1 | NN1 | E+ | 0.66 | 0.22 | | |
| 757 | navel | naval | n4v0l | n4v0l | coll. naval engagement | 157 | B | | NN1 | NN1 | C | 0 | 0 | | |
| 758 | nonentity | identity | nanEn?ItI | .1dEn?ItI | idiom a case of mistaken identity | 160 | B | | NN1 | NN1 | E+ | 0.71 | 0.078888886 | | |
| 759 | odor | a door | 5d0r | 0dOr | coll. out of order | 164 | B | | NN1 | AT0 NN1 | I | 0.48 | 0.12 | e | |
| 760 | peephole | people | piph5l | pip.0l | idiom power to the people | 173 | B | | NN1 | NN1 | I+ | 0.31 | 0.051666666 | | |
| 761 | persistance | resistance | p0rsIst0ns | rI.zIst0ns | idiom path of least resistance | 174 | B | | NN1 | NN1 | E+ | 0.62 | 0.062 | | |
| 762 | pianist | penis | pi0nIs | pi.nIs | coll. 12-inch penis | 175 | B | | NN1 | NN1 | R | 0.04 | 0.006666667 | | +1 |
| 763 | pickerel | pickle | pIk0r0l | pIk..0l | idiom be in a pickle | 175 | B | | NN1 | NN1 | I+ | 0.07 | 0.01 | | +1 |
| 764 | pillow | pillar | pIl5. | pIl0r | coll. pillar of fire | 176 | B | | NN1 | NN1 | I | 0.27 | 0.054 | | |
| 765 | pitchers | pictures | pI.C0rz | pIkC0rz | idiom you ought to be in pictures | 177 | B | | NN2 | NN2 | E+ | 0.18 | 0.025714286 | | |
| 766 | pity | city | pI?I | sI?I | coll. the city of New York | 177 | B | | NN1 | NN1 | I | 1 | 0.25 | | |
| 767 | plaice | face | pl4s | f.4s | title I've grown accustomed to her face | 177 | B | | NN1 | NN1 | Q+ | 0.27 | 0.0675 | | |
| 768 | platitude | altitude | pl&.?Itud | ..&l?Itud | coll. altitudes of achievement | 178 | B | | NN1 | NN1 | I | 0.3 | 0.033333335 | | |
| 769 | plot | pot | plat | p.at | idiom have a chicken in every pot | 178 | B | | NN1 | NN1 | E+ | 0.06 | 0.015 | | |
| 770 | poodle | paddle | pud0l | p&d0l | idiom be up the creek without a paddle | 179 | B | | NN1 | NN1 | S+ | 0.3 | 0.06 | | |
| 771 | poultry | poetry | p5.ltrI | p5I.trI | | 181 | B | | NN1 | NN1 | | 0.17 | 0.024285715 | | |
| 772 | puce | pews | pjus | pjuz | | 184 | B | | NN1 | NN2 | | 0.07 | 0.0175 | | |
| 773 | reasons | seasons | riz0nz | siz0nz | quote a man for all seasons | 193 | B | | NN2 | NN2 | Q+ | 0.66 | 0.11 | | |
| 774 | rhesus | reason | ris0s | riz0n | quote people's faith in reason | 196 | B | | NN1 | NN1 | Q+ | 1.07 | 0.214 | | |
| 775 | rigids | riches | rIJIdz | rICI.z | idiom from rags to riches | 197 | B | | NN2 | NN1 | E+ | 0.29 | 0.048333332 | | |
| 776 | roam | room | r5m | rum | idiom need lots of room | 197 | B | | NN1 | NN1 | I+ | 0.27 | 0.09 | | |
| 777 | runt | rent | r^nt | rEnt | coll. for rent | 200 | B | | NN1 | NN1 | I | 0.26 | 0.065 | | |
| 778 | scandal | sandal | sk&nd0l | s.&nd0l | | 203 | B | | NN1 | NN1 | | 0.1 | 0.014285714 | | |
| 779 | scarlets | starlets | skarlIts | starlIts | coll. film starlet | 119 | B | see indigo | NN2 | NN2 | R | 0.14 | 0.0175 | | |
| 780 | screech | speech | skriC | sp.iC | idiom freedom of speech | 204 | B | | NN1 | NN1 | I+ | 0.26 | 0.052 | | |
| 781 | sentiments | sediments | sEn?0m0nts | sE.d0m0nts | coll. fine sediment | 207 | B | | NN2 | NN2 | C | 0.28 | 0.028 | | |
| 782 | sequels | equals | sikw0lz | .ikw0lz | idiom treat as equals | 207 | B | | NN2 | NN2 | I+ | 0.08 | 0.011428571 | | |
| 783 | shack | shock | S&k | Sak | idiom to come as a shock | 208 | B | | NN1 | NN1 | I+ | 0.23 | 0.07666667 | | |
| 784 | show van ism | chauvinism | S5v&nIz0m | S5vInIz0m | | 210 | B | | NN1 | NN1 | | 0.26 | 0.028888889 | | |
| 785 | shrivelry | chivalry | SrIv0lrI | S.Iv0lrI | coll. act of chivalry | 210 | B | | NN1 | NN1 | I | 0.03 | 0.00375 | | |
| 786 | slug | rug | sl^g | .r^g | idom sweep something under the rug | 213 | B | | NN1 | NN1 | E+ | 0.19 | 0.0475 | | |
| 787 | smacks | snacks | sm&ks | sn&ks | idiom drop in for snacks | 213 | B | | NN2 | NN2 | I+ | 0.11 | 0.022 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 788 | spaying | Spain | sp4IN | sp4.n | quote the rain in Spain ... | 216 | B | | | NN1 | NP0 | Q+ | 0.29 | 0.058 | | +1 |
| 789 | spree | tree | spri | .tri | quote a partridge in a pear tree | 218 | B | | | NN1 | NN1 | Q+ | 0.26 | 0.065 | | |
| 790 | stairs | stars | st7rz | starz | idiom avoid the stars | 218 | B | see also cell | | NN1 | NN2 | I+ | 0.29 | 0.058 | | |
| 791 | stilling | killing | stIlIN | .kIlIN | idiom kill two birds with one stone | 53 | B | see cone | | NN1 | NN1 | E+ | 0.24 | 0.04 | | |
| 792 | stork | storm | stOrk | stOrm | idiom calm before the storm | 221 | B | | | NN1 | NN1 | I+ | 0.66 | 0.132 | | |
| 793 | Strauss | stress | str2s | strEs | coll. stress and strain | 221 | B | | | NN1 | NN1 | B | 0.3 | 0.06 | | |
| 794 | sty | sky | st1 | sk1 | quote a goldmine in the sky | 222 | B | | | NN1 | NN1 | Q+ | 0.16 | 0.053333335 | | |
| 795 | Swede | sweet | swid | swit | idiom take the bitter with the sweet | 224 | B | | | NN1 | NN1 | E+ | 0.09 | 0.0225 | | |
| 796 | her sylph | herself | sIlf | sElf | idiom keep something to oneself | 224 | B | | | DPS NN1 | PNX | I+ | 0.2 | 0.05 | | |
| 797 | Talmud | tall mud | talmUd | tOlm^d | | 226 | B | | | NN1 | AJ0 NN1 | | 0.53 | 0.08833333 | | |
| 798 | thaw | draw | T.O | drO | idiom quick on the draw | 229 | B | | | NN1 | NN1 | I+ | 0.7 | 0.23333333 | | |
| 799 | tile | tale | t1l | t4l | title the tales from the Vienna woods | 232 | B | | | NN1 | NN1 | Q+ | 0.27 | 0.09 | | |
| 800 | tine | time | t1n | t1m | idiom fall on hard times | 232 | B | | | NN1 | NN1 | E+ | 0.14 | 0.046666667 | | |
| 801 | trail | trial | tr4.l | tr10l | idiom learn by trial and error | 234 | B | | | NN1 | NN1 | I+ | 0.33 | 0.066 | | |
| 802 | trend | tent | trEnd | t.Ent | idiom right around the tent | 235 | B | WS had trend-end | | NN1 | NN1 | E+ | 0.12 | 0.024 | | |
| 803 | vampire | empire | v&mp10r | .Emp10r | idiom the sun never sets on the Br. Empire | 242 | B | | | NN1 | NN1 | Q+ | 0.53 | 0.07571428 | | |
| 804 | vault | fault | vOlt | fOlt | idiom generous to a fault | 243 | B | | | NN1 | NN1 | E+ | 0.17 | 0.0425 | | |
| 805 | vesper | whisper | vEsp0r | wIsp0r | idiom talk above a whisper | 244 | T | | | NN1 | NN1 | I+ | 0.29 | 0.048333332 | | |
| 806 | VIP | way I pee | vi1pi | w41pi | | 245 | B | rel. clause | | NN1 | NN1 PNP VVB | | 0.35 | 0.07 | | |
| 807 | vituperation | recuperation | vItup0r4S0n | rIkup0r4S0n | coll. power of recuperation | 246 | B | | | NN1 | NN1 | I | 0.6 | 0.054545455 | | |
| 808 | wane | plain | .w4n | pl4n | quote the rain in Spain ... | 249 | B | | | NN1 | NN1 | Q+ | 0.49 | 0.1225 | | |
| 809 | wedlock | hemlock | wEdlak | hEmlak | | 250 | B | | | NN1 | NN1 | | 0.82 | 0.13666667 | | |
| 810 | weevil | evil | wiv0l | .iv0l | idiom the lesser of two evils | 251 | B | | | NN1 | NN1 | E+ | 0.11 | 0.022 | | |
| 811 | whisker | whisper | wIsk0r | wIsp0r | idiom talk below a whisper | 252 | B | | | NN1 | NN1 | I+ | 0.23 | 0.038333334 | | |
| 812 | whorescopes | horoscopes | hOr.sk5ps | har0sk5ps | | 253 | B | P: non-word | | NN2 | NN2 | | 0.32 | 0.035555556 | | -1 |
| 813 | wife | wise | w1f | w1z | idiom a word to the wise | 253 | B | | | NN1 | NN1 | E+ | 1 | 0.33333334 | | |
| 814 | windrow | window | wIndr5 | wInd.5 | quote serenade ... 'neath a fair lady's window | 254 | B | | | NN1 | NN1 | Q+ | 0.03 | 0.005 | | |
| 815 | yearning | learning | j9rnIN | l9rnIN | coll. higher learning | 259 | B | | | NN1 | NN1 | C | 0.25 | 0.041666668 | | |
| 816 | bourbon | Burden | burb0n | burd0n | idiom beast of burden | 34 | B | overlooked by WS | | NN1 | NN1 | I+ | 0.21 | 0.035 | | |
| 817 | cervix | service | s9rvIks | s9rvI.s | idiom at your service | 67 | B | see p. 38 | | NN1 | NN1 | I+ | 0 | 0 | | |
| 818 | platitude | latitude | pl&d0tjud | .l&d0tjud | coll. longitude and latitude | 178 | B | | | NN1 | NN1 | B | 0 | 0 | | |
| 819 | Acapulco | a capella | ak0pUlk5 | ak0pEl.0 | _def. | 6 | ne | | Italian | NP0 | PRP NN1 | | 0.63 | 0.07875 | | |
| 820 | Aeneid | he need | .iniId | hini.d | | 8 | T | | | NP0 | PNP VVB | | 0.17 | 0.028333334 | | |
| 821 | agate | I got | &gIt | 1gat | | 9 | T | Agate=name of font? | | NP0 | PNP VMB | | 0.5 | 0.125 | l | |
| 822 | Andalusian | and illusion | &nd0luZ0n | 0ndIluZ0n | | 13 | T | what? | | NP0 | CJC NN1 | | 0.23 | 0.025555555 | | |
| 823 | Argus | our guess | arg0s | argEs | idiom our guess is as good as yours | 15 | B | atrocious | | NP0 | AT0 NN1 | E+ | 0.23 | 0.046 | | |
| 824 | armageddon | I'm a-gettin' | arm0gEd0n | 1.m0gE?In | idiom I'm getting out of here | 16 | B | | | NP0 | PNP VBB VVG | I+ | 0.38 | 0.04222222 | | |
| 825 | Atlas | at last | &tl0s | 0tl&s | idiom at last, we are alone | 18 | ne | | | NP0 | PRP AV0 | Q+ | 0.47 | 0.094 | e | |
| 826 | Avon | havin' | .1v0n | h&vIn | idiom are you having any fun | 20 | T | | | NP0 | VHG | S+ | 0.36 | 0.072 | | |
| 827 | Baal | bail | b40l | b4.l | | 21 | ne | | | NP0 | VVB | | 0.04 | 0.01 | | |
| 828 | Bangladesh | bang the dish | baNgl0dES | b&ND.0dIS | | 23 | T | | | NP0 | VVI AT0 NN1 | | 0.89 | 0.09888889 | | |
| 829 | Caruso | Crusoe | k0rus5 | k.rus5 | _def. | 43 | B | | | NP0 | NP0 | | 0.04 | 0.006666667 | | |
| 830 | Champlain | champaigne | S&mpl4n | S&mp.4n | _def. | 45 | ne | | Chinese | NP0 | NN1 | | 0.06 | 0.008571428 | e | |
| 831 | Champlain | chomping | S&mpl4n | Camp.IN | idiom horses chomping at the bit | 45 | T | | | NP0 | VVG | Q+ | 0.86 | 0.122857146 | | |
| 832 | Chianti | can't ye | kiant.i | k.&ntj4 | | 47 | B | WS:Chianti-can't you, see rum | | NP0 | VMB XX0 PNP | | 0.68 | 0.09714286 | | |
| 833 | Dresden | dressed in | drEzd0n | drEstIn | | 70 | T | | | NP0 | VVN AVP | | 0.16 | 0.022857143 | | |
| 834 | dunce | dance | d^ns | d&ns | idiom may I dance with you | 72 | T | | | NP0 | VVI | I+ | 0.28 | 0.07 | | |
| 835 | Essex | ass aches | Es0ks | &s4ks | | 79 | ne | | | NP0 | NN1 VVZ | | 0.48 | 0.096 | | |
| 836 | Hallelujah | Honolulu | h&l0luj0 | han0lulu | _def. | 106 | ne | | | NP0 | NP0 | | 1.07 | 0.13375 | | |
| 837 | Harvard | harder | harv0rd | hard0r. | coll. try harder | 108 | T | | | NP0 | AV0 | I | 0.55 | 0.07857143 | | |
| 838 | Hogmanay | hog many | hagm0n4 | hagmEnI | | 112 | T | | | NP0 | VVI PN1 | | 0.51 | 0.07285714 | l | |
| 839 | Kodak | Koran | k5d&k | k0ran | _def. | 132 | ne | | | NP0 | NP0 | | 1.41 | 0.282 | e | |
| 840 | koodoo | could you | kud.u | kUdju | idiom brother, could you spare a dime | 132 | T | | | NP0 | VBB PNP | Q+ | 0.38 | 0.076 | | |
| 841 | Kumquat | come quick | k^mkwat | k^mkwIk | | 132 | T | | | NP0 | VVB AV0 | | 0.44 | 0.06285714 | | |
| 842 | Manhasset | man has it | m&nh&sIt | m&nh&zIt | | 157 | T | see Nantucket | | NP0 | NN1 VHZ PNP | | 0.07 | 0.00875 | | |
| 843 | Mecca | maker | mEk0. | m4k0r | idiom meet one's maker | 148 | T | | | NP0 | NN1 | E+ | 0.32 | 0.064 | | |
| 844 | Nantucket | Nan took it | n&nt^kIt | n&ntUkIt | | 157 | T | | | NP0 | NP0 VVD PNP | | 0.28 | 0.035 | | |
| 845 | Nero | near | n6r5 | n6r. | idiom the end is near | 158 | T | | | NP0 | AJ0 | I+ | 0.24 | 0.06 | | +1 |
| 846 | nurture | nature | n9rC0r | n4.C0r | coll. mother nature | 162 | B | | | NP0 | NN1 | R | 0.33 | 0.055 | | |
| 847 | Parthenon | passing on | parT0nan | p&.sInan | coll. an idea worth passing on | 170 | T | | | NP0 | VVG AVP | P | 0.32 | 0.04 | | |
| 848 | Pontius | conscious | p^nS0s | kanS0s | coll. semi-conscious | 179 | T | | | NP0 | AJ0 | R | 0.5 | 0.083333336 | | |
| 849 | Seoul | sold | s5l. | s5ld | | 207 | T | | | NP0 | VVN | | 0.09 | 0.0225 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 850 | Thinatra | Sinatra | TInatr0 | sInatr0 | | 230 | ne | | lisp | NP0 | NP0 | | 0.11 | 0.015714286 | | |
| 851 | Tibet | to bet | tIbEt | t0bEt | title to be your life | 231 | T | | | NP0 | TO0 VVI | Q+ | 0.01 | 0.002 | | |
| 852 | Uruguay | your way | jUr0gw4 | jOr..w4 | proverb you go your way and I'll go mine | 241 | T | | | NP0 | DPS NN1 | S+ | 0.51 | 0.07285714 | | +1 |
| 853 | Pawtucket | Pa took it | pOtakIt | patUkIt | | 157 | T | see Nantucket | | NP0 | NN1 VVD PNP | | 0 | 0 | | |
| 854 | Faust | first | f2.st | f9rst | quote first in war, first in peace, ... | 85 | B | | | NP0 | AV0 | Q+ | 0.34 | 0.068 | | |
| 855 | Harvard | our word | harv0rd | .arw0rd | idiom our word against yours | 108 | B | | | NP0 | DPS NN1 | I+ | 0.16 | 0.022857143 | | |
| 856 | Joyce | choice | J3s | C3s | coll. unfortunate choice | 126 | B | | | NP0 | NN1 | C | 0.18 | 0.06 | | |
| 857 | Kahluah | clue | k0l8 | k.lu | idiom have a clue | 128 | B | | | NP0 | NN1 | I+ | 0.33 | 0.0825 | | +1 |
| 858 | Iraq | wreck | Irak | .rEk | idiom things are going from wreck to ruin | 122 | B | | | NP0 | NN1 | E+ | 0.37 | 0.0925 | | +1 |
| 859 | Genoan | genuine | JEn0w0n | JEnu.In | coll. the genuine article | 96 | B | | | NP0 | AJ0 | C | 0.39 | 0.055714287 | | |
| 860 | Korea | carrier | k0ri0. | k&ri0r | coll. carrier girl | 132 | B | | | NP0 | NN1 | R | 0.28 | 0.046666667 | l | |
| 861 | Orly | early | OrlI | 9rlI | proverb the early bird gets the worm | 250 | B | see warm | | NP0 | AJ0 | S+ | 0.29 | 0.0725 | | |
| 862 | Ruth | truth | .rUT | trUT | proverb truth is stranger than fiction | 200 | B | | | NP0 | NN1 | S+ | 0.07 | 0.0175 | | |
| 863 | acclaim | a clam | 0kl4m | 0kl&m | coll. clam bake | 6 | T | | | NN1 | AT0 NN1 | R | 0.27 | 0.054 | | |
| 864 | adder | utter | &d0r | ^?0r | coll. utter confusion | 8 | B | | | NN1 | AJ0 | C | 0.39 | 0.0975 | | |
| 865 | addict | attic | &dIkt | &?Ik. | coll. attic rendevouz | 8 | B | | | NN1 | NN1 | R | 0.19 | 0.038 | | |
| 866 | almond | arm and | a.m0nd | arm0nd | idiom cost an arm and a leg | 11 | B | no 2nd script | | NN1 | NN1 CJC | E+ | 0.04 | 0.006666667 | | |
| 867 | ambivalence | ambulance | &mbIv0l0ns | &mb.j0l0ns | coll. ambulance chasers | 12 | B | syllable lost | | NN1 | NN1 | R | 1.1 | 0.11 | | +1 |
| 868 | antic | antique | &n?Ik | &ntik | coll. antique collector | 13 | B | | | NN1 | NN1 | R | 0.36 | 0.072 | | |
| 869 | author | other | OT0r | ^D0r | | 19 | B | sem. field | | NN1 | AJ0 | | 0.51 | 0.1275 | | |
| 870 | bazaar | bizzare | b0zar | bizar | coll. bizarre experience | 25 | B | | | NN1 | AJ0 | C | 0.26 | 0.052 | | |
| 871 | beaver | fever | biv0r | fiv0r | coll. feaver pitch | 26 | B | | | NN1 | NN1 | R | 0.66 | 0.132 | | |
| 872 | belly | very | bElI | vErI | | 28 | B | syntax prevent much else | | NN1 | AV0 | | 0.29 | 0.0725 | | |
| 873 | blight | white | bl1t | .w1t | coll. white supremacy | 31 | B | | | NN1 | AJ0 | R | 0.65 | 0.1625 | | |
| 874 | bottle | battle | ba?0l | b&?0l | coll. battle fatigue | 33 | B | WS confused w/ metal fatigue | | NN1 | NN1 | R | 0.18 | 0.036 | | |
| 875 | bourbon | urban | burb0n | .9rb0n | coll. urban renewal | 34 | B | see rum | | NN1 | NN1 | C | 0.51 | 0.085 | | |
| 876 | cedar | see the | sid0r | siD0. | coll. cedars of Lebanon | 44 | B | | | NN1 | VVB AT0 | I | 0.08 | 0.016 | | |
| 877 | cervix | service | s9rvIks | s9rvI.s | coll. service station | 45 | B | | | NN1 | NN1 | R | 0.1 | 0.014285714 | | |
| 878 | clue | glue | klu | glu | | 50 | B | | | NN1 | NN1 | | 0.11 | 0.036666665 | | |
| 879 | cod | cold | ka.d | k5ld | coll. cold war | 51 | B | | | NN1 | AJ0 | R | 0.33 | 0.0825 | | |
| 880 | creche | crash | kr4S | kr&S | coll. crash diet | 58 | B | | French | NN1 | NN1 | R | 0.27 | 0.0675 | | |
| 881 | crossroad | crossword | krasr5.d | krasw9rd | coll. crossword puzzle | 59 | B | | | NN1 | NN1 | R | 0.55 | 0.06875 | | |
| 882 | drogue | drug | dr5g | dr^g | coll. drug store | 70 | B | | | NN1 | NN1 | R | 0.28 | 0.07 | | |
| 883 | due | blue | d.u | blu | coll. blue horizon | 71 | B | | | NN1 | AJ0 | C | 0.46 | 0.15333334 | | |
| 884 | earring | hearing | .6rIN | h6rIN | coll. hearing aid | 74 | B | | | NN1 | AJ0 | C | 0.07 | 0.014 | | |
| 885 | elf | shelf | .Elf | SElf | coll. shelf space | 76 | B | | | NN1 | NN1 | R | 0.52 | 0.13 | | |
| 886 | epoch | pock | ipak | .pak | coll. pock-marked | 78 | B | | | NN1 | NN1 | R | 0.13 | 0.0325 | e | +1 |
| 887 | eunuch | unique | jun0k | junik | coll. unique experience | 80 | B | | | NN1 | AJ0 | C | 0.26 | 0.052 | e | |
| 888 | eyrie | eerie | Eri | iri | coll. eerie feeling | 82 | B | | | NN1 | AJ0 | C | 0.29 | 0.096666664 | | |
| 889 | fat | cat | f&t | k&t | quote the fog comes on ... | 68 | B | quote identified correctly? | | NN1 | NN1 | Q+ | 0.44 | 0.14666666 | | |
| 890 | feed | speed | .fid | spid | coll. speed limit | 85 | B | | | NN1 | NN1 | R | 0.33 | 0.0825 | | |
| 891 | fig | big | fIg | bIg | idiom I'm a big boy now | 87 | B | | | NN1 | NN1 | E+ | 0.38 | 0.12666667 | | |
| 892 | file | vile | f1l | v1l | coll. vile idea | 87 | B | | | NN1 | AJ0 | C | 0.14 | 0.046666667 | | |
| 893 | flea | pea | fli | p.i | idiom thick as pea soup | 89 | B | | | NN1 | NN1 | E+ | 0.29 | 0.096666664 | | |
| 894 | floor play | foreplay | flOr | f.Or | coll. foreplay | 89 | B | just morpheme | | NN0 NN1 | NN1 | R | 0.06 | 0.015 | | |
| 895 | fun | fund | f^n. | f^nd | coll. fund raiser | 94 | B | | | NN1 | NN1 | R | 0.09 | 0.0225 | | |
| 896 | genital | gentle | JEnIt0l | JEn.?0l | coll. gentle persuasion | 96 | B | | | AV0 | AV0 | C | 0.27 | 0.03857143 | | +1 |
| 897 | glass | grass | gl&s | gr&s | coll. grass widow | 98 | B | | | NN1 | NN1 | R | 0.11 | 0.0275 | | |
| 898 | graft | graf (Zeppelin) | graft | graf. | coll. Graf Zeppelin | 100 | B | title ~ PropR | | NN1 | NP0 | F | 0.07 | 0.014 | | |
| 899 | gust | ghost | g^st | g5st | coll. ghost story | 103 | B | | | NN1 | NN1 | R | 0.29 | 0.0725 | | |
| 900 | heir | hair | .7r | h7r | coll. heir removal | 110 | B | | | NN1 | NN1 | R | 0.07 | 0.023333333 | | |
| 901 | herd | hard | h9rd | hard | idiom do it the hard way | 110 | B | | | NN1 | AJ0 | E+ | 0.29 | 0.0725 | | |
| 902 | hippie | happy | hIpI | h&pI | title happy birthday to you | 111 | B | | | NN1 | AJ0 | Q+ | 0.28 | 0.07 | | |
| 903 | homily | family | hamIlI | f&mIlI | coll. family woman | 112 | B | | | NN1 | NN1 | R | 0.56 | 0.093333334 | | |
| 904 | house | horse | h2.s | hOrs | coll. horse opera | 114 | B | | | NN1 | NN1 | R | 0.33 | 0.0825 | | |
| 905 | hurt | heart | h9rt | hart | coll. heart-to-heart | 114 | B | | | NN1 | NN1 | B | 0.29 | 0.0725 | | |
| 906 | interval | integral | In?0rv0l | In?0gr0l | coll. an integral part | 121 | B | | | NN1 | AJ0 | C | 1.44 | 0.18 | | |
| 907 | ire | higher | .10r | h10r | coll. higher things | 122 | B | | | NN1 | AJ0 | C | 0.07 | 0.0175 | | |
| 908 | jam | damn | J&m | d&m | coll. one thing after another | 124 | B | | | NN1 | AJ0 | I | 0.66 | 0.22 | | |
| 909 | jenny | any | JEnI | .EnI | coll. spinning jenny | 124 | B | | | NN1 | AT0 | C | 0.34 | 0.085 | | |
| 910 | jowl | jaw | J2l | JO. | coll. cheek by jowl | 125 | B | | | NN1 | NN1 | B | 0.35 | 0.11666667 | | |
| 911 | jungle | jingle | J^Ng0l | JINg0l | title jingel bells | 127 | B | | | NN1 | NN1 | Q+ | 0.29 | 0.048333332 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 912 | jut | jet | J^t | JEt | coll. jet set | 127 | B | | | NN1 | NN1 | R | 0.26 | 0.086666666 | | |
| 913 | lay | day | l4 | d4 | coll. day preacher | 134 | B | | | NN1 | NN1 | R | 0.34 | 0.17 | | |
| 914 | lemming | lemon | lEmIN | lEm0n | coll. lemon juice | 136 | B | | | NN1 | NN1 | R | 0.2 | 0.04 | | |
| 915 | lentil | Lent till | lEn?0l | lEntIl | | 136 | B | | | NN1 | NP0 PRP | | 0.21 | 0.035 | | |
| 916 | lingo | bingo | lINg5 | bINg5 | coll. bingo game | 139 | B | | | NN1 | NN1 | R | 0.66 | 0.132 | | |
| 917 | litter | little | lI?0r | lI?0l | idiom every little bit helps | 140 | B | | | NN1 | AJ0 | I+ | 0.13 | 0.026 | | |
| 918 | litter | bitter | lI?0r | bI?0r | idiom bitter pill | 140 | B | see also Swede | | NN1 | AJ0 | I+ | 0.66 | 0.132 | | |
| 919 | locust | low cost | l5k0st | l5kast | coll. low-cost food | 141 | B | | | NN1 | AJ0 NN1 | C | 0.26 | 0.043333333 | e | |
| 920 | lore | lower | lO.r | l50r | coll. lower body | 142 | B | | | NN1 | AJC | C | 0.35 | 0.0875 | | |
| 921 | lust | just | l^st | J^st | | 143 | B | | | NN1 | AJ0 | | 1 | 0.25 | | |
| 922 | mink | mint | mINk | mInt | coll. mint condition | 150 | B | | | NN1 | AJ0 | C | 0.33 | 0.0825 | | |
| 923 | nacelle | nasal | n0sEl | n4z0l | coll. nasal drops | 156 | B | | | NN1 | AJ0 | C | 0.61 | 0.122 | l | |
| 924 | nay | May | n4 | m4 | coll. May day celebration | 158 | B | | | NN1 | NP0 | I | 0.14 | 0.07 | | |
| 925 | neap | neat | nip | nit | coll. neat trick | 158 | B | | | NN1 | AJ0 | C | 0.18 | 0.06 | | |
| 926 | nit | net | nIt | nEt | coll. net loss | 159 | B | | | NN1 | NN1 | R | 0.2 | 0.06666667 | | |
| 927 | noodle | new dill | nud0l | nudIl | | 160 | B | post-punch explanation | | NN1 | AJ0 NN1 | | 0 | 0 | e | |
| 928 | nook | book | nUk | bUk | coll. bookworm | 160 | B | | | NN1 | NN1 | R | 0.66 | 0.22 | | |
| 929 | notion | potion | n5S0n | p5S0n | coll. love potion | 161 | B | | | NN1 | NN1 | R | 0.66 | 0.132 | | |
| 930 | nudge | fudge | n^J | f^J | coll. fudge sundae | 162 | B | | | NN1 | NN1 | R | 1 | 0.33333334 | | |
| 931 | nymph | lymph | nImf | lImf | coll. lymph glands | 162 | B | | | NN1 | NN1 | R | 0.23 | 0.0575 | | |
| 932 | owl | old | 5l. | 5ld | proverb there's no fool like an old fool | 167 | B | | | NN1 | AJ0 | S+ | 0.09 | 0.03 | | |
| 933 | peasant | pleasant | p.Ez0nt | plEs0nt | | 172 | B | what? | | NN1 | AJ0 | | 0.15 | 0.021428572 | | |
| 934 | pheasant | peasant | fEz0nt | pEz0nt | quote rogue and peasant slave (Hamlet) | 174 | B | | | NN1 | NN1 | Q+ | 0.23 | 0.038333334 | | |
| 935 | plinth | prince | plInT | prInT | coll. prince charming | 178 | B | | | NN1 | NN1 | I | 0.11 | 0.022 | | |
| 936 | Poe | poor | p5. | p8r | idiom the poor man's something | 178 | B | | | NN1 | AJ0 | I+ | 0.34 | 0.11333334 | | |
| 937 | quiff | cliff | kwIf | klIf | coll. cliff hanger | 189 | B | | | NN1 | NN1 | R | 0.25 | 0.0625 | | |
| 938 | rabbit | rapid | r&bIt | r&pId | coll. rapid transit | 190 | B | | | NN1 | AJ0 | C | 0.25 | 0.05 | | |
| 939 | raccoon | wreck and (ruin) | r&kun | rEk0n | idiom go to wreck and ruin | 190 | B | | | NN1 | NN1 CJC | E+ | 0.45 | 0.09 | l | |
| 940 | raid | great | .r4d | gr4t | title the Great Skelton's music guide | 191 | B | | | NN1 | AJ0 | Q+ | 0.47 | 0.1175 | | |
| 941 | rail | real | r4l | ril | idiom the real thing | 191 | B | | NYC | NN1 | AJ0 | I+ | 0.29 | 0.096666664 | | |
| 942 | rear | near | r6r | n6r | coll. in the near future | 193 | B | | | NN1 | AJ0 | I | 0.31 | 0.10333333 | | |
| 943 | remorse | Morse | rImOrs | ..mOrs | coll. morse code | 194 | B | | | NN1 | NN1 | R | 0.13 | 0.021666666 | | +1 |
| 944 | rube | rude | rub | rud | coll. rude shock | 199 | B | | | NN1 | AJ0 | C | 0.21 | 0.07 | | |
| 945 | rye | right | r1. | r1t | coll. dry sense of humor | 200 | B | | | NN1 | AJ0 | I | 0.07 | 0.023333333 | | |
| 946 | sailfish | selfish | s4lfIS | sElfIS | coll. selfish motives | 202 | B | | | NN1 | AJ0 | C | 0.26 | 0.043333333 | | |
| 947 | samovar | some of our | s&m0var | s^m0var | | 202 | B | | | NN1 | PN1 PRP DPS | | 0.27 | 0.03857143 | | |
| 948 | scheme | steam | skim | stim | coll. steam engine | 204 | B | | | NN1 | NN1 | R | 0.14 | 0.035 | | |
| 949 | scrotum | totem | skr5?0m | .t.5?0m | coll. totem pole | 205 | B | | | NN1 | NN1 | R | 0.25 | 0.035714287 | | |
| 950 | seek | sick | sik | sIk | coll. sick joke | 206 | B | | | NN1 | AJ0 | C | 0.1 | 0.033333335 | | |
| 951 | shad | sad | S&d | s&d | coll. a sad occasion | 208 | B | | | NN1 | AJ0 | C | 0.09 | 0.03 | | |
| 952 | shark | shock | Sark | Sa.k | coll. shock absorbers | 208 | B | | | NN1 | NN1 | R | 0.03 | 0.0075 | | |
| 953 | shay | jay | S4 | J4 | coll. jay walking | 208 | B | | | NN1 | NN1 | I | 0.38 | 0.19 | | |
| 954 | shock | shop | Sak | Sap | coll. shop talk | 209 | B | | | NN1 | NN1 | R | 0.23 | 0.07666667 | | |
| 955 | sincere | sear | sIns6r | ...s6r | coll. sear sucker suit | 211 | B | what? | | AJ0 | NN1 | R | 0.28 | 0.046666667 | | +1 |
| 956 | snore | shore | snOr | S.Or | coll. shore duty | 214 | B | | | NN1 | NN1 | R | 0.27 | 0.0675 | | |
| 957 | spaniel | Spanish | sp&nj0l | sp&n.IS | coll. Spanish Armada | 216 | B | | | NN1 | AJ0 | R | 1.1 | 0.15714286 | | |
| 958 | spice | space | sp1s | sp4s | coll. aerospace industry | 217 | ne | just morpheme | | NN1 | NN1 | R | 0.27 | 0.0675 | | |
| 959 | steel | still | stil | stIl | idiom we can all still be friends | 219 | B | | | NN1 | AV0 | E+ | 0.1 | 0.025 | | |
| 960 | stork | stark | stOrk | start | coll. stark naked | 221 | B | | | NN1 | AV0 | C | 0.39 | 0.078 | | |
| 961 | suite | seat | swit | s.it | coll. backseat driver | 222 | B | | | NN1 | NN1 | R | 0.11 | 0.0275 | | |
| 962 | swish | shish | swIS | S.IS | coll. shish kebab | 224 | B | | | NN1 | NN1 | F | 0.28 | 0.07 | | |
| 963 | tapir | tapered | t4p0r. | t4p0rd | | 226 | B | quote? | | NN1 | AJ0 | | 0.09 | 0.015 | | |
| 964 | thigh | bi | T1 | b1 | coll. bi-focals | 230 | B | just morpheme | | NN1 | UNC | R | 1 | 0.5 | | |
| 965 | three | tree | Tri | tri | quote a partridge in a pear tree | 230 | B | | | CRD | NN1 | Q+ | 0.2 | 0.06666667 | | |
| 966 | tin | thin | tIn | TIn | idiom the thin red line | 232 | B | | | NN1 | AJ0 | E+ | 0.18 | 0.06 | | |
| 967 | tongue | kung (fu) | t^N | kUN | coll. kung fu | 233 | B | just morpheme | | NN1 | UNC | F | 0.44 | 0.14666666 | | |
| 968 | totter | tartar | ta.?0r | tar?0r | coll. tartar sauce | 235 | B | | | NN1 | NN1 | R | 0.04 | 0.006666667 | | |
| 969 | tour | whore | t8r | hOr | coll. whore house | 234 | B | | | NN1 | NN1 | R | 0.73 | 0.24333334 | | |
| 970 | tram | damn | tr&m | d.&m | idiom one damn thing after another | 235 | B | | | NN1 | AJ0 | I+ | 0.14 | 0.035 | | |
| 971 | trip-tease | strip-tease | .trIptiz | strIptiz | coll. striptease | 236 | B | | | NN1 | NN1 | R | 0.1 | 0.0125 | | |
| 972 | troll | droll | tr5l | dr5l | idiom a droll sense of humor | 236 | B | | | NN1 | AJ0 | E+ | 0.11 | 0.0275 | | |
| 973 | tweet | sweet | twit | swit | coll. sweet music | 238 | B | | | NN1 | AJ0 | C | 0.44 | 0.11 | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 974 | vamp | lamp | v&mp | l&mp | coll. lamp light | 242 | B | | | NN1 | NN1 | R | 0.44 | 0.11 | | |
| 975 | vest | vast | vEst | v&st | coll. vast mistake | 244 | B | | | NN1 | AJ0 | C | 0.2 | 0.05 | | |
| 976 | vice | nice | v1s | n1s | idiom what's a nice girl like you doing ... | 245 | B | | | NN1 | AJ0 | E+ | 0.66 | 0.22 | | |
| 977 | visa | these are | vis0. | Dis0r | | 246 | ne | what? | | NN1 | DT0 VBB | | 0.42 | 0.084 | | |
| 978 | vise | wise | v1s | w1z | coll. wise guy | 246 | B | | | NN1 | AJ0 | C | 0.15 | 0.05 | | |
| 979 | vowel | bowel | v20l | b20l | coll. bowel movement | 247 | B | | | NN1 | NN1 | R | 0.44 | 0.11 | | |
| 980 | whore | horror | hOr.. | hOr0r | coll. horror show | 253 | B | | | NN1 | NN1 | R | 0.11 | 0.022 | | -1 |
| 981 | yard | hard | jard | hard | idiom it's a hard life | 259 | B | | | NN1 | AJ0 | E+ | 0.44 | 0.11 | | |
| 982 | yarn | darn | jarn | darn | coll. any damn thing | 259 | B | | | NN1 | AJ0 | I | 1 | 0.25 | | |
| 983 | bust | bus | bast | bas. | coll. bus stop | 39 | B | | | NN1 | NN1 | R | 0 | 0 | | |
| 984 | pun | pen | pan | pEn | coll. pen pal | 184 | B | | | NN1 | NN1 | R | 0 | 0 | | |
| 985 | bourbon | urban | b9rb0n | .9rb0n | coll. urban life | 199 | B | | | NN1 | AJ0 | C | 0 | 0 | | |
| 986 | sheik | silk | Si.k | sIlk | coll. silk veil | 209 | B | collocation recoverability | | NN1 | NN1 | R | 0 | 0 | | |
| 987 | Rhodes scholared | rose colored | r5dskal0rd | r5.zk^l0rd | idiom rose-colored glasses | 196 | B | | | NP0 NN1 | AV0 AJ0 | I+ | 0.39 | 0.039 | | |
| 988 | cane chew | can't you | k4nCU | k&nC0 | title can't you hear me calling, ... | 42 | T | | | NN0 NN1 | VM0 XX0 PNP | Q+ | 0.56 | 0.112 | | |
| 989 | highway cop | I wake up | h1w4kap | .1w4k^p | | 111 | T | | | NN0 NN1 | PNP VVB AVP | P | 0.29 | 0.04142857 | | |
| 990 | liner pier | lyin' up here | l1.n0rp6r | l1In0.p6r | | 139 | T | | | NNO NN1 | VVG P AV0 | | 0.14 | 0.015555556 | | |
| 991 | H heaver | achiever | 4Chiv0r | 0C.iv0r | coll. late achiever | 105 | B | | | ZZ0 NN1 | NN1 | C | 0.36 | 0.05142857 | | |
| 992 | opera-tunist | opportunist | ap0r0tunIst | ap0r.tunIst | | 236 | B | see tune only morpheme | | NN0 NN1 | NN1 | | 0.04 | 0.0036363637 | | |
| 993 | Oxo-gin | oxygen | aks0JIn | aksIJ0n | coll. breathe oxygen | 167 | B | | | NP0 NN1 | NN1 | I | 0.01 | 0.0014285714 | | |
| 994 | knock need | knock knee | naknid | nakni. | coll. knock knee | 158 | B | WS | | NN0 NN1 | NN0 NN1 | R | 0.11 | 0.018333333 | | |
| 995 | Nostrum Damus | Nostradamus | nastr0md4m0s | nastr0.d4m0s | | 161 | B | | | UNC NP0 | NP0 | | 0.14 | 0.011666667 | | |
| 996 | Umber Ella | umbrella | ^mb0rEl0 | ^mb.rEl0 | _def. | 239 | ne | | | NN0 NP0 | NN1 | | 0.04 | 0.005 | | +1 |
| 997 | clip-sew | calipso | k.lIps5 | k0lIps5 | coll. calipso music | 49 | B | | | NN1 | NN1 | R | 0.07 | 0.01 | | -1 |
| 998 | clock | cock | klak | k.ak | coll. cocksucker | 49 | B | I knew it was out there | | NN1 | NN1 | R | 0.06 | 0.015 | | |
| 999 | clods | gods | kladz | g.adz | idiom chariot of the gods | 49 | B | | | NN1 | NN1 | I+ | 0.17 | 0.034 | | |
| 1000 | bugger | beggar | b^g0r | bEg0r | title beggar's opera | 37 | B | | | NN1 POS | NN1 POS | Q+ | 0.26 | 0.052 | | |
| 1001 | harpies | Harper's | harpI.z | harp0rz | title Harper's Bazaar | 107 | B | | | NN1 | NP0 POS | Q+ | 0.05 | 0.007142857 | | |
| 1002 | sheik | sheep | Sik | Sip | idiom wolf in sheep's clothing | 209 | B | | | NN1 POS | NN1 POS | E+ | 0.23 | 0.07666667 | | |
| 1003 | teensters' | teamsters' | tinst0rz | timst0rz | coll. teamsters' union | 228 | B | | | NN1 POS | NN1 POS | R | 0.14 | 0.0175 | | |
| 1004 | ale | all | 4l | Ol | proverb all's well that ends well | 10 | B | see ale-hell | | NN1 | NN1 | S+ | 0.29 | 0.145 | | |
| 1005 | artichoke | architect | ar?IC5k. | arkItEkt | | 16 | B | what? | | NN1 | NN1 | | 1.4 | 0.175 | | |
| 1006 | bitch | stitch | .bIC | stIC | proverb a stitch in time saves nine | 30 | B | | | NN1 | NN1 | S+ | 0.54 | 0.135 | | |
| 1007 | bloat | boat | bl5t | b.5t | title row, row, row your boat | 31 | ne | env. adjusted | | NN1 | NN1 | Q+ | 0.06 | 0.015 | | |
| 1008 | bride | bread | br1d | brEd | idiom which side one's bread is buttered on | 25 | B | see barter | | NN1 | NN1 | E+ | 0.3 | 0.075 | | |
| 1009 | burp | bird | b9rp | b9rd | idiom a little bird told me | 38 | B | | | NN1 | NN1 | S+ | 0.44 | 0.11 | | |
| 1010 | conversation | conservation | kanv0rs4S0n | kans0rv4S0n | | 54 | B | metathesis! | | NN1 | NN1 | | 1.66 | 0.1509091 | | |
| 1011 | cranes | rain | kr4nz | .r4n. | title the rain in spain ... | 57 | B | sg-pl adjustment | | NN2 | NN1 | Q+ | 0.35 | 0.07 | | |
| 1012 | cut | cup | k^t | k^p | idiom my cup runneth over | 61 | B | | | NN1 | NN1 | Q+ | 0.31 | 0.10333333 | | |
| 1013 | dace | days | d4s | d4z | idiom happy days are here again | 62 | B | | | NN1 | NN2 | Q+ | 0.07 | 0.023333333 | | |
| 1014 | denier | then you | d0n.6r | D0nj0. | | 65 | B | | | NN1 | CJS PNP | | 0.47 | 0.07833333 | 1 | |
| 1015 | dog | fog | dag | fag | quote the fog comes on ... | 68 | B | where? | | NN1 | NN1 | Q+ | 1 | 0.33333334 | | |
| 1016 | era | error | 6r0. | Er0r | coll. Churchill Era | 78 | B | | | NN1 | NN1 | R | 0.33 | 0.0825 | | |
| 1017 | fertilization | naturalization | f9rt..Il0z4S0n | n&.C0r0l0z4S0n | _def. | 86 | B | what? | | NN1 | NN1 | | 1.48 | 0.105714284 | | -1 |
| 1018 | flame | fame | fl4m | f.4m | idiom s.o.'s fame has spread | 88 | B | see also indigo | | NN1 | NN1 | I+ | 0.06 | 0.015 | | |
| 1019 | flute | fruit | flut | frut | | 90 | B | | Chinese | NN1 | NN1 | | 0.11 | 0.0275 | | |
| 1020 | gas | guess | g&s | gEs | idiom your guess is as good as mine | 96 | B | | | NN1 | NN1 | E+ | 0.19 | 0.06333333 | | |
| 1021 | groom | broom | grum | brum | proverb a new broom sweeps clean | 102 | B | | | NN1 | NN1 | S+ | 0.31 | 0.0775 | | |
| 1022 | gull | lull | g^l | l^l | idiom lull in the conversation | 103 | B | | | NN1 | NN1 | I+ | 1 | 0.33333334 | | |
| 1023 | hams | hands | h&m.z | h&ndz | idiom all hands on deck | 106 | B | | | NN2 | NN1 | E+ | 0.2 | 0.04 | | |
| 1024 | herd | bird | h9rd | b9rd | proverb a bird in the hand ... | 110 | B | | | NN1 | NN1 | S+ | 1 | 0.25 | | |
| 1025 | honey | money | h^nI | m^nI | | 113 | B | what? | | NN1 | NN1 | | 0.52 | 0.13 | | |
| 1026 | interloper | antelope | In?0rl5p0r | &n?I.l5p.. | idiom where the deer and antelope play | 121 | B | | | NN1 | NN1 | E+ | 0.38 | 0.038 | | +1 |
| 1027 | lays | days | l4z | d4z | title oh, the days dwindle down ... | 134 | B | see also May | | NN2 | NN2 | Q+ | 0.34 | 0.11333334 | | |
| 1028 | lesion | legion | liZ0n | liJ0n | coll. French Foreign Legion | 136 | B | | | NN1 | NN1 | R | 0.31 | 0.062 | | |
| 1029 | lewd | Lord | lu.d | lOrd | quote the lord giveth, and the lord .. | 137 | B | | | NN1 | NN1 | Q+ | 0.33 | 0.0825 | | |
| 1030 | lice | lights | l1.s | l1ts | idioms head lice head lights | 137 | B | | | NN1 | NN2 | R | 0.07 | 0.0175 | | |
| 1031 | loining | learning | l3.nIN | l9rnIN | quote little learning is a dangerous thing (Pope) | 141 | B | | | NN1 | NN1 | Q+ | 0.33 | 0.055 | | |
| 1032 | lynch | inch | lInC | .InC | proverb an inch is as good as a mile | 143 | B | | | NN1 | NN1 | S+ | 0.06 | 0.015 | | |
| 1033 | malicious | militia | m0lIS0s | mIlIS0. | | 145 | B | | | NN1 | NN1 | | 0.08 | 0.011428571 | | |
| 1034 | maneuver | manure | m0nuv0r | m0n8..r | coll. horse manure | 146 | B | | | NN1 | NN1 | R | 0.67 | 0.095714286 | | |
| 1035 | mines | minds | m1n.z | m1ndz | proverb great minds think alike | 220 | B | see stink | | NN2 | NN1 | S+ | 0.09 | 0.018 | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1036 | nail | mail | n4l | m4l | idiom the mail must go through | 156 | B | | | NN1 | NN1 | Q+ | 0.14 | 0.046666667 | |
| 1037 | nudes | news | nudz | nu.z | title no news is good news (Wodehouse) | 162 | B | | | NN2 | NN2 | Q+ | 0.11 | 0.0275 | |
| 1038 | oak | joke | .5k | J5k | idiom the joke's on you | 163 | B | | | NN1 | NN1 | I+ | 0.52 | 0.17333333 | |
| 1039 | pain | rain | p4n | r4n | quote the rain in Spain ... | 216 | B | see spay | | NN1 | NN1 | Q+ | 0.52 | 0.17333333 | |
| 1040 | parking | parting | parkIN | par?IN | idiom parting is such sweet sorrow | 170 | B | | | NN1 | NN1 | E+ | 0.66 | 0.11 | |
| 1041 | peepers | people | pip0rz | pip0l. | proverb people who live in glass houses... | 113 | B | see hose | | NN2 | NN1 | S+ | 0.38 | 0.06333333 | |
| 1042 | prose | rose | pr5z | .r5z | proverb a rose by any other name....as sweet | 183 | B | | | NN1 | NN1 | S+ | 0.16 | 0.04 | |
| 1043 | pup | cup | p^p | k^p | quote my cup runneth over | 185 | B | | | NN1 | NN1 | Q+ | 0.24 | 0.08 | |
| 1044 | rube | rub | rub | r^b | quote aye, there's the rub | 199 | B | | | NN1 | NN1 | Q+ | 0.28 | 0.093333334 | |
| 1045 | rum | room | r^m | rUm | quote there's more room to fight | 199 | B | syntax not identical ?! | | NN1 | NN1 | Q+ | 0.28 | 0.093333334 | |
| 1046 | seasons | seasonings | siz0..nz | siz0nINz | | 205 | B | | | NN2 | NN2 | | 0.35 | 0.04375 | -1 |
| 1047 | servant | serpent | s9rv0nt | s9rp0nt | | 207 | B | | | NN1 | NN1 | | 0.66 | 0.09428571 | |
| 1048 | snail | trail | sn4l | tr4l | title there's a long, long trail a-winding | 214 | B | | | NN1 | NN1 | Q+ | 0.63 | 0.1575 | |
| 1049 | snitch | stitch | snIC | stIC | proverb a stitch in time saves nine | 214 | B | | | NN1 | NN1 | S+ | 0.34 | 0.085 | |
| 1050 | stalk | stork | stO.k | stOrk | | 218 | B | | | NN1 | NN1 | | 0.04 | 0.008 | |
| 1051 | strain | rain | str4n | ..r4n | quote into every life a little rain must fall | 221 | B | | | NN1 | NN1 | Q+ | 0.15 | 0.03 | |
| 1052 | teal | tail | til | t4l | | 227 | B | | | NN1 | NN1 | | 0.27 | 0.09 | |
| 1053 | thing | think | TIN. | TINk | quote I think that I shall never see ... | 230 | B | | | NN1 | VVB | Q+ | 0.18 | 0.045 | |
| 1054 | tool | fool | tul | ful | proverb there's no fool like an old fool | 233 | B | | | NN1 | NN1 | S+ | 1 | 0.33333334 | |
| 1055 | tufts | tough | t^fts | t^f.. | proverb when the going gets tough ... | 237 | B | | | NN2 | NN1 | S+ | 0.15 | 0.03 | |
| 1056 | unction | action | ^NkS0n | &.kS0n | proverb actions speak louder than words | 240 | B | | | NN1 | NN1 | S+ | 0.66 | 0.11 | |
| 1057 | urn | turn | .9rn | t9rn | proverb one good turn deserves another | 240 | B | | | NN1 | NN1 | S+ | 0.07 | 0.0175 | |
| 1058 | vassal | vessel | v&s0l | vEs0l | | 243 | B | | | NN1 | NN1 | | 0.19 | 0.038 | |
| 1059 | vicar | liquor | vIk0r | lIk0r | proverb candy is dandy, but liquor is quicker | 245 | B | | | NN1 | NN1 | S+ | 0.44 | 0.088 | |
| 1060 | vigil | Virgil | vI.JIl | v9rJIl | | 245 | B | | | NN1 | NP0 | | 0.33 | 0.055 | |
| 1061 | word | work | w9rd | w9rk | proverb a woman's work is never done | 255 | B | | | NN1 | NN1 | S+ | 0.52 | 0.13 | |
| 1062 | word | bird | w9rd | b9rd | proverb a bird in the hand ... | 255 | B | | | NN1 | NN1 | S+ | 0.66 | 0.165 | |
| 1063 | yule | fool | jul | ful | proverb there's no fool like an old fool | 261 | B | | | NN1 | NN1 | S+ | 1 | 0.33333334 | |
| 1064 | God I | gotta | ga?1 | ga?0 | idiom if you gotta go ... | 99 | T | atrocious, elliptical | | NN1 PNP | VM0 TO0 | S+ | 0.29 | 0.0725 | |
| 1065 | abbreviate | a brie we ate | 0brivi4t | 0briwi4t | | 5 | ne | | | VVB | AT0 NN1 PNP VVD | | 0.08 | 0.01 | |
| 1066 | affiliate | a fill he ate | 0fIl.i4t | 0fIlhi4t | | 9 | ne | | | VVB | AT0 NN1 PNP VVD | | 0.07 | 0.00875 | |
| 1067 | afflict | a flick | 0flIkt | 0flIk. | _def. | 9 | ne | | | VVB | ATO NN1 | | 0.07 | 0.011666667 | |
| 1068 | ain't | aunt | 4nt | &nt | _def. | 9 | ne | | | VBB XX0 | NN1 | | 0.27 | 0.09 | |
| 1069 | air | err | 7r | 9r | proverb to err is human, ... forgive, divine | 92 | B | see forklift | | VVI | VVI | S+ | 0.3 | 0.15 | |
| 1070 | amends | a men's | 0mEndz | 0mEn.z | _def. | 12 | ne | | | VVZ | AT0 NN1 POS | | 0.11 | 0.018333333 | |
| 1071 | bait | beat | b4t | bit | idiom you can't beat it | 22 | B | | | VVB | VVB | E+ | 0.28 | 0.093333334 | |
| 1072 | bead | beat | bid | bit | coll. beat it | 25 | B | | | VVI | VVI | I | 0.09 | 0.03 | |
| 1073 | beer | be | b6r | bi. | quote to be or not to be | 27 | B | beer (v.) is pushing it, | | VVI | VBI | Q+ | 0.32 | 0.10666667 | |
| 1074 | beguile | big girl | bIg1.l | bIg9rl | idiom she's a big girl now | 27 | B | | | VVB | AJ0 NN1 | E+ | 0.33 | 0.055 | |
| 1075 | bend | end | bEnd | .End | idiom the be-all and end-all | 28 | B | | | VVB | VVB | E+ | 0.21 | 0.0525 | |
| 1076 | bind | mind | b1nd | m1nd | idiom mind over matter | 30 | ne | desp. WC B□,3 | | VVB | NN1 | E+ | 0.44 | 0.11 | |
| 1077 | bisex | bisect | b1sEks | b1sEkt | coll. bisecting angles | 30 | B | | | VVG | VVG | C | 0.34 | 0.05666667 | |
| 1078 | bleach | breach | bliC | briC | idiom breach of promise | 31 | B | | | VVI | VVI | I+ | 0.11 | 0.0275 | |
| 1079 | blouse | blows | bl2z | bl5z | | 31 | B | | | VVZ | VVZ | | 0.29 | 0.0725 | |
| 1080 | braise | praise | br4z | pr4z | quote praise Him who made it | 34 | B | what? | | VVB | VVB | Q+ | 0.14 | 0.035 | |
| 1081 | bullet | pull it | bUlIt | pUlIt | | 38 | B | Pun intr./Targ. trans. + O | | VVB | VVB PNP | | 0.14 | 0.028 | |
| 1082 | cauterize | caught a rise | kO?0r1z | ga?0r1z | | 44 | B | | Cockney | VVB | VVB AT0 NN1 | | 0.36 | 0.05142857 | |
| 1083 | cavort | quart | k0vOrt | k.wOrt | _def. | 44 | B | | Swedish | VVI | NN1 | | 0.12 | 0.02 | +1 |
| 1084 | chant | shan't | C&nt | S&nt | | 46 | T | WS had chant-can't | | VVB | VM0 XX0 | | 0.19 | 0.0475 | |
| 1085 | cost | lost | kast | last | title love's labour lost | 56 | B | | | VVN | AJ0 | Q+ | 0.66 | 0.165 | |
| 1086 | craze | praise | kr4z | pr4z | title praise the lord and pass the ammunition | 57 | B | spoon w/parse-pass | | VVI | VVI | Q+ | 0.23 | 0.0575 | |
| 1087 | crow | go | kr5 | g.5 | idiom if you gotta go... | 59 | B | | | VVI | VVI | S+ | 0.14 | 0.046666667 | |
| 1088 | crunch | lunch | kr^nC | .l^nC | idiom out to lunch | 59 | B | | | VVI | NN1 | I+ | 0.23 | 0.046 | |
| 1089 | cull | call | k^l | kOl | idiom don't call us, we'll call you | 60 | B | | | VVB | VVB | E+ | 0.28 | 0.093333334 | |
| 1090 | depart | the part | dIpart | D0part | | 65 | T | | | VVB | AT0 NN1 | | 0.06 | 0.01 | |
| 1091 | deploy | the ploy | dIpl3 | D0pl3 | | 65 | B | | | VVB | AT0 NN1 | | 0.06 | 0.012 | |
| 1092 | dry | cry | dr1 | kr1 | idiom see a grown man cry | 71 | B | | | AJ0 | VVB | E+ | 0.52 | 0.17333333 | |
| 1093 | earn | learn | .9rn | l9rn | coll. live and learn | 73 | B | | | VVB | VVB | B | 0.08 | 0.02 | |
| 1094 | eat | beat | .it | bit | idiom if you can't beat them, ... | 74 | B | | | VVI | VVI | S+ | 0.21 | 0.07 | |
| 1095 | elate | be late | il4t | .l4t | idiom better late than never | 75 | B | WS elate-late | | VVB | VBB AJ0 | S+ | 0.13 | 0.0325 | |
| 1096 | elevate | I'll have 8 | El0v4t | 1l0v4t | | 76 | ne | | | VVB | PNP VM0 PN1 | | 0.28 | 0.046666667 | |
| 1097 | eloping | loping | il5pIN | .l5pIN | idiom go loping down the road | 76 | B | | | VVG | VVG | E+ | 0.13 | 0.021666666 | +1 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1098 | enclose | in clothes | Enkl5.z | Inkl5Dz | | 77 | B | ellipsis, complicated | VVB | PRP NN2 | | 0.34 | 0.04857143 | | |
| 1099 | endow | indeed | End2. | Indid | | 77 | ne | | VVB | AV0 | | 0.6 | 0.12 | | |
| 1100 | evidence | have a dance | .EvId0ns | h&v0d&ns | idiom may I have a dance with you | 80 | B | | VVB | VHB AT0 NN1 | I+ | 0.52 | 0.065 | | |
| 1101 | field | feel | fild | fil. | proverb you're only as young as you feel | 86 | B | | VVB | VVB | S+ | 0.11 | 0.0275 | | |
| 1102 | flail | fail | fl4l | f.4l | idiom words fail me | 88 | B | | VVB | VVB | E+ | 0.06 | 0.015 | | |
| 1103 | foist | first | f3.st | f9rst | | 90 | T | | VVB | AV0 | | 0.33 | 0.066 | | |
| 1104 | forklift | forgive | fOrklIft | f0rg.Iv. | proverb to err is human, ... | 92 | B | | VVI | VVI | S+ | 0.65 | 0.08125 | | |
| 1105 | fry | try | fr1 | tr1 | idiom try harder | 94 | B | | VVB | VVB | I+ | 0.52 | 0.17333333 | | |
| 1106 | grow | glow | gr5 | gl5 | idiom glow with pride | 103 | B | | VVI | VVI | E+ | 0.13 | 0.043333333 | | |
| 1107 | grow | blow | gr5 | bl5 | coll. blow your mind | 103 | B | | VVB | VVB | I | 0.44 | 0.14666666 | | |
| 1108 | herd | hurt | h9rd | h9rt | idiom you always hurt the one you love | 110 | B | | VVI | VVI | E+ | 0.09 | 0.0225 | | |
| 1109 | hew | you | hju | .ju | | 110 | T | what? | VVI | PNP | | 0.08 | 0.026666667 | | |
| 1110 | immerse | worse | Im9rs | .w9rs | idiom from bad to worse | 117 | T | | VVI | AJC | E+ | 1.1 | 0.22 | | +1 |
| 1111 | immolate | him more late | .Im0.l4t | hImOrl4t | foreigner talk | 117 | T | | VVB | PNP AJC | | 0.36 | 0.045 | | |
| 1112 | impale | in pail | Imp4l | Inp4l | coll. pail  bucket | 118 | T | | VVB | PRP NN1 | R | 0.11 | 0.022 | | |
| 1113 | inhale | in hell | Inh4l | InhEl | | 119 | B | | VVI | PRP NN1 | | 0.26 | 0.052 | | |
| 1114 | inhibit | inhabit | InhIbIt | Inh&bIt | quote they shall inhabit the earth | 119 | B | | VVI | VVI | Q+ | 0.28 | 0.04 | | |
| 1115 | inoculate | immaculate | Inakjul4t | Im&kjulIt | coll. immaculate conception | 120 | T | | VVB | AJ0 | C | 0.6 | 0.06666667 | | |
| 1116 | insert | assert | Ins9rt | 0.s9rt | idiom assert one's masculinity | 120 | B | | VVI | VVI | I+ | 0.11 | 0.018333333 | e | |
| 1117 | jab | 'd you have | J.&b | J0&v | | 123 | B | | VVB | VDD PNP VHI | | 0.25 | 0.0625 | | -1 |
| 1118 | joke | choke | J5k | C5k | coll. choke to death | 125 | B | | VVI | VVI | I | 0.18 | 0.06 | | |
| 1119 | lacquer | like her | l&k0r | l1k0r | | 133 | B | | VVB | VVI PNP | | 0.22 | 0.044 | | |
| 1120 | lath | laugh | l&T | l&f | proverb he who laughs last ... | 134 | B | | VVZ | VVZ | S+ | 0.44 | 0.14666666 | | |
| 1121 | lease | leave | lis | liv | idiom love it or leave it | 135 | B | | VVB | VVB | S+ | 0.66 | 0.22 | | |
| 1122 | let | met | lEt | mEt | idiom never met a man I didn't like | 137 | T | | VMN | VVN | I+ | 0.38 | 0.12666667 | | |
| 1123 | lop | top | lap | tap | coll. top banana | 142 | T | | VVI | AJ0 | C | 0.38 | 0.12666667 | | |
| 1124 | maimed | named | m4md | n4md | title a streetcar named desire | 145 | ne | | VVN | VVN | Q+ | 0.11 | 0.0275 | | |
| 1125 | neap | reap | nip | rip | quote as you sow, so shall ye reap | 158 | B | | VVB | VVI | Q+ | 0.29 | 0.096666664 | | |
| 1126 | needle | need all | nid0l | nidOl | | 158 | B | | VVB | VVB AT0 | | 0.25 | 0.05 | | |
| 1127 | nod | not | nad | nat | | 160 | B | morpheme, ok when part of word | NN1 | XX0 | | 0.09 | 0.03 | | |
| 1128 | paint | ain't | p4nt | .4nt | idiom ... isn't what it used to be | 169 | B | | VVB | VBB XX0 | E+ | 0.16 | 0.04 | | |
| 1129 | park | bark | park | bark | idiom his bark is worse than his bite | 170 | T | | NN1 | NN1 | E+ | 0.16 | 0.04 | | |
| 1130 | parse | pass | pars | p&.s | title praise the lord and pass the ammunition | 8 | B | spoon w/craze-praise | VVB | VVB | Q+ | 0.21 | 0.0525 | | |
| 1131 | pawn | upon | .pOn | 0pan | quote return with your shields ... | 172 | B | | VVB | PRP | Q+ | 0.32 | 0.08 | | |
| 1132 | ponder | yonder | pand0r | jand0r | coll. wide blue yonder | 179 | B | | VVB | VVB | C | 1 | 0.16666667 | | |
| 1133 | punch | lunch | p^nC | l^nC | coll. out to lunch | 185 | B | | NN1 | NN1 | I | 1 | 0.25 | | |
| 1134 | raise | praise | .r4z | pr4z | quote ...o bury Caesar, not to praise him | 191 | B | | VVI | VVI | Q+ | 0.24 | 0.06 | | |
| 1135 | rate | ate | r4t | .4t | idiom something that I ate | 192 | B | | VVD | VVD | I+ | 0.03 | 0.01 | | |
| 1136 | razor | raise your | r4z.0r | r4zj0r | idiom raise eyebrows | 192 | B | | VVI | VVI DPS | I+ | 0.09 | 0.015 | | |
| 1137 | reap | weep | rip | wip | idiom read it and weep | 192 | B | | VVB | VVB | I+ | 0.21 | 0.07 | | |
| 1138 | reek | meek | rik | mik | quote the meek shall inherit the earth | 194 | T | | VVB | VV0 | Q+ | 0.66 | 0.22 | | |
| 1139 | relapse | relax | rIl&ps | rIl&ks | coll. relax and enjoy | 194 | B | | VVI | VVI | B | 0.24 | 0.04 | | |
| 1140 | repeat | repent | rIpi.t | rIpEnt | proverb marry in haste, repent in leisure | 195 | B | | VVB | VVB | S+ | 0.38 | 0.06333333 | | |
| 1141 | roil | rule | r3l | rul | quote Britain rule the waves | 198 | B | | VVZ | VVZ | Q+ | 0.3 | 0.1 | | |
| 1142 | ruminate | Roman ate | rum0n4t | r5m0n4t | | 200 | B | | VVB | NP0 VVD | | 0.27 | 0.03857143 | | |
| 1143 | seek | sheik | sik | Sik | idiom sheik of Araby | 206 | T | | VVB | NN1 | I+ | 0.17 | 0.05666667 | | |
| 1144 | sicken | thicken | sIk0n | TIk0n | idiom the plot thickens | 210 | B | | VVZ | VVZ | I+ | 0.25 | 0.05 | | |
| 1145 | skid | kid | skId | .kId | idiom I kid you not | 211 | B | | VVB | VVB | I+ | 0.08 | 0.02 | | |
| 1146 | slake | take | sl4k | t.4k | quote take five | 212 | B | | VVI | VVI | Q+ | 0.4 | 0.1 | | |
| 1147 | slink | sink | slINk | s.INk | idiom sink or swim | 213 | B | | VVI | VVI | B+ | 0.06 | 0.012 | | |
| 1148 | snow | snore | sn5. | snOr | _def. | 214 | ne | | VVI | VVI | | 0.3 | 0.075 | | |
| 1149 | stink | think | stINk | T.INk | proverb  great minds think alike | 220 | B | | VVB | VVB | S+ | 0.32 | 0.064 | | |
| 1150 | stray | stay | str4 | st.4 | idiom something is here to stay | 221 | B | | VVI | VVI | E+ | 0.03 | 0.0075 | | |
| 1151 | strike | like | str1k | ..l1k | idiom I've never met a man I couldn't like | 221 | B | | VVI | VVI | Q+ | 0.28 | 0.056 | | |
| 1152 | tack | take | t&k | t4k | idiom I just can't take it anymore | 225 | B | | VVI | VVI | I+ | 0.27 | 0.09 | | |
| 1153 | sing | Thing | TIN | sIN | idiom it don't mean a thing ... | 211 | T | | VVI | NN1 | E+ | 0.11 | 0.036666665 | | |
| 1154 | thumb | sum | T^m | s^m | idiom sum up a case | 230 | B | | VVI | VVI | I+ | 0.11 | 0.036666665 | | |
| 1155 | tinkle | twinkle | t.INk0l | twINk0l | title twinkle, twinkle, little star | 232 | B | | VVB | VVB | Q+ | 0.13 | 0.018571429 | | |
| 1156 | tramp | cramp | tr&mp | kr&mp | idiom cramp one's style | 235 | B | | VVI | VVI | E+ | 0.16 | 0.032 | | |
| 1157 | tryst | trust | trIst | tr^st | idiom in God we trust | 236 | B | wtf? | VVB | VVB | Q+ | 0.27 | 0.054 | | |
| 1158 | underwrite | on the right | ^nd0r1t | anD0r1t | idiom on the right side of the ledger | 240 | T | | VV0 | PRP AT0 AJ0 | E+ | 0.31 | 0.044285715 | | |
| 1159 | undulate | on the late | ^ndj0l4t | 0nD.0l4t | | 240 | T | | VV0 | PRP AT0 AJ0 | | 0.43 | 0.05375 | e | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1160 | ventilate | went till 8 | vEn?0l4t | wEntIl4t | | 244 | T | | | VV0 | VVD PRP NN1 | | 0.29 | 0.03625 | | |
| 1161 | venture | went your | vEnC0r | wEn?0. | idiom go one's way | 244 | T | | | VV0 | VVD DPS | E+ | 0.77 | 0.12833333 | | |
| 1162 | wand | want | wand | want | coll. anything you want | 249 | B | | | VVB | VVB | I | 0.09 | 0.0225 | | |
| 1163 | wane | rain | w4n | r4n | idiom it never rains but it pours | 249 | B | | | VVZ | VVZ | E+ | 0.14 | 0.046666667 | | |
| 1164 | west | rest | wEst | rEst | | 251 | B | | rabbit | VVB | VVB | | 0.14 | 0.035 | | |
| 1165 | whine | shine | w1n | S1n | idiom rise and shine | 252 | B | | | VVB | VVB | B+ | 1 | 0.33333334 | | |
| 1166 | wilt | will | wIlt | wIl. | coll. I will | 253 | B | | | VVB | VMD | I | 0.07 | 0.0175 | | |
| 1167 | worship | war-ship | w0rSIp | wOrSIp | | 255 | T | | | NN1 | NN1 | | 0.25 | 0.041666668 | | |
| 1168 | yawn | you're on | j..On | j8ran | coll. you're on | 259 | B | P: exclamation | | VV0 | PNP VBB AVP | P | 1.29 | 0.258 | e | -1 |
| 1169 | yearn | earn | j9rn | .9rn | idiom earn one's way | 259 | B | | | VVI | VVI | I+ | 0.1 | 0.025 | | |
| 1170 | yonder | (a)re on their | jand0r | ranD0r | idiom on one's way home | 260 | T | | | PRP | VBB PRP DPS | I+ | 0.71 | 0.11833333 | | |
| 1171 | zing | sing | zIN | sIN | | 262 | ne | what? | | VV0 | VV0 | | 0.07 | 0.023333333 | | |
| 1172 | mend straight | menstruate | mEndstr4t | mEn.str4t | | 148 | B | | | VVI AVP | VVI | | 0.11 | 0.012222222 | | |
| 1173 | share an aid | serenade | S7r0n4d | sEr0n4d | quote serenade ... 'neath a fair lady's window | 254 | B | see windrow | | VVB AT0 NN1 | VVI | Q+ | 0.38 | 0.054285713 | | |
| 1174 | feed 'em | freedom | f.id0m | frid0m | idiom battle cry of freedom | 85 | T | | | VVB PNP | NN1 | Q+ | 0.04 | 0.006666667 | | |
| 1175 | trust Owens | throw stones | tr^st50nz | Tr5st5.nz | proverb people who live in glass houses... | 113 | B | see hose | | VVI NP0 | VVI NN2 | S+ | 0.51 | 0.05666667 | | |
| 1176 | watch her | water | waC0r | wa?0r | coll. Scotch and water | 250 | B | | | VVI PNP | NN1 | B | 0.66 | 0.132 | | |
| 1177 | wore cologne | walk alone | wOrk0l5n | wO.k0l5n | | 52 | B | see cologne | | VVB | VVB | | 0.03 | 0.00375 | | |
| 1178 | blown apart | Bonaparte | bl5n0part | b.5n0part | coll. Napoleon Bonaparte | 31 | B | | | VVB AV0 | NP0 | I | 0.06 | 0.006666667 | | |
| 1179 | ginned | sinned | JInd | sInd | idiom forgive me, father, for I have sinned | 97 | B | | | VVN | VVN | Q+ | 0.38 | 0.095 | | |
| 1180 | invading | evading | Inv4dIN | i.v4dIN | idiom evade the issue | 121 | B | | | VVG | VVG | I+ | 0.25 | 0.035714287 | | |
| 1181 | open | hopin' | .5p0n | h5pIn | idiom keep hoping | 165 | B | | | AV0 | VVG | I+ | 0.07 | 0.014 | | |
| 1182 | zebra | the bra | zibr0 | D0bra | | 261 | T | | | NN1 | AT0 NN1 | | 0.84 | 0.168 | e | |

# Appendix F: Intrusion Frequency Table

The following table is taken from Sobkowiak (1991: 223). It is the primary basis for the cost table in Appendix G.

| T\P | S | Z | h | m | n | N | l | r | j | w | ? | i | I | E | & | a | O | U | u | 9 | 0 | ^ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | . | sum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| f | 1 | 0 | 5 | 0 | 1 | 0 | 1 | 3 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 67 |
| v | 0 | 0 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 81 |
| T | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 61 |
| D | 1 | 0 | 1 | 0 | 1 | 0 | 3 | 2 | 1 | 1 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 237 |
| s | 52 | 0 | 3 | 1 | 1 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 265 |
| z | 7 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 134 |
| S |  | 2 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 50 |
| Z | 4 |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| h | 2 | 0 |  | 5 | 3 | 0 | 3 | 2 | 4 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 79 | 132 |
| m | 0 | 0 | 3 |  | 28 | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 78 |
| n | 0 | 0 | 3 | 38 |  | 16 | 7 | 7 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 45 | 134 |
| N | 0 | 0 | 0 | 3 | 26 |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 31 |
| l | 1 | 0 | 1 | 0 | 12 | 0 |  | 30 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 141 |
| r | 0 | 0 | 0 | 2 | 8 | 0 | 40 |  | 2 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 224 | 334 |
| j | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 |  | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 83 |
| w | 0 | 0 | 2 | 1 | 3 | 0 | 4 | 14 | 1 |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 138 |
| ? | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 0 | 0 |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 78 |
| i | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  | 79 | 5 | 2 | 1 | 1 | 0 | 1 | 0 | 20 | 0 | 4 | 1 | 0 | 13 | 0 | 5 | 0 | 0 | 8 | 140 |
| I | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 106 |  | 50 | 20 | 10 | 2 | 2 | 4 | 1 | 161 | 6 | 9 | 0 | 0 | 11 | 3 | 3 | 1 | 0 | 40 | 429 |
| E | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 55 |  | 57 | 18 | 2 | 1 | 2 | 4 | 37 | 24 | 2 | 1 | 0 | 20 | 3 | 3 | 5 | 0 | 1 | 247 |
| & | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 13 | 51 |  | 63 | 8 | 0 | 2 | 5 | 31 | 12 | 3 | 2 | 0 | 17 | 1 | 0 | 3 | 0 | 0 | 212 |
| a | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 10 | 6 | 37 |  | 29 | 3 | 4 | 8 | 19 | 24 | 0 | 1 | 1 | 3 | 14 | 1 | 4 | 0 | 2 | 169 |
| O | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 17 | 33 |  | 4 | 5 | 3 | 26 | 10 | 0 | 4 | 3 | 3 | 20 | 1 | 0 | 5 | 0 | 140 |
| U | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 1 | 0 | 1 |  | 8 | 0 | 10 | 10 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 1 | 43 |
| u | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 1 | 2 | 3 | 2 |  | 0 | 10 | 3 | 0 | 3 | 2 | 0 | 15 | 0 | 0 | 3 | 0 | 49 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 4 | 6 | 7 | 7 | 0 | 2 |  | 4 | 3 | 3 | 1 | 7 | 0 | 2 | 2 | 1 | 0 | 0 | 54 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 154 | 24 | 35 | 34 | 17 | 5 | 20 | 5 |  | 10 | 5 | 2 | 1 | 9 | 40 | 2 | 4 | 1 | 77 | 476 |
| ^ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 8 | 15 | 48 | 13 | 4 | 10 | 2 | 16 |  | 0 | 0 | 0 | 2 | 12 | 0 | 0 | 0 | 0 | 144 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 13 | 12 | 44 | 36 | 4 | 0 | 1 | 2 | 51 | 4 |  | 3 | 10 | 19 | 7 | 0 | 1 | 0 | 2 | 219 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 7 | 15 | 2 | 0 | 3 | 0 | 6 | 2 | 2 |  | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 42 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 3 | 0 |  | 0 | 1 | 0 | 0 | 0 | 0 | 9 |
| 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 10 | 12 | 16 | 5 | 0 | 0 | 1 | 1 | 13 | 1 | 14 | 0 | 4 |  | 2 | 0 | 0 | 0 | 0 | 94 |
| 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 5 | 3 | 3 | 25 | 10 | 2 | 14 | 5 | 28 | 7 | 2 | 4 | 6 | 2 |  | 0 | 0 | 0 | 2 | 120 |
| 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 2 | 4 | 0 | 1 | 1 | 0 | 0 | 1 | 3 | 0 | 1 | 0 | 0 | 3 | 0 |  | 6 | 0 | 1 | 27 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 11 | 22 | 8 | 5 | 0 | 0 | 5 | 6 | 0 | 0 | 0 | 0 | 2 | 0 | 3 |  | 0 | 1 | 66 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 4 | 5 | 5 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |  | 1 | 30 |
| . | 2 | 0 | 74 | 25 | 47 | 5 | 104 | 280 | 45 | 39 | 5 | 29 | 50 | 5 | 3 | 4 | 3 | 0 | 6 | 1 | 203 | 1 | 1 | 0 | 0 | 2 | 11 | 0 | 0 | 0 |  | 1264 |
| sum | 103 | 15 | 105 | 87 | 152 | 21 | 189 | 368 | 70 | 93 | 54 | 216 | 422 | 205 | 286 | 316 | 113 | 28 | 88 | 49 | 646 | 117 | 49 | 22 | 34 | 106 | 140 | 20 | 25 | 11 | 958 |  |

# Appendix G: Cost Table

| T\P | p | t | k | b | d | g | C | J | f | v | T | D | s | z | S | Z | h | m | n | N | l | r | j | w | ? | i | I | E | & | a | O | U | u | 9 | 0 | ^ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | . |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | 0.00 | 0.31 | 0.23 | 0.14 | 1.00 | 1.00 | 1.00 | 1.00 | 0.23 | 0.66 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 0.66 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.24 |
| t | 0.18 | 0.00 | 0.14 | 0.44 | 0.09 | 1.00 | 0.38 | 1.00 | 0.52 | 0.66 | 0.20 | 1.00 | 0.34 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 0.34 | 1.00 | 0.38 | 0.34 | 1.00 | 1.00 | 0.21 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.07 |
| k | 0.24 | 0.16 | 0.00 | 1.00 | 0.52 | 0.10 | 0.38 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 0.34 | 1.00 | 1.00 | 1.00 | 0.34 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.18 |
| b | 0.16 | 0.38 | 0.52 | 0.00 | 0.38 | 0.31 | 1.00 | 1.00 | 0.38 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 0.66 | 1.00 | 0.66 | 0.66 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.21 |
| d | 0.44 | 0.11 | 0.34 | 0.21 | 0.00 | 0.44 | 1.00 | 0.66 | 1.00 | 0.44 | 0.66 | 0.44 | 0.66 | 0.66 | 1.00 | 1.00 | 1.00 | 0.66 | 0.38 | 1.00 | 0.34 | 0.44 | 1.00 | 1.00 | 0.18 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.09 |
| g | 0.66 | 0.66 | 0.11 | 0.44 | 0.34 | 0.00 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.38 |
| C | 1.00 | 0.38 | 0.52 | 1.00 | 1.00 | 1.00 | 0.00 | 0.18 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.15 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| J | 1.00 | 1.00 | 1.00 | 0.66 | 0.44 | 0.66 | 0.20 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.38 | 0.31 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 |
| f | 0.21 | 1.00 | 1.00 | 0.66 | 1.00 | 0.52 | 1.00 | 1.00 | 0.00 | 0.17 | 0.44 | 1.00 | 0.34 | 1.00 | 1.00 | 1.00 | 0.38 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 |
| v | 1.00 | 0.66 | 1.00 | 0.18 | 0.66 | 0.66 | 1.00 | 1.00 | 0.14 | 0.00 | 1.00 | 1.00 | 0.66 | 0.52 | 1.00 | 1.00 | 1.00 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.17 |
| T | 0.52 | 0.18 | 1.00 | 1.00 | 0.52 | 1.00 | 1.00 | 0.66 | 0.24 | 1.00 | 0.00 | 0.66 | 0.25 | 0.66 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 |
| D | 1.00 | 0.18 | 0.66 | 1.00 | 0.05 | 0.44 | 1.00 | 1.00 | 1.00 | 0.38 | 0.23 | 0.00 | 0.38 | 0.34 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 | 0.66 | 1.00 | 1.00 | 0.23 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.13 |
| s | 1.00 | 0.44 | 0.27 | 0.66 | 1.00 | 1.00 | 0.44 | 0.38 | 0.27 | 1.00 | 0.11 | 1.00 | 0.00 | 0.07 | 0.09 | 1.00 | 0.52 | 1.00 | 1.00 | 1.00 | 0.66 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.10 |
| z | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 | 0.44 | 0.07 | 0.00 | 0.31 | 0.38 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.21 |
| S | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.19 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 0.17 | 1.00 | 0.00 | 0.66 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 |
| Z | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| h | 1.00 | 0.44 | 0.38 | 0.52 | 1.00 | 1.00 | 0.52 | 1.00 | 0.52 | 0.52 | 1.00 | 1.00 | 0.44 | 1.00 | 0.66 | 1.00 | 0.00 | 0.38 | 0.52 | 1.00 | 0.52 | 0.66 | 0.44 | 0.38 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.07 |
| m | 0.52 | 1.00 | 0.66 | 0.44 | 0.44 | 0.66 | 1.00 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 | 0.00 | 0.14 | 1.00 | 0.38 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.19 |
| n | 1.00 | 0.66 | 0.66 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 | 0.11 | 0.00 | 0.19 | 0.31 | 0.31 | 1.00 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.10 |
| N | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.52 | 0.14 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| l | 1.00 | 1.00 | 0.66 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.23 | 1.00 | 0.00 | 0.13 | 0.25 | 0.25 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.08 |
| r | 0.52 | 0.52 | 1.00 | 0.66 | 0.29 | 0.52 | 1.00 | 0.38 | 1.00 | 0.44 | 1.00 | 1.00 | 0.44 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 0.29 | 1.00 | 0.11 | 0.00 | 0.66 | 0.14 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.04 |
| j | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 0.27 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.38 | 0.00 | 0.66 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.09 |
| w | 1.00 | 1.00 | 1.00 | 0.52 | 1.00 | 0.66 | 1.00 | 0.66 | 0.34 | 0.08 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 1.00 | 0.52 | 1.00 | 0.44 | 0.21 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.13 |
| ? | 1.00 | 0.17 | 0.66 | 1.00 | 0.12 | 0.66 | 0.66 | 1.00 | 0.66 | 1.00 | 1.00 | 1.00 | 0.52 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.44 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.34 |
| i | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.15 | 0.29 | 0.30 | 0.30 | 0.30 | 0.40 | 0.30 | 0.40 | 0.26 | 0.40 | 0.29 | 0.30 | 0.40 | 0.28 | 0.40 | 0.29 | 0.40 | 0.40 | 0.29 |
| I | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.10 | 0.00 | 0.21 | 0.26 | 0.28 | 0.30 | 0.30 | 0.29 | 0.30 | 0.00 | 0.29 | 0.28 | 0.40 | 0.40 | 0.28 | 0.29 | 0.29 | 0.30 | 0.40 | 0.11 |
| E | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.28 | 0.20 | 0.00 | 0.19 | 0.27 | 0.30 | 0.30 | 0.30 | 0.29 | 0.23 | 0.26 | 0.30 | 0.30 | 0.40 | 0.26 | 0.29 | 0.29 | 0.29 | 0.40 | 1.00 |
| & | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.30 | 0.28 | 0.20 | 0.00 | 0.18 | 0.29 | 0.40 | 0.30 | 0.29 | 0.24 | 0.28 | 0.29 | 0.30 | 0.40 | 0.27 | 0.30 | 0.40 | 0.29 | 0.40 | 1.00 |
| a | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.29 | 0.28 | 0.29 | 0.23 | 0.00 | 0.25 | 0.29 | 0.29 | 0.29 | 0.26 | 0.26 | 0.40 | 0.30 | 0.30 | 0.29 | 0.27 | 0.30 | 0.29 | 0.40 | 0.66 |
| O | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.29 | 0.27 | 0.24 | 0.00 | 0.29 | 0.29 | 0.29 | 0.25 | 0.28 | 0.40 | 0.29 | 0.29 | 0.29 | 0.26 | 0.30 | 0.40 | 0.29 | 1.00 |
| U | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.29 | 0.30 | 0.30 | 0.40 | 0.30 | 0.00 | 0.29 | 0.40 | 0.28 | 0.28 | 0.40 | 0.40 | 0.40 | 0.40 | 0.29 | 0.40 | 0.40 | 0.30 | 1.00 |
| u | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.30 | 0.29 | 0.40 | 0.30 | 0.30 | 0.29 | 0.30 | 0.00 | 0.40 | 0.28 | 0.29 | 0.40 | 0.29 | 0.30 | 0.40 | 0.27 | 0.40 | 0.40 | 0.29 | 1.00 |
| 9 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.40 | 0.30 | 0.00 | 0.29 | 0.29 | 0.29 | 0.30 | 0.29 | 0.40 | 0.30 | 0.30 | 0.30 | 0.40 | 1.00 |
| 0 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.24 | 0.01 | 0.26 | 0.23 | 0.24 | 0.27 | 0.29 | 0.26 | 0.29 | 0.00 | 0.28 | 0.29 | 0.30 | 0.30 | 0.28 | 0.23 | 0.30 | 0.29 | 0.30 | 0.07 |
| ^ | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.27 | 0.29 | 0.27 | 0.21 | 0.28 | 0.29 | 0.28 | 0.30 | 0.27 | 0.00 | 0.40 | 0.40 | 0.40 | 0.30 | 0.28 | 0.40 | 0.40 | 0.40 | 1.00 |
| 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.28 | 0.28 | 0.28 | 0.22 | 0.23 | 0.29 | 0.40 | 0.30 | 0.30 | 0.20 | 0.29 | 0.00 | 0.29 | 0.28 | 0.26 | 0.29 | 0.40 | 0.30 | 0.40 | 0.66 |
| 2 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.30 | 0.40 | 0.29 | 0.27 | 0.30 | 0.40 | 0.29 | 0.40 | 0.29 | 0.30 | 0.29 | 0.00 | 0.40 | 0.40 | 0.29 | 0.40 | 0.40 | 0.30 | 1.00 |
| 3 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.40 | 0.40 | 0.30 | 0.30 | 0.40 | 0.40 | 0.30 | 0.40 | 0.40 | 0.40 | 0.29 | 0.00 | 0.40 | 0.30 | 0.40 | 0.40 | 0.40 | 1.00 |
| 4 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.27 | 0.28 | 0.28 | 0.27 | 0.29 | 0.40 | 0.40 | 0.30 | 0.30 | 0.28 | 0.30 | 0.27 | 0.40 | 0.29 | 0.00 | 0.30 | 0.40 | 0.40 | 0.40 | 1.00 |
| 5 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.30 | 0.29 | 0.29 | 0.29 | 0.25 | 0.28 | 0.30 | 0.27 | 0.29 | 0.25 | 0.29 | 0.30 | 0.29 | 0.29 | 0.30 | 0.00 | 0.40 | 0.40 | 0.40 | 0.66 |
| 6 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.29 | 0.30 | 0.29 | 0.40 | 0.30 | 0.30 | 0.40 | 0.40 | 0.30 | 0.29 | 0.40 | 0.40 | 0.29 | 0.40 | 0.29 | 0.40 | 0.00 | 0.29 | 0.40 | 1.00 |
| 7 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.30 | 0.30 | 0.28 | 0.26 | 0.29 | 0.29 | 0.40 | 0.40 | 0.29 | 0.29 | 0.40 | 0.40 | 0.30 | 0.40 | 0.40 | 0.30 | 0.29 | 0.00 | 0.40 | 1.00 |
| 8 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.40 | 0.29 | 0.40 | 0.29 | 0.29 | 0.29 | 0.29 | 0.29 | 0.30 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.30 | 0.40 | 0.40 | 0.00 | 1.00 |
| . | 0.16 | 0.07 | 0.10 | 0.21 | 0.11 | 0.18 | 1.00 | 0.34 | 0.27 | 0.34 | 0.38 | 0.66 | 0.08 | 0.25 | 0.66 | 1.00 | 0.08 | 0.14 | 0.10 | 0.38 | 0.06 | 0.03 | 0.10 | 0.11 | 0.38 | 0.13 | 0.10 | 0.38 | 0.52 | 0.44 | 0.52 | 1.00 | 0.34 | 1.00 | 0.04 | 1.00 | 1.00 | 1.00 | 1.00 | 0.66 | 0.24 | 1.00 | 1.00 | 1.00 | 0.00 |

This preliminary cost table is based on the following formulae where x is frequency attested by Sobkowiak as documented in Appendix F and 161 is the highest frequency among Vs:

| segment pair type | formula |
|---|---|
| C/C C/. V/.: | $y=x^{-0.6}$ (asymptotic) |
| V/V: | $y=0.3-0.3x/161$ (linear) |
| C/V & V/C: | 1 (unattested) |

# VITA

Christian F. Hempelmann, born 5 February 1972 in Hannover, Germany.

## Education

Ph.D. in Linguistics
student since 2000 (candidate since July 2002, successful defense 28 April 2003, graduation 8 August 2003): Interdepartmental Program in Linguistics at Purdue University,

- dissertation "Paronomasic Puns: Target Recoverability towards Automatic Generation"
- dissertation committee: Victor Raskin (chair), Salvatore Attardo, Shaun Hughes, Mary Niepokuj, Sergei Nirenburg
- primary area: computational linguistics (ontological semantics, NLP for information security); secondary areas: linguistic humor studies, theoretical linguistics, and historical linguistics

*M.A. in English*
2000 specialization in TESOL, Youngstown State University. Thesis: "Incongruity and Resolution of Humorous Narratives-Linguistic Humor Theory and the Medieval Bawdry of Rabelais, Boccaccio, and Chaucer" supervised by Salvatore Attardo
*M.A. in English Linguistics, secondary area Religious Studies*
1998, [Magister Artium der Englischen Sprachwissenschaft, Zweitfach Religionswissenschaft], Universität Hannover, Thesis: "Linguistic Approaches to Humor: The General Theory of Verbal Humor in Performance" supervised by Rainer Schulze
*Abitur*
1991, major in Ancient Greek, German literature, and mathematics, Kaiser-Wilhelms-Gymnasium, Hannover, Germany

## Research and Professional Experience

*since Aug. 2000*
research assistant in various NLP projects with Victor Raskin and Mikhail Atallah at the Center for Education and Research in Information Assurance and Security (CERIAS) at Purdue University

*since Aug. 2000*
teaching assistant in the English Department of Purdue University: taught introductory composition and linguistics courses
*Aug. 1998 - June 2000*
teaching assistant in the English Department of Youngstown State University: taught introductory composition and linguistics courses; helped with German courses in the Foreign Languages Department
*Oct. 1999 - May 2000*
created the camera-ready copy for a linguistics textbook using the LaTeX system, including creation of the graphics, writing part of the glossary, and indexing the book: Brown, Steven and Salvatore Attardo. *Understanding Language - Structure, Interaction, and Variation*. Ann Arbor: University of Michigan Press. 2000.
*Aug. 1991 - Aug. 1998*
employed by Textilwerkstatt-Verlag, European Textile Network: translation of German texts into English and other editorial and DTP work for the international quarterly *Textileforum*, its web site, and other publications, supervising the computer systems and network (Apple Macintosh) of the publishing house, responsible for the subscriber database of the quarterly, working with the following programs: ACI 4th Dimension (including programming of new processes for various databases), QuarkXpress, Aldus PageMaker, Adobe PhotoShop, Microsoft Word, Excel, PowerPoint, etc.
*Nov. 1997 - Mar. 1998*
created the print-ready copy of a linguistics anthology in QuarkXpress: Schulze, Rainer. ed. *Making Meaningful Choices in English*. Tübingen: Gunter Narr. 1998.
*July 1995 - Sept. 1995*
internship at the University of Central England in Birmingham, UK

## Teaching Experience

*Introduction to Linguistics*
YSU, Spring 1999 to Fall 2000; introductory undergraduate linguistics course
*Composition I*
YSU, Fall 1998 to Spring 1999; Purdue, Fall 2000; freshman composition course
*Elements of Linguistics*
Purdue, Fall 2002; introductory undergraduate linguistics course
*Composition II*
Purdue, Spring 2001; sophomore composition course
*Introduction to Linguistics*
Purdue, Fall 2001, Summer 2003; supplementary teaching for Victor Raskin in graduate-level introduction course
*Ontological Semantics*
Purdue, Fall 2001; supplementary teaching for Victor Raskin in graduate-level computational linguistics course

## Academic and University Service

*since 2001*
Member of the dissertation committee of Michele Sala, Università degli Studi di Bergamo, Italy
*since 2000*
Referee for HUMOR - International Journal of Humor Research
*since 2000*
Member of the Computers and Composition Committee, Purdue
Macintosh Tutorials and Resource Collections
*since 2002*
Secretary of the Purdue Linguistics Association (PLA)
*2000 – 2002*
Founding President of the Purdue Linguistics Association (PLA)
*July 2002*
Reviewer for the U.S. Civilian Research & Development Foundation for the Independent States of the Former Soviet Union (CRDF)
*1999 – 2000*
Graduate Student Delegate to the English Department, YSU
*2000*
German Tutor in the Foreign Language Department, YSU

## Membership in Professional Societies

Linguistic Society of America
International Society for Humor Studies
Medieval Association of the Midwest
Modern Language Association

## Publications

Book Editorship

- *Proceedings of the New Security Paradigms Workshop 2002.* with Victor Raskin. Eds. New York: ACM. 2003.
- *Proceedings of the New Security Paradigms Workshop 2001.* with Victor Raskin. Eds. New York: ACM. 2002.

Papers

- " '99 nuns giggle, 1 nun gasps:' The not-all-that-Christian Natural Class of Christian Jokes." *HUMOR - International Journal of Humor Research.* 16-1. 2003: 1-31.
- "Natural Language Watermarking and Tamperproofing." with Mikhail J. Atallah, Victor Raskin, Mercan Karahan, Radu Sion, Umut Topkara, and Katrina E. Triezenberg. In: Fabien A. P. Petitcolas. Ed. *Information Hiding, 5th International Workshop, IH 2002.* Berlin: Springer. 2002: 196-210.

- "Script oppositions and logical mechanisms: Modeling incongruities and their resolutions." with Salvatore Attardo and Sara DiMaio. *HUMOR - International Journal of Humor Research* 15-1. 2002: 3-46.
- "Why NLP should move into IAS." with Victor Raskin, Sergei Nirenburg, Mikhail J. Atallah, and Katrina E. Triezenberg. In: Krauwer, Steven (on behalf of ELSNET). Ed. *Proceedings of the Workshop on a Roadmap for Computational Linguistics at COLING 2002, Taipei, August 31, 2002.* Utrecht: ELSNET. 2002: 1-7.
- "Ontology in Information Security: A Useful Theoretical Foundation and Methodological Tool." with Victor Raskin, Katrina E. Triezenberg, and Sergei Nirenburg. In: Raskin, Victor and Christian F. Hempelmann. Eds. *Proceedings of the New Security Paradigms Workshop 2001.* New York: ACM. 2002: 53-59.
- "Natural Language Watermarking: Design, Analysis, and a Proof-of-concept Implementation." with Victor Raskin, Mikhail Atallah, Florian Kerschbaum, Sanket Naik, Michael Crogan, and Dina Mohamed. In: Moskowitz, Ira S. Ed. *Information Hiding. Proceedings of the Fourth International Workshop IH 2001.* Berlin: Springer: 185-199. 2001.

Reviews

- "Uwe Wirth: *Diskursive Dummheit: Abduktion und Komik als Grenzphänomene des Verstehens.* [Stupidity in Discourse: Abduction and Humor as Fringe Phenomena of Understanding.] Heidelberg: Winter. 1999." *HUMOR - International Journal of Humor Research*. Forthcoming. 16-3. 2003.

## Presentations

Conference Presentations

- "The Genesis of a Script for Bankruptcy in Ontological Semantics." with Victor Raskin, Sergei Nirenburg, Inna Nirenburg, and Katrina E. Triezenberg. at the Text Meaning Workshop of the HLT-NAACL 2003 Human Language Technology Conference in Edmonton, Canada, May 31, 2003.
- "YPS-The Ynperfect Pun Selector for Computational Humor." at the CHI2003 of the ACM, Ft. Lauderdale, FL, April 6, 2003.
- "Permissible Distance and Recoverability in Paronomasic Puns." at the 14th ISHS Conference, University of Bologna, Bertinoro, Italy, July 5, 2002.
- " '99 nuns giggle, 1 nun gasps:' The not-all-that-Christian Natural Class of Christian Jokes" at the 2001 Conference of the International Society for Humor Studies in College Park, MD, July 7, 2001.
- "Developing an Automatic Hybrid Data and Text System for Downgrading Sensitive Documents (Poster)." with Victor Raskin, Mikhail Atallah and Dina Mohamed. at the Second Annual Research Symposium of the Center for Education and Research in Information Assurance and Security (CERIAS), Purdue University, West Lafayette, IN, April 26, 2001.
- "Watermarking of Natural Language Text (Poster)." with Victor Raskin, Mikhail Atallah, Florian Kerschbaum, Sanket Naik, Michael Crogan, and Dina

Mohamed. at the Second Annual Research Symposium of the Center for Education and Research in Information Assurance and Security (CERIAS), April 26, 2001.
- "The Joking Monk: Humor and Narrative Structure in Rabelais' *Gargantua*" at the 1999 Conference of the International Society for Humor Studies in Oakland, CA, July 2, 1999.

Invited Presentations
- "YPS: The Ynperfect Pun Selector for Computational Humor." at Twente University, Enschede, The Netherlands, May 15, 2003.
- "YPS: The Ynperfect Pun Selector for Computational Humor." at the ITC-irst Centro per la Ricerca Scientifica e Tecnologica, Trento, Italy, May 6, 2003.
- "Natural Language Information Assurance and Security." with Victor Raskin. at the Center for Education and Research in Information Assurance and Security (CERIAS) Security Seminar, Purdue University, West Lafayette, IN, April 8, 2003.
- "Current Issues in Linguistic Humor Research: An Overview." LinguA guest lecture at the Universität Hannover, Germany, June 18, 2002.
- "Current Issues in Linguistic Humor Research: An Overview." at the Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands, June 6, 2002.
- "Ontology for IAS: Extending Research and Application Paradigms In Information Security." with Victor Raskin and Katrina E. Triezenberg. at the Center for Education and Research in Information Assurance and Security (CERIAS) Security Seminar, Purdue University, West Lafayette, IN, February 6, 2002.

## Awards

*2003*
GSA travel award to support the presentation of research at the Computer-Human Interface (CHI) 2003 Conference of the Association for Computing Machinery (ACM) in Ft. Lauderdale, FL
*2001*
Quadrille Ball Scholarship for research in natural language processing and information security
*2001*
GSA travel award to support the presentation of research at the Conference of the International Society of Humor Studies in College Park, MD