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A Real-Time N-Gram Approach to Choosing Synonyms Based on Context

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Graduate Program in Computer Science
A thesis submitted in partial fulfillment of the requirements for the degree in Master of Science
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A REAL-TIME N-GRAM APPROACH TO CHOOSING SYNONYMS BASED ON
CONTEXT

(Thesis format: Monograph)

by

Brian Jeffrey Moore

Graduate Program in Computer Science

A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science

The School of Graduate and Postdoctoral Studies
The University of Western Ontario
London, Ontario, Canada

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Abstract

Synonymy is an important part of all natural language but not all synonyms are created equal. Just because two words are synonymous, it usually doesn't mean they can always be interchanged. The problem that we attempt to address is that of near-synonymy and choosing the right word based purely on its surrounding words. This new computational method, unlike previous methods used on this problem, is capable of making multiple word suggestions which more accurately models human choice. It contains a large number of words, does not require training, and is able to be run in real-time. On previous testing data, when able to make multiple suggestions, it improved by over 17 percentage points on the previous best method and 4.5 percentage points on average, with a maximum of 14 percentage points, on the human annotators near-synonym choice. In addition this thesis also presents new synonym sets and human annotated test data that more accurately fits this problem.

Keywords

Near-synonymy, context, N-grams, Google N-Grams

For my brother, without his support and guidance this probably would have never been written.

Brent Moore

(1971-2011)

May the fish always be biting

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1 Introduction

Near-synonymy, which is often simply referred to as synonymy, is the closeness of meaning among words. Near-synonymous words can sometimes be substituted for each other in sentences. The problem that we attempt to address is that of context-sensitive near-synonymy: the choice of a possible word substitution with a near-synonym based purely on its surrounding words. This is usually not an easy problem, because natural language, specifically English, is such a varied and unconstrained language that there are no hard and fast rules that govern all word usage. For these sentences ‘He found it [difficult] to believe.’ and “He found it [hard] to believe.” which near-synonym do we choose? What is more accurate given this context ‘difficult’ or ‘hard’? The choice is not always an easy one and it could be argued that both words are fitting here. But when we use another near-synonym we began to see that there are times when context does prevent the usage of some words, ‘He found it [demanding] to believe.’ for instance. Synonyms are actually a group of words that can be divided into two sets, absolute and near.

Absolute synonymy means that two words share exactly the same meaning and all the same nuances. In theory an absolute synonym would be totally interchangeable with any other synonym in any context. But unfortunately, even in an optimistic light, absolute synonymy is very rare. Some philosophers will even argue that it doesn’t exist at all, and can’t [1]. It is also argued that language works to eliminate absolute synonyms by reasoning that an absolute synonym serves little purpose in any language and either it would fall into disuse or would take on a new nuance of meaning making it into a near-synonym [1].

Near-synonymy is usually what most of us think of when we hear the word synonym and this is the word relationship that we focus on in this thesis. Near-synonyms are words which are close in meaning. They are almost absolute synonyms but are not exactly the same. They are very similar in meanings but have different usage patterns and convey slightly different nuances or meaning [2]. It is near-synonyms which make up a common

thesaurus. For example the words **error**, **mistake** and **blunder** are all near-synonyms to each other but each has slightly different connotations and can't always be used in the same context. Table 1 shows a detailed breakdown of the slightly different connotations for each word. "Synonym" is used to mean "Near-Synonym" in the remainder of this thesis when used in contexts in which no confusion could arise.

Error implies a straying from a proper course and suggests guilt as may lie in failure to take proper advantage of a guide.
Mistake implies misconception, misunderstanding, a wrong but not always blameworthy judgment, or inadvertence; it expresses less severe criticism than <i>error</i> .
Blunder is harsher than <i>mistake</i> or <i>error</i> ; it commonly implies ignorance or stupidity, sometimes blameworthiness.

Table 1: An abridged entry from Webster's new dictionary of synonyms showing some slight differences between 3 near-synonyms.

The motivation behind this new method is to use the vast amount of the new data available in the form of Google n-grams(a dataset containing 'n' sequential words) to create a fast and practical method that is able to find a proper near-synonym that fits a particular context by attempting to match the surrounding words in an idiomatic fashion with similar ones in the n-gram data. To my knowledge this system is the first capable of making multiple word suggestions and the first capable of running in real-time. Previous methods have only been capable of making a single word suggestion for each synonym set which has been somewhat of a limitation. There is very rarely a context where only one near-synonym is possible and by restricting testing to only one word has negatively affected results by making this problem into one which is trying to find only the word specified by a particular human writer rather than finding synonyms which fit the context. The contributions presented in this thesis are as follows:

- This new method, unlike previous methods used on this problem, is capable of making multiple word suggestions which more accurately models human choice.
- This system is capable of running in real-time on a standard computer. This could allow for the use of this system in many future user specific applications, including word processing software.
- This system contains over 170 thousand words and does not need to be trained on any specific synonym set prior to use.
- New larger synonym sets and testing data are presented which we believe are more suited to testing this problem.

The remainder of this thesis is organized in the following way: Chapter 2 serves as a literature review and examines several of the influential papers that have dealt with this problem in the past. Chapter 3 details the new method presented here. Chapter 4 presents the results obtained from testing this method. Finally, Chapter 5 summarizes and concludes this work and discusses possible future work.

2 Literature Review

This chapter is meant to serve as a survey of the important research papers that have dealt with the rather elusive problem of near-synonymy and choosing the right near-synonymous word in different contexts. A problem often considered almost a “non-problem” because if all synonyms are considered absolute the choice is binary - yes, there is a synonym, or no there isn’t. Because of this view, this problem has not received the amount of attention in many fields including computational linguistics as other equally fundamental concepts like polysemy [1]. I explore two very differing kinds of approaches to this problem of near-synonymy. First, in Section 2.1, we look at a few of the many papers that have used increasingly complex algorithms and have built large human-annotated knowledge resources to conceptually model near-synonyms using their differences in nuance. Then, in Section 2.2, we look at a new approach to this problem that has begun to emerge and is the basis for the method presented in this thesis. As large corpora of text become available and data storage becomes cheaper and more easily available, some researchers have begun to take a straightforward idiomatic approach that does not need much direct knowledge of natural language. It instead relies on copious amounts of data and using the structural information implicitly contained within the data. These newer approaches simply seek to match contexts in order to make a decision regarding which near-synonym could be substituted.

It is generally agreed upon that near-synonym differences can be classified into four broad groups [1]. Some examples of these near-synonym differences are shown in Figure 1.

- **Denotational variations**
- **Stylistic variations**
- **Expressive variations**
- **Structural variations**

The papers surveyed here vary in the groups on which they focus. The conceptual papers deal mainly with the internal variations in the nuances of the near-synonyms (the first 3 groups), whereas the papers which focus on context mainly deal with structural variations (the last group).

Examples of near-synonymic variation.

Type of variation	Example
Abstract dimension	<i>seep : drip</i>
Emphasis	<i>enemy : foe</i>
Denotational, indirect	<i>error : mistake</i>
Denotational, fuzzy	<i>woods : forest</i>
Stylistic, formality	<i>pissed : drunk : inebriated</i>
Stylistic, force	<i>ruin : annihilate</i>
Expressed attitude	<i>skinny : thin : slim, slender</i>
Emotive	<i>daddy : dad : father</i>
Collocational	<i>task : job</i>
Selectional	<i>pass away : die</i>
Subcategorization	<i>give : donate</i>

Figure 1: Examples of the four broad groups of near-synonym variation taken from Edmonds and Hirst.

2.1 Conceptual Differences of Near-synonyms

These papers focus on the conceptual differences between near-synonyms rather than the linguistic and lexicographical approaches that the later idiomatic papers focus on.

2.1.1 Near-Synonymy and Lexical Choice

Edmonds and Hirst [1] seek to develop a new computational model to effectively represent the subtle differences between near-synonyms. Near-synonyms present a unique problem that no previous model could adequately handle. Edmonds and Hirst also present a lexical choice process which uses this proposed model to decide which near-synonym is more appropriate in a particular situation based on things like formality and tone.

The previous models of lexical knowledge were based on the compositional and relational theories of word meaning. Typically, these models used a structure like that

shown in Figure 2. These models were unable to adequately describe near-synonyms properly and their various subtle fine-grained differences. Usually, to represent words and concepts, a model contains many schemas. Each schema represents elements in the lexicon that are linked to more and more general classes which they lexicalize. These schemata are then organized into an ontology, a hierarchal organization which is often language-independent allowing its usage in multi-language applications. In these previous models, if multiple words are representative of the same concept, they are all linked to the parent schema, which effectively treats all synonyms as absolutes – with no difference between one another. Ambiguous words are duplicated and each copy is connected to a parent for each specific sense, which can lead to an abundance of language-specific concepts in a supposedly language-independent ontology.

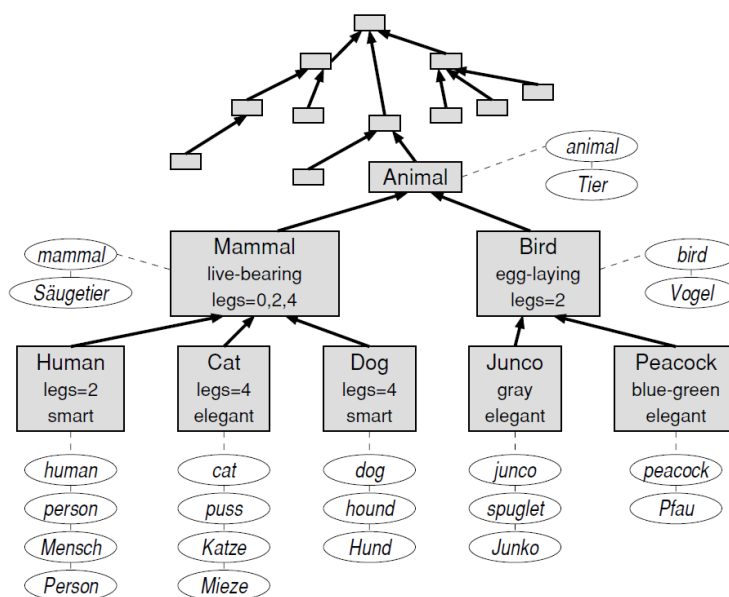


Figure 2: A classic hierarchical ontology of word meaning with lexical entries for English and German. These models were unable to adequately describe near-synonyms properly and their various subtle fine-grained differences.

In their proposed model, Edmonds and Hirst use this previous model and modify it to account for the many fine-grained aspects of near-synonymy. Their model is based on the notion of clustering near-synonyms together to form concepts which are defined not externally but by the synonyms themselves. This clustering results in what they call a

clustered model of lexical knowledge, shown in Figure 3. This model contains several levels; the first level is a classic ornithology that resembles the previous models, only it arranges entire clusters of near-synonyms rather than individual words. The other levels are concerned with the internal structure of each cluster, representing each cluster as the various differences in the lexical nuances between near-synonyms. The model accounts for the first three categories of difference but leaves out the fourth, structural variation.

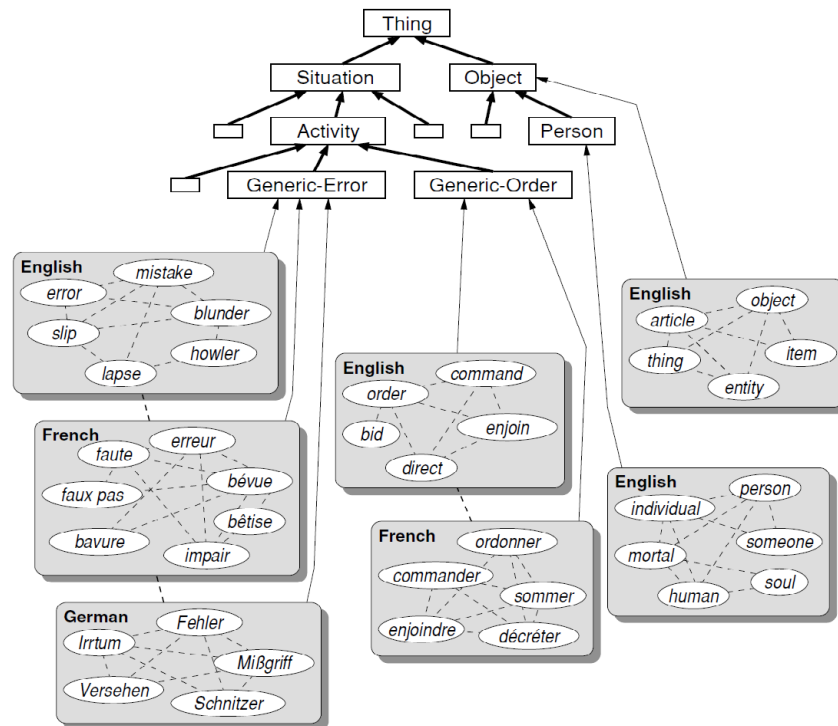


Figure 3: Edmond and Hirst’s clustered model of lexical knowledge. New model able to describe near-synonyms, based on the notion of clustering near-synonyms together to form concepts.

2.1.2 Building and Using a Lexical Knowledge-Base of Near-Synonym Differences

Inkpen and Hirst [2] primarily focus on the previous clustered model for near-synonyms and investigate how to automatically populate it using data extracted from special directories of near-synonym differences. The directory used in this paper is called “Choose the Right Word” but the methods can be applied to many similar directories.

“Choose the Right Word” contains 5452 near-synonyms grouped in 909 clusters. This paper realizes the limitation of manually anointing data specifically for this problem and seeks to overcome this issue by extracting information from handmade precompiled directories which already contain a list of synonym differences.

This paper also uses the very interesting idea of collocational information for near-synonyms which is used to enhance the previous automatic data collection by adding some structural variation. Collocational behavior is taken to be words that appear together or very near to the near-synonym (separated by only a few non-content words) with a frequency that is much higher than chance. This collocational information is collected from the 100 million word British national corpus which is part-of-speech tagged and further refined using the World Wide Web. A combination of five different statistical measures were used to compute these dependencies, point-wise mutual information, dice, chi-squared, log likelihood and Fishers extract test [2]. This paper regards this behavior as important because it can give insight into how near-synonym should be used in context. An example of this is *daunting task* which is a more common collocation then *daunting job* which is a valid but much lower frequency collocation. Also there are words that do not correlate well and should not be used together like *daunting duty* which is an unacceptable combination and called an anti-collocation. Some further examples are shown in Table 2.

Collocations	Anti-Collocations
ghastly mistake	ghastly error
ghastly blunder	ghastly faux pas
	ghastly blooper
	ghastly solecism
	ghastly goof
	ghastly contretemps
	ghastly boner
	ghastly slip

Table 2: Examples of Collocations and Anti-Collocations identified by Inkpen and Hirst’s method.

This paper almost acts as a sort of bridge that links the two types of papers in this chapter together. Like the previous paper it examines the conceptual nature of near-synonyms by

exploring the many fine-grained differences internal to near-synonyms, and like the next papers presented here it also explores some of the basic structural variations of near-synonyms.

2.2 Structural Differences of Near-Synonyms

The methods presented below take an idiomatic approach to the problem of near-synonymy and simply seek to classify different near-synonyms by finding other words that appear in similar contexts. This is the same approach taken by the new method presented in this thesis.

2.2.1 Choosing the Word Most Typical in Context Using a Lexical Co-occurrence Network

Edmonds was amongst the first to tackle the problem of the near-synonymy by using a large corpus combined with an idiomatic approach. Edmonds notes that knowledge-based approaches to this problem in the past had suffered from “serious lexical acquisition bottlenecks” that apparently stemmed from human annotation.

In his paper he presents a new statistical approach to solving a problem of choosing “the most typical” word from a small list of possibilities (usually only 3) to fill a lexical gap created by removing the original word. This fill-in-the blank method is a straightforward but somewhat problematic way of evaluating this and similar methods. The words used in the selected set of near-synonyms are chosen to be of low polysemy in an attempt to minimize the chance of a word having multiple senses. Table 3 shows Edmonds’ 7 Near-synonym sets. As noted this approach to evaluation is not a perfect way of testing this because only the near-synonyms chosen by the authors of the Wall Street Journal (the source of the corpus) are deemed correct and the authors are not always typical and many different synonyms can be used in a given context. This evaluation also worked well in this instance because the purpose of this paper was to determine the “most typical” synonym used in a specific context rather than finding the best. Though despite any short-comings this evaluation and these sets have, they have endured and continue to be used in the majority of subsequent papers dealing with this problem of structural differences in near-synonymy. A sentence used by this method is shown in Figure 4.

The **error** | mistake | oversight} was magnified when the Army failed to charge the standard percentage rate for packing and handling.

Figure 4: Sample sentence from Edmonds’ method to test the method’s ability to properly select the proper near-synonym from the 3 possibilities using the context (boldface indicates the original word from the Wall Street Journal).

Set	POS	Synonyms
1	JJ	difficult, hard, tough
2	NN	error, mistake, oversight
3	NN	job, task, duty
4	NN	responsibility, commitment, obligation, burden
5	NN	material, stuff, substance
6	VB	give, provide, offer
7	VB	settle, resolve

Table 3: Edmonds’ 7 sets of near-synonyms used to test his method. Each set of near-synonyms was chosen to be of low polysemy in an attempt to minimize the chance of a word having multiple senses.

The method presented in this paper builds a lexical co-occurrence network as shown in Figure 5 and uses second order co-occurrence relations in order to choose the best word. By using second order co-occurrence relationships, results can be uncovered without a massive volume of text. A very large corpus would be required when simply looking at direct first order co-occurrence. This method does not need such a large amount of data but does require that a lexical network be built in advance for every group of near-synonyms used. Even though words may never occur together, these second order co-occurrence relationships might show that the occurrence of the first word may be used to predict that the other word will be used. Edmonds lexical co-occurrence network is built layer by layer. A root word is connected to other words which have significant co-occurrence and this process is recursively repeated for each word. A first-order co-occurrence is determined by the intersection of two well-known measures of significance, mutual information scores and T scores [3].

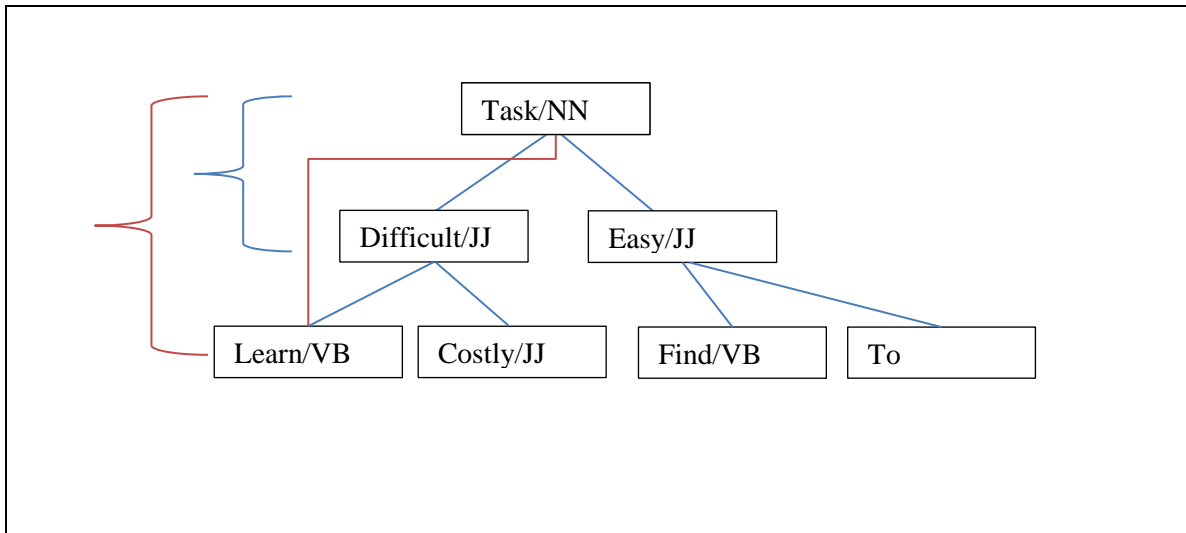


Figure 5: Example of the lexical co-occurrence network built by Edmonds’ method. Although ‘task’ and ‘learn’ never appear in first-order co-occurrence they can be linked in second order co-occurrence through the word ‘difficult’.

Edmonds’ method was tested on the texts from the 1987 Wall Street Journal (31,116 cases), and scored a 53.5% accuracy on these 7 sets of near synonyms, 8 percentage points higher than a base line that always chooses the most common synonym in the set.

2.2.2 A Statistical Model for Near-Synonym Choice

Nearly 10 years after Edmonds first took on this task of examining context for near-synonymy, Inkpen [4] published a paper which addresses the same problem but used a much larger corpus with simpler methods and was able to obtain improved results. The Waterloo multi-text system was used as a corpus which contains about 1 TB of texts collected by a web crawler. Three separate methods are presented in this paper all with the common goal of selecting the “most typical” synonym to be used in a particular context. All three methods focus on an idiomatic approach and make choices based simply on context rather than nuances of meaning and differences between near-synonyms that she explored in previous work explained in Section 2.1.2.

Inkpen's unsupervised statistical method

Inkpen's first method computes a score for each candidate near-synonym to fill the space created by removing one of the near-synonyms from a sentence, the "lexical gap" as she calls it. The score is based on point-wise mutual information (PMI) between the candidate and other content words appearing in the context. In this method stopwords are filtered out and do not play a role in candidate selection.

PMI between two words X and Y is the probability of observing the two words together divided by the probability of observing them independently.

$$PMI(x, y) = \log_2 \frac{P(x, y)}{P(x)P(y)}$$

The probabilities can be approximated by using frequency counts and word totals, C and N.

$$PMI(x, y) \approx \log_2 \frac{C(x, y)N}{C(x)C(y)}$$



Figure 6: Inkpen's unsupervised method models the context as a window of k words before and after the near-synonym gap.

Each candidate word (C_i) is scored based on the K words to the left and the K words to the right of the lexical gap, this is shown in Figure 6, and is computed using the following formula:

$$Score(C_i, window) = \sum_{j=1}^k PMI(C_i, w_j) + \sum_{j=k+1}^{2k} PMI(C_i, w_j)$$

This makes this method position independent for all words within the window. The best results in the paper were obtained using small window sizes $K=1$ and $K=2$ and quickly declines as window size is increased. Demonstrating that the larger K becomes, the more information on syntax and local inner sentence context is lost, showing the importance of syntax. Although not explicitly stated, it is fair to assume that this method is relatively slow to compute because it uses the Waterloo terabyte corpus so a query for each word must be sent to a remote server.

This method was tested on the same 1987 Wall Street Journal (31,116 cases), and scored an average 62% accuracy on these 7 sets of near synonyms, 9 percentage points higher than Edmond's method.

Inkpen's anti-collocation method

This implemented method uses data collected regarding collocational behavior from previous work by Inkpen and Hirst. This relatively straightforward method uses collocational behavior of words in order to identify combinations of words that a native speaker of English would and would not use together. This method simply ranks collocations (words that can be used together) higher than anti-collocations (words which cannot be used together), with ties being decided by frequency count.

This method was tested on a smaller set from the same 1987 Wall Street Journal (332 cases), and scored an average 59% accuracy on these 7 sets of near synonyms, 6 percentage points higher than Edmond's method.

Inkpen's supervised statistical method

The third and best performing method used by Inkpen is a supervised learning method. This method uses trained classifiers for each group of near-synonyms and several features from each sentence. This method is somewhat limited because classifiers need to be trained on each set of near-synonyms before execution and a change to a different set or the creation of a new set requires retraining of the classifiers before use. Two types of features are used in this method. One is the score to the left and right of the lexical gap and the other consists of the 500 most frequent words that fall near the gap.

Inkpen uses the same evaluation techniques presented by Edmunds but also addresses some of the inherent problems in those techniques and suggests that the best way to evaluate this algorithm would be to use human readers but notes this kind of evaluation would be incredibly time-consuming. Inkpen even did some limited trials to verify this with human judges on a small sample of the data set, each containing only 350 sentences. The results show a high agreement of 78.5%. This is a high but not perfect agreement which shows this task is indeed difficult and there is no one correct way of doing it. Synonym usage will vary according to writing style and several other factors.

This method was tested on the same 1987 Wall Street Journal (31,116 cases), and scored an average 65% accuracy on these 7 sets of near synonyms, 12 percentage points higher than Edmond's method.

2.2.3 Near-Synonym Choice using a 5-gram Language Model

Several years after Inkpen published the previous paper, she co-authored this paper with Islam [5] which presented a new unsupervised statistical method of solving the same near-synonymy problem. This new near-synonymy method uses a new and different type of corpus, the Google Web 1T n-gram data set, collected from over 1 trillion webpages. This corpus contains English words ranging from unigrams to 5-grams and includes their observed frequency counts. Because of Inkpen's previous results and the fact that the best results were achieved with a small window size, it is natural to assume that this very large corpus, even being limited to a five word scope, would contain enough information to make a decision about near-synonym choice. The method presented in this paper considers up to four words before the lexical gap and up to four words after. This is done by the shifting of the query as illustrated in Figure 7. This shift results in at most 5 queries to the Google Web corpus per near synonym.

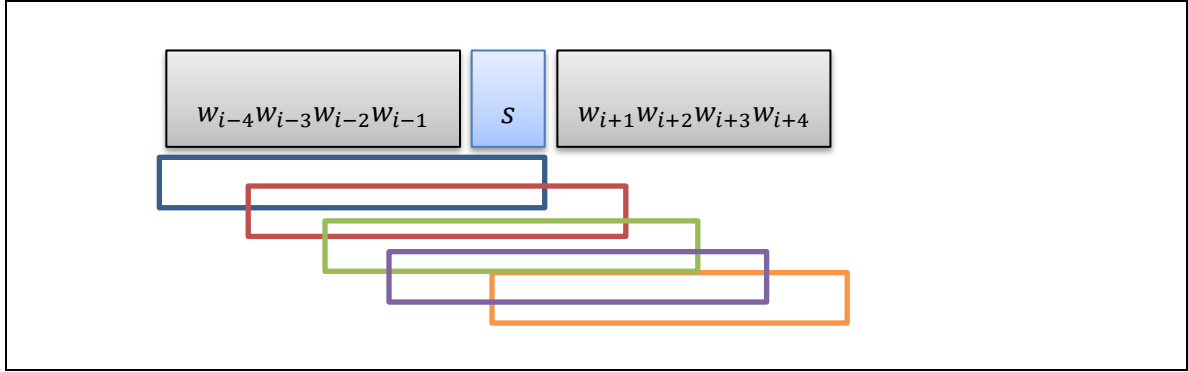


Figure 7: Shifting of input in Islam & Inkpen's method to create 5 separate 5-word strings to search for in the Google 1T Web N-grams.

Queries by this method are done recursively, meaning that if no-grams are found to match the current context a smaller n-gram is used from 5-grams down to bigrams. This gives us

$$\begin{aligned} \text{number of queries} = \\ \text{number of sets} * \text{number of synonyms} * n_gram_length(2 - 5) . \end{aligned}$$

This makes this method rather time-consuming, especially in a real world situation compared to a test with a limited number of synonym sets. This is simply due to the number of queries that are issued and the size of the unmodified Google Web corpus. For each near synonym in a set, a string is constructed from the input text by filling the gap with this specific near synonym. This results in a set of strings ($\{S_1 \dots S_m\}$) equal in size to the number of near-synonyms ($s_1 \dots s_m$) in the set.

$$S_1 = W_{i-4}W_{i-3}W_{i-2}W_{i-1}S_1W_{i+1}W_{i+2}W_{i+3}W_{i+4}$$

$$S_2 = W_{i-4}W_{i-3}W_{i-2}W_{i-1}S_2W_{i+1}W_{i+2}W_{i+3}W_{i+4}$$

...

$$S_m = W_{i-4}W_{i-3}W_{i-2}W_{i-1}S_mW_{i+1}W_{i+2}W_{i+3}W_{i+4}$$

Language models are a probability distribution over a set of strings used in order to predict the probability of a string, S , occurring in a sentence [5]. The language model

used in this paper is based on n-gram models which is by far the most common models used [5]. For example, if sentence S is made up of 5 words $S = w_1w_2w_3w_4w_5$ then the 5-gram language model would be:

$$\begin{aligned} P(S) &= P(w_1)P(w_2|w_1)P(w_3|w_1w_2)P(w_4|w_1w_2w_3)P(w_5|w_1w_2w_3w_4) \\ &= \prod_{i=1}^5 P(w_i | w_{i-5+1}^{i-1}) \end{aligned}$$

When using n-gram language models, it is prudent to also use a smoothing function so a non-occurring or missing word with a probability of zero does not cancel the other grams being used. The smoothing function used in this paper was loosely based on the one-count method [6].

Ultimately the language model used in this method is:

$$P(S) = \prod_{i=5}^p P(w_i | w_{i-n+1}^{i-1})$$

The smoothing was found to be necessary because even though this corpus is quite large it is still possible to find missing grams, partly due to the pruning that was done by Google and partly due to the large context window and other methods possibly used in this paper. Google's pruning removed tokens that appeared less than 200 times and n-grams that appeared less than 40 times [7].

This paper notes that unlike Inkpen's original method, stopwords and punctuation are not filtered out. This alteration seems to be of benefit as many common stopwords actually do seem to play a very large role in deciding near-synonym context. It is not noted whether the 10 word context window used in this method is able to extend beyond sentence punctuation and capture unrelated context from neighboring sentences which likely would not benefit this method and simply be a source of noise and would contribute to finding non-occurring grams.

This method was tested on the same 1987 Wall Street Journal (31,116 cases), and scored an average 65% accuracy on these 7 sets of near synonyms, statistically comparable to Inkpen's supervised method and 12 percentage points higher than Edmond's method.

3 Proposed Method

The basic premise of this work is to create a small, fast and portable system that can be used in a real-life situation that addresses the problem of contextual near-synonymy. Up until now all the known systems that that have been created to handle this problem are very slow, very large or require some kind of advanced knowledge about the specific writing style the system can be used on, and possibly the greatest limitation was that all of them need to be trained on each synonym group to be used on which negates any prospect of them being used for any non-research purpose.

Very large and very slow was the case in Islam and Inkpen’s paper using similar Google n-gram data [5]. This paper used the entire Google web n-gram dataset, from unigrams to 5-grams. This dataset is large and look-up was very slow and could not be feasibly run in a useful manner. The Google Web n-gram dataset used previously is reported to be in the neighborhood of 100 GB which is roughly 40 times larger than the 2.4 GB databases created for this project.

Specific knowledge of writing style to be used on was the case with Inkpen and Edmonds’ methods. They both trained their systems on the Wall Street Journal articles [3] [4]. The writing style in the Wall Street Journal is most likely grammatically correct but probably does not represent the average English writing style, making these systems static and unable to be transferred to other domains of English.

This system uses a 5-gram dataset of the n-grams released by Google. These n-grams are fixed blocks of “n” words collected by Google as it digitized 5.2 million books published between 1500 and 2008 [8]. An example of a 5-gram is shown in Figure 8.

Gram 1	Gram 2	Gram 3	Gram 4	Gram 5
The	quick	brown	fox	jumps

Figure 8: Example of a 5-gram from the Google n-gram dataset.

This data set was constructed using a sliding window approach. As the document was scanned, the window was shifted over by one word (punctuation being treated as words) and each time a new 5 gram was created. An example is shown in Figure 9.

Sample sentence: The quick brown fox jumps over the lazy dog. 5-gram 1: the quick brown fox jumps 5-gram 2: quick brown fox jumps over 5-gram 3: brown fox jumps over the 5-gram 4: fox jumps over the lazy 5-gram 5: jumps over the lazy dog 5-gram 6: over the lazy dog .

Figure 9: Example of the 5-grams created from the sample sentence by using a sliding window.

It should be noted that this method produced many 5 grams which span two partial sentences. These 5-grams are not useful for our purposes because they did not provide valid contextual clues for replacement and were removed during database construction. This will be elaborated upon further later in this document. Figure 10 shows an example of this.

the circulation . Whenever I

Figure 10: Example of a 5-gram that contains 2 partial sentences.

There are several Google n-gram data sets in existence. One is a 2006 web 1T set compiled from indexed webpages through the Google search engine. This set was used by a previous paper [5] described in Section 2.2.3 and trials were run on this data set but the unchecked grammar and often messy html tags did not seem to offer the results desired by this system. Other data includes a 2009 and a 2012 set created from the scanning of published literature [8]. There were also many subsets of these later n-gram datasets and it was decided to use one of these smaller subsets as the base of this program. This program uses the 'English one million' version 20090715 containing the one million most common words/unigrams.

The decision to use this smaller subset was influenced by the goal of making the program run quickly (in real-time) and also the time needed to construct the database. This smaller subset required the Cognitive Engineering Laboratory system to run continuously for two

weeks to construct this database which made using the full 2012 set of 500 billion words unfeasible on the current system. This full 2012 version of the 5-grams is much larger, and would be an interesting set to use in future work.

Unlike the previous methods used for idiomatic matching, this new method does not try to match the entire 5-gram but rather several smaller features found to be important in choosing synonyms based on context. By doing this, it becomes a trade-off between total accuracy and size of the database. To achieve perfect accuracy it would potentially require an infinitely large database that contains every possible English five word context, but instead of trying to achieve this, this thesis focuses on creating a practical system.

Perhaps this system's greatest advantage is the fact that it contains over 170 thousand words and does not need to be trained on any specific synonym set prior to use. We define the English language as the words occurring in the Google 5-grams, allowing this system to be run on the entire English language without any preprocessing. Coupled with its real-time speed allows this system to be used in a viable practical application.

3.1 Databases

The Google 5-grams used by this program are available in .csv format with the profile shown in Figure 11 [8].

```
ngram TAB year TAB match_count TAB page_count TAB volume_count NEWLINE
```

Figure 11: Format of Google 5-grams used by this method (boldface indicates fields used in database construction).

Uncompressed these files equal 254 GB but through pruning and the use of the following techniques are reduced by over 99%. The 5-grams are first converted from their default .csv format into a relational MySQL database to both reduce size and allow real-time access.

This is done in 2 steps. The first step is in creating 2 tables – ‘fivegrams’ and ‘wordlist’

‘wordlist’ is a small table that contains indexes for the 176,436 unique individual words that are contained in the stored 5-grams. It serves as an index of all word strings and unique IDs, shown in Figure 12. This table allows each string to only be saved onto the disk once regardless of how many times it is used [9]. For example the word ‘the’ appears over 34 million times in the ‘fivegram’ table, which would require more than 1.6 GB to store. This table is only roughly 8 MB in size. Figure 12 shows the structure of the ‘wordlist’ table.

Field	Type	Null	Key	Default	Extra
word	varchar(50)	NO	MUL	NULL	
Wordindex	int(10) unsigned	NO	PRI	NULL	

Figure 12: The ‘wordlist’ relational database table structure, allows each word to only be saved onto the disk once regardless of how many times it is used in the stored 5-grams.

The following Tables 4 and 5 show a small example of how words are stored in the ‘wordlist’ and referenced in the ‘fivegram’ table.

Word	wordIndex
the	1
dog	2
and	3
cat	4

Table 4: Example of how words are stored in ‘wordlist’ as a string with a unique integer ID.

The 5-gram “The dog and the cat” then would be stored as

Gram 1	Gram 2	Gram 3	Gram 4	Gram 5
1	2	3	1	4

Table 5: Example of how n-grams are stored in ‘fivegrams’, contains “the dog and the cat” by storing word IDs rather than strings.

‘fivegrams’ is a moderately sized table which contains 70,783,464 of the Google 5-grams and is roughly 14 GB in size. Extensive pruning was done during database construction in an attempt to clean up the data and remove non-English symbols and other things that would either not occur in natural text or were altered by the digitizing done by Google books. This is an intermediate table and is not required to run the final system. The structure of the ‘fivegrams’ table is shown in Figure 13.

Field	Type	Null	Key	Default	Extra
Gram_ID	int(10) unsigned	NO	PRI	NULL	auto_increment
w1	int(10) unsigned	NO	MUL	NULL	
w2	int(10) unsigned	NO	MUL	NULL	
w3	int(10) unsigned	NO	MUL	NULL	
w4	int(10) unsigned	NO	MUL	NULL	
w5	int(10) unsigned	NO	MUL	NULL	
Frequency	mediumint(8) unsigned	NO		NULL	
lastUsed	mediumint(9)	YES		NULL	

Figure 13: The ‘fivegrams’ SQL table structure to store all pruned 5-grams. This is an intermediate table not required to run the final system.

For example periods and commas, and usually quotation marks are all considered separate words in the n-grams and because it was felt that grams containing these would likely contain context from multiple sentences/thoughts, these grams were removed. Table 6 shows some of the many 5-grams that were removed during database construction.

Gram 1	Gram 2	Gram 3	Gram 4	Gram 5
!	!	!	"	now
.	and	yet	I	hope
'	ve	gone	.	"
'	â€	one	of	the
(will	as	they	believe
interior	.	in	this	way

Table 6: Sample of some of the 5-grams from the original Google dataset(eng-1M-5gram-20090715) that were removed through pruning during relational database construction.

Construction of this table was quite straightforward. Every word was first converted to lowercase then only 5-grams which each gram contained at least one alphabetic character were added to the table.

During trials another database was constructed with minimal pruning as a comparison case but only increased accuracy by a minor amount and increased the size significantly; for example ‘wordlist’ became four times bigger on disk.

The second step was to create 4 individual feature tables to further reduce size and allow portability. These 4 features are the before bigram, after bigram, split bigram and important word. These 4 corresponding tables, ‘ct_bb’, ‘ct_ba’, ‘ct_bs’ and ‘ct_bis’, are approximately 2.4 GB combined. These are the tables that are used as well as the ‘wordlist’ table when the program is in operation. These tables store the ID of the queried word, the count for the specific word, the ID’s of the 2 context words, the global frequencies and the local frequencies. Figure 14 shows the table structure used by each feature.

Field	Type	Null	Key	Default	Extra
w_index	int(11)	NO	PRI	NULL	
word_count	int(11)	NO	PRI	NULL	
w1	int(11)	NO	MUL	NULL	
w2	int(11)	NO	MUL	NULL	
local_freq	int(11)	YES		0	
global_freq	int(11)	YES		0	

Figure 14: The SQL table structure used by each of the 4 feature tables. Stores the 2 word context of the feature(w1 and w2), local and global frequencies of each context. It is Indexed by the query near synonymous word(w_index) and the number of unique contexts(word count).

Local and global frequencies are the last two fields shown in Figure 14 can be described as follows:

Local frequency is the observed frequency of this context within the ‘fivegrams’ table. For example suppose the before bigram feature table (ct_bb) contained the context ‘a little’ for the word “lamb”. It would have as local frequency equal to the number of times the word ‘lamb’ was preceded by the bigram ‘a little’. If the following two 5 grams existed in the ‘fivegram’ table. This feature would have a local frequency of 2.

“a little lamb fleece as”

“a little lamb spent each”

Global frequency denotes the frequency counts of n-grams as recorded by Google. This is meant to represent how often this phrase was found in all the books that were scanned.

When two contexts are the same, the Google frequencies are simply added together.

“a little lamb fleece as” frequency=200

“a little lamb spent each” frequency=100

In this example, the context ‘a little’ before ‘lamb’ would have a global frequency of 300.

3.2 Features

There are four features that are extracted from the 5-grams in the database. These features have been identified by examining the frequency counts in the database to find distinctive contexts that commonly differentiate between near-synonyms. An example of this is the before bigram ‘the most’ which alone eliminates most of the wrong near-synonyms in the original ‘difficult, hard, tough’ synonym set.

By using four features from each 5-gram we are increasing the virtual size of the database without adding more grams and increasing the physical size. This facilitates real-time operation and minimal database size.

$$4 \text{ features} * 70,000,000 \text{ physical } 5\text{grams} = 280,000,000 \text{ virtual } 5\text{grams}$$

One of the drawbacks to doing this is that it compounds a problem already common to the n-grams. Since the grams are only five words long, they suffer from not having a rich source of context. This can be seen in the sample run by this system “was too ____ time for”. The human annotators who examined this suggested that only the word “little” could be used and this is logical because the phrase is almost idiomatic “was too little time for”. See Chapter 4 and Appendices for details. The computer however indicated the word “small” as well. Two separate phrases were found in the database “Was too small...” and “... small time for” which led to the suggestion “small”. “small” fits the before or after context individually but does not when they are combined.

The solution in this case may be to accept only answers in which all of the four features agree (it can be noted in Figure 15 that the split bigram feature did not agree (the 0 following ‘bs’) because the context “too small time” was not found. This solution requires an increase in the number of 5-grams, because too many false negatives were observed with the current set of 5-grams.

->was too ____ time for
 Synonym: little
 computer guesses: little freq: 1740.0 ba:1 bb:1 bs:1 bis:1
 computer guesses: small freq: 1277.0 ba:1 bb:1 bs:0 bis:1

Figure 15: Example from this system showing of limitations of only using a 5 word context scope.

The database is physically constructed in the way shown in Figure 16. With two preceding context words as well as two trailing context words with the desired word used in synonym lookup located at position three.

B2 B1 WORD A1 A2

Figure 16: A depiction of the layout of the 5 word 5-grams in the database.

It should be noted that there were previous efforts made in constructing the database and shifting the position of ‘word’ from position one to position five. Since the original 5-gram data was collected by Google using a shifting window this made very little difference in the accuracy of the system. The very miniscule results in terms of increased accuracy (~1%) and a huge increase in database size did not warrant inclusion.

3.2.1 Before bigram feature

B2 B1 WORD A1 A2

Figure 17: A depiction of the layout of the before bigram feature.

This feature shown in Figure 17 consists of the two context words that precede the desired word. Unlike many previous methods stopwords are also considered. In addition to the individual words being stored in the database the local and global frequencies are also stored. These frequencies are used in the ranking/decision and will be explained in more detail shortly.

An example of this feature:

Assume a look up of the before bigram “**many people**” returns the following 3 entries in the ‘fivegram’ table.

many people like small dogs . [Reported to occur 100 times by Google]

many people like big dogs [Reported to occur 200 times by Google]

many people eat ice cream [Reported to occur 50 times by Google]

The 2 words “like” and “eat” would be returned by this simple query.

“like” would be assigned a global frequency of 300 and a local frequency of 2.

“eat” would be assigned a global frequency of 50 and a local frequency of 1.

3.2.2 After bigram feature



Figure 18: A depiction of the layout of the after bigram feature.

This feature shown in Figure 18 uses the two words that immediately follow the desired word. This feature is similar to the previous before bigram feature.

An example of this feature:

Assume a look up of the after bigram “**ice cream**” returns the following 3 entries from the ‘fivegram’ table.

I don't like **ice cream** [Reported to occur 100 times by Google]

those kids like **ice cream** [Reported to occur 50 times by Google]

many people eat **ice cream** [Reported to occur 50 times by Google]

the words “like” and “eat” would be returned by this simple query.

“like” would be assigned a global frequency of 150 and a local frequency of 2.

“eat” would be assigned a global frequency of 50 and a local frequency of 1.

3.2.3 Split bigram feature



Figure 19: A depiction of the layout of the split bigram feature.

The split bigram feature, shown in Figure 19, considers the word directly to the right and the left of the desired word. This is actually the highest performing feature in many situations and has one of the highest accuracies among all the features on average. A summary of the feature accuracies on one set of testing data discussed in section 4.2 is shown in Figure 20.

bb correct: 104 times 91%
bb wrong: 10 times 9%
ba correct: 100 times 92%
ba wrong: 9 times 8%
bs correct: 109 times 93%
bs wrong: 8 times 7%
bis correct: 112 times 86%
bis wrong: 18 times 14%

Figure 20: Feature accuracies on human 1 annotated data with the split bigram feature (bs) accuracy shown in boldface.

This performance is particularly notable because it considers stopwords unlike the majority of the previous methods which prune them out. In most situations the leading

and trailing words are often stopwords, and this demonstrates how stopwords are actually quite important in this application of choosing among near-synonyms.

An example of this feature:

Assume a look up of the split bigram “**people ice**” returns the following 3 entries from the ‘fivegrams’ table.

Some **people** like **ice** skating [Reported to occur 300 times by Google]

Some **people** like **ice** cream [Reported to occur 50 times by Google]

many **people** eat **ice** cream [Reported to occur 50 times by Google]

the words “like” and “eat” would be returned by this simple query.

“like” would be assigned a global frequency of 350 and a local frequency of 2.

“eat” would be assigned a global frequency of 50 and a local frequency of 1.

3.2.4 Important word feature



Figure 21: A depiction of the layout of the important word feature.

This feature, shown in Figure 21, ignores a small list of 41 stopwords and tries to find a context word that is near the desired word. Originally, this feature was supposed to use two context words [one to the left and one to the right] but because of the limited number of contexts this feature uses ‘or’ logic and simply tries to find one matching context word.

The accuracy of this feature seems to be rather ‘hit and miss’. It seems to find correct suggestions that the other features do not but also produces more wrong answers. It can be seen in Figure 22 that important word (bis) is correct 112 times (more often than the

other features) but is wrong 18 times (more often than the other features). It would be interesting to work more with this feature to see if the number of wrong answers could be reduced in future work.

bb correct: 104 times 91% bb wrong: 10 times 9% ba correct: 100 times 92% ba wrong: 9 times 8% bs correct: 109 times 93% bs wrong: 8 times 7% bis correct: 112 times 86% bis wrong: 18 times 14%

Figure 22: Feature accuracies on human 1 annotated data with the important word feature (bis) accuracy shown in boldface.

An example of this feature:

Assume a look up of the important word “**ice**” or “**snow**” returns of the following 4 entries from the ‘fivegrams’ table.

I don’t like **ice** cream [Reported to occur 100 times by Google]

Some large blocks of **ice** [Reported to occur 250 times by Google]

heavy **snow** fall is expected [Reported to occur 50 times by Google]

of **ice** blocks in artic [Reported to occur 50 times by Google]

the words “like”, “fall” and “blocks” would be returned by this simple query.

“like” would be assigned a global frequency of 100 and a local frequency of 1.

“blocks” would be assigned a global frequency of 300 and a local frequency of 2.

“fall” would be assigned a global frequency of 50 and a local frequency of 1.

3.3 Operation

The operation of this system is rather simple. Two human annotated datasets were given to the system with a certain word removed. Figure 23 shows some of the human annotated data. The system then attempted to fill each blank using one or more of the synonyms that it was provided with. The system responses were then compared to the human responses.

<p>Q28: He faces several _____ personnel appointments , the most crucial being the next head of the Federal Bureau of Investigation .</p> <p>difficult hard tough problematic challenging</p> <p>Q29: Which word to you think fits best?</p> <p>difficult</p> <p>Q30: Tell me how a _____ guy like me could pressure a one-and-a-half-billion dollar company like Clark ?</p> <p>little small tiny insignificant</p> <p>Q31: Which word to you think fits best?</p> <p>tiny</p> <p>Q32: Sources familiar with USAir and its agreement with Winston-Salem , N.C.-based Piedmont said that while USAir is eager to eliminate TWA as a major shareholder , it could be _____ for the company to buy back TWA's USAir shares .</p> <p>difficult hard tough problematic challenging</p> <p>Q33: Which word to you think fits best?</p> <p>Challenging</p>
--

Figure 23: Sample of human annotated test data (doctoral candidate of English Literature).

Trials were also done using the system as a document correction program. Every word in the document would be sequentially scanned and synonyms dynamically retrieved from the Moby thesaurus [10].

During testing of this system, with several indexes created on the 4 feature tables, an average combined 4 feature runtime of 500ms per word was observed on 150 test sentences of the later described set (in Section 4.2.1) of 7 near-synonyms of difficult. The proposed system was implemented in Java programming language and run using a computer in the Cognitive Engineering Laboratory with specifications shown in Table 7. This would suggest this system is currently capable of running in real-time up to approximately 120 words a minute on a similar machine.

CPU	AMD Opteron Processor 250 (2393 MHz)
Memory	8128 Megabytes
OS	Solaris 10

Table 7: System specifications of machine on which the Java implementation of this system was tested.

The ranking of the system's proposed synonyms is currently done through Feature voting. Ranking is first done based on the number of features that agree and ties are resolved based on the global frequency of the words. This can be seen in Figure 24. Ranking would be of the utmost importance for a fully automatic application of this system. The four features are all weighted equally currently. Evidence suggests that different weightings would increase accuracy but the weightings would have to be different for each synonym set and would require careful examination of all these sets. An example of this is using a set to we have created for testing, the difficult set of which contained seven synonyms of difficult – [difficult, hard, tough, trying, challenging, problematic, unmanageable] used in later human tests. From our testing it appears that the before bigram feature offers far more value and its predictions are very accurate. We believe this is because of this specific synonym set and the fact that the word 'more' when used before the word is a very telling feature.

->could be ____ for the
computer guesses: difficult freq: 444.0 ba feature:1 bb:1 bs:1 bis:0
computer guesses: hard freq: 207.0 ba feature:1 bb:0 bs:1 bis:0
computer guesses: problematic freq: 8.0 ba feature:1 bb:0 bs:1 bis:0
computer guesses: trying freq: 11.0 ba feature:1 bb:0 bs:0 bis:0
computer guesses: tough freq: 2.0 ba feature:1 bb:0 bs:0 bis:0

Figure 24: An example of the current ranking. Ranking is first done based on the number of features that agree and ties are resolved based on the global frequency of the words. ‘problematic’ is ranked above ‘trying’ despite a lower frequency because it has more agreeing features.

4 Results

This chapter reports on two evaluations of the proposed system for choosing appropriate synonyms. The first evaluation uses data provided by Diana Inkpen. The second evaluation uses data generated as part of this study.

4.1 Comparison to Previous Research

First, as a means of comparison to previous methods we run our program on the human annotator data that Inkpen and others used. We use the seven synonym sets which have become standard for this problem, shown in Figure 25. These tests were run on this system simply as a means of comparing this work to the previous methods but that not the new systems intended purpose nor where it's true power lies. This new computational method, unlike previous methods used on this problem, is capable of making multiple word suggestions which more accurately models human choice. It contains a large number of words, does not require training, and is able to be run in real-time.

Set	Synonyms
1	Difficult, hard, tough
2	Error, mistake, oversight
3	Job, task, duty
4	Responsibility, commitment, obligation, burden
5	Material, stuff, substance
6	Give, provide, offer
7	Settle, resolve

Figure 25: Edmond's original 7 sets of near-synonyms from the paper discussed in section 2.2.1

It is somewhat difficult to make a direct comparison between these previous methods and this system, because unlike them this system is able to choose more than one adequate answer. Even though the human annotators they used were also able to choose multiple answers when they felt it was appropriate, this option was used sparingly, only about 5% of the time, according to Inkpen. Because of this comparison bias, in the table we also have included the accuracy of just this system's first choice which is shown in Table 8.

Set	Inter-annotator agreement	Inkpen's method [4]	Web n-gram method [5]	Proposed method (single choice)	Proposed method (multiple choices)	Average # of choices	Unknown contexts
[difficult,hard, tough]	72%	53%	62%	69%	86%	2.3	3
[error, mistake, oversight]	82%	68%	70%	59%	72%	1.6	13
[job, task, duty]	86%	78%	80%	59%	88%	2.5	8
[responsibility, burden, obligation, commitment]	76%	66%	76%	53%	85%	3.0	3
[material, stuff, substance]	76%	64%	56%	60%	83%	2.1	15
[give, provide, offer]	78%	52%	52%	44%	83%	2.5	7
[settle, resolve]	80%	77%	66%	57%	84%	1.6	10
AVERAGE	78.5%	65.4%	66.0%	57.3%	83%	-	-

Table 8: Comparison of results from the proposed method, reported human inter-annotator agreement, Inkpen's unsupervised method, Islam & Inkpen's method on 350 human annotated sentences from the 1987 Wall Street using the 7 original synonym sets. The gold standard is the original word used in the Wall Street Journal article.

With this method, when the program made no suggestion, it chose the first word in the set by default. As indicated in the far right column, the number of unknown contexts varied a fair bit throughout the seven synonyms sets and is an indication that the 5-gram database may be lacking in size. It is left for future work to determine how much of an increase in database size would correct this problem.

Figure 26 presents some of the contexts in which the system correctly identified the correct word for the [difficult, hard, tough] set according to the data. Some of the idiosyncrasies from the original testing data are visible here, for instance, contractions being turned into two separate words.

42 contexts found
much more _____ we ve: suggested -[difficult, hard, tough] actual -[difficult]
it s _____ to put: suggested -[hard, difficult] actual -[hard]
faced a _____ choice cut: suggested -[difficult, hard] actual -[hard]
making it _____ for us: suggested -[difficult, hard, tough] actual -[difficult]
be particularly _____ as the: suggested -[difficult, hard, tough] actual -[difficult]
become increasingly _____ to choose: suggested -[difficult, hard] actual -[difficult]
it s _____ to keep: suggested -[difficult, hard] actual -[difficult]
to look _____ at the: suggested -[hard, difficult] actual -[hard]
raids more _____ and more: suggested -[difficult, hard, tough] actual -[difficult]
it more _____ to replace: suggested -[difficult, hard, tough] actual -[difficult]
make it _____ for smaller: suggested -[difficult, hard, tough] actual -[difficult]
it is _____ to trade: suggested -[difficult, hard, tough] actual -[difficult]
have a _____ time justifying: suggested -[hard, difficult, tough] actual -[difficult]
them too _____ for wall: suggested -[hard, difficult, tough] actual -[hard]
significantly too _____ for executives: suggested -[hard, difficult, tough] actual -[hard]
be more _____ to convince: suggested -[difficult, hard, tough] actual -[difficult]
of seems _____ for me: suggested -[difficult, hard] actual -[difficult]
found it _____ to believe: suggested -[difficult, hard] actual -[hard]
evidence of _____ feelings over: suggested -[hard] actual -[hard]
it s _____ for people: suggested -[difficult, hard] actual -[hard]
discover how _____ running a: suggested -[difficult, hard, tough] actual -[hard]
trying desperately _____ to keep: suggested -[hard, difficult] actual -[hard]
dealer said _____ work was: suggested -[hard] actual -[hard]
a very _____ market and: suggested -[difficult, hard, tough] actual -[tough]
will be _____ for both: suggested -[difficult, hard] actual -[difficult]
it is _____ to predict: suggested -[difficult, hard, tough] actual -[difficult]
will be _____ but congressional: suggested -[difficult, hard, tough] actual -[difficult]
be so _____ to administer: suggested -[difficult, hard, tough] actual -[hard]
s pretty _____ to cut: suggested -[hard, difficult, tough] actual -[hard]
regions especially _____ hit last: suggested -[hard, difficult] actual -[hard]
been hit _____ by rising: suggested -[hard, difficult] actual -[hard]
plan very _____ unfortunately it: suggested -[difficult, hard, tough] actual -[difficult]
doors so _____ to operate: suggested -[difficult, hard, tough] actual -[difficult]
will be _____ to match: suggested -[difficult, hard, tough] actual -[difficult]
made that _____ she complains: suggested -[hard, difficult] actual -[difficult]
about their _____ life about: suggested -[hard, difficult] actual -[hard]
it a _____ race to: suggested -[hard, difficult] actual -[hard]
it s _____ to predict: suggested -[difficult, hard] actual -[difficult]
gop s _____ work blocking: suggested -[hard, difficult, tough] actual -[hard]
it is _____ to see: suggested -[difficult, hard, tough] actual -[difficult]
s always _____ to be: suggested -[difficult, hard, tough] actual -[difficult]
gone through _____ times because: suggested -[hard, difficult, tough] actual -[hard]

Figure 26: Contexts from the 350 sentence human annotated testing data provided by Inkpen which the system successfully chose the correct word for the [difficult, hard, tough] synonym set.

Figure 27 presents some of the contexts in which the system incorrectly chose words to fill the gap. It can be seen that proper nouns like the name ‘Goldsmith’ and some idioms like ‘to hang tough’ may cause improper suggestions by the system.

==Worst Contexts==

5 contexts found

goldsmith is _____ on mrs: suggested -[hard, difficult] actual -[tough]

working suburbia _____ when you: suggested -[difficult] actual -[hard]

noted for _____ business tactics: suggested -[difficult, hard] actual -[tough]

to hang _____ on 15th: suggested -[hard] actual -[tough]

launch a _____ new drive: suggested -[difficult, hard] actual -[tough]

Figure 27: Contexts from the 350 sentence human annotated testing data provided by Inkpen which this system incorrectly chose the proper word for the [difficult, hard, tough] synonym set.

Figure 28 presents some of the contexts in which this system had no suggestion. Visible is an instance ‘it s _____’ where formatting within Inkpen’s original test data has led to problems, the data has not been modified for our testing.

==Unknown Contexts(not found)==

3 contexts found

need a _____ driver to

had gets _____ the larger

it s _____ frankly to

Figure 28: Contexts from the 350 sentence human annotated testing data provided by Inkpen which this system did not choose any word for the [difficult, hard, tough] synonym set.

4.1.1 Individual feature accuracies

The accuracies shown above are from the union of all four features, Table 9 provides a complete breakdown of the accuracies of the individual features plus several of the intersections on one of the seven synonyms sets, *[difficult, hard, tough]*.

Feature	Correct suggestion (single choice)	Correct suggestion (multiple choice)	Wrong suggestion (multiple choice)	Unknown context
Before bigram(bb)	36%	42%	4%	54%
After bigram(ba)	34%	48%	8%	44%
Split bigram(bs)	44%	52%	2%	46%
Important word(bis)	58%	80%	8%	12%
Union (no default)	68%	84%	10%	6%
Union	70%	86%	14%	0%

Table 9: All of the accuracies of the 4 individual features plus the union of all features on 50 annotated test sentences from Inkpen’s data for the [difficult, hard, tough] synonym set.

In this case the *split bigram* and the *important word* features seem to be far more accurate than the **before bigram** or the **after bigram** but as mentioned before the performance of different features varies depending on this specific synonym set used.

4.1.1.1 Before bigram feature

Figures 29-31 show the contexts in the testing data where the before bigram feature correctly suggested the correct near-synonym (Figure 29), the incorrect synonym (Figure 30), and did not make a suggestion (Figure 31).

<p>21 contexts found</p> <p>much more ____: suggested -[difficult, hard] actual -[difficult]</p> <p>making it ____: suggested -[difficult, hard] actual -[difficult]</p> <p>be particularly ____: suggested -[difficult] actual -[difficult]</p> <p>become increasingly ____: suggested -[difficult] actual -[difficult]</p> <p>to look ____: suggested -[hard] actual -[hard]</p> <p>it more ____: suggested -[difficult, hard, tough] actual -[difficult]</p> <p>make it ____: suggested -[difficult, hard, tough] actual -[difficult]</p> <p>it is ____: suggested -[difficult, hard, tough] actual -[difficult]</p> <p>have a ____: suggested -[hard, difficult, tough] actual -[difficult]</p> <p>them too ____: suggested -[hard] actual -[hard]</p> <p>be more ____: suggested -[difficult] actual -[difficult]</p> <p>found it ____: suggested -[difficult, hard] actual -[hard]</p> <p>a very ____: suggested -[difficult, hard, tough] actual -[tough]</p> <p>will be ____: suggested -[difficult, hard] actual -[difficult]</p>
--

it is ____ : suggested -[difficult, hard, tough] actual -[difficult]
 will be ____ : suggested -[difficult, hard] actual -[difficult]
 be so ____ : suggested -[hard, difficult, tough] actual -[hard]
 been hit ____ : suggested -[hard] actual -[hard]
 will be ____ : suggested -[difficult, hard] actual -[difficult]
 it a ____ : suggested -[hard, difficult] actual -[hard]
 it is ____ : suggested -[difficult, hard, tough] actual -[difficult]

Figure 29: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the before bigram feature made the correct suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Worst Contexts==
 2 contexts found
 faced a ____ : suggested -[difficult] actual -[hard]
 discover how ____ : suggested -[difficult] actual -[hard]

Figure 30: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the before bigram feature made the wrong suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Unknown Contexts(not found)==
 27 contexts found
 it s ____
 goldsmith is ____
 working suburbia ____
 it s ____
 raids more ____
 significantly too ____
 of seems ____
 evidence of ____
 need a ____
 it s ____
 trying desperately ____
 dealer said ____
 noted for ____
 s pretty ____
 regions especially ____
 plan very ____
 doors so ____
 had gets ____
 made that ____

about their ____
 it s ____
 to hang ____
 it s ____
 gop s ____
 s always ____
 launch a ____
 gone through ____

Figure 31: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the before bigram feature made no suggestion on the [difficult, hard, tough] synonym set.

4.1.1.2 After bigram feature

Figures 32-34 show the contexts in the testing data where the after bigram feature correctly suggested the correct near-synonym (Figure 32), the incorrect synonym (Figure 33), and did not make a suggestion (Figure 34).

23 contexts found

____ to put: suggested -[difficult, hard] actual -[hard]
 ____ for us: suggested -[difficult, hard] actual -[difficult]
 ____ as the: suggested -[hard, difficult, tough] actual -[difficult]
 ____ to choose: suggested -[difficult, hard] actual -[difficult]
 ____ to keep: suggested -[difficult, hard] actual -[difficult]
 ____ at the: suggested -[hard, difficult] actual -[hard]
 ____ and more: suggested -[difficult, hard, tough] actual -[difficult]
 ____ to replace: suggested -[difficult, hard] actual -[difficult]
 ____ to convince: suggested -[difficult, hard] actual -[difficult]
 ____ for me: suggested -[difficult, hard] actual -[difficult]
 ____ to believe: suggested -[difficult, hard] actual -[hard]
 ____ for people: suggested -[difficult, hard] actual -[hard]
 ____ to keep: suggested -[difficult, hard] actual -[hard]
 ____ work was: suggested -[hard] actual -[hard]
 ____ for both: suggested -[difficult, hard] actual -[difficult]
 ____ to predict: suggested -[difficult, hard] actual -[difficult]
 ____ to cut: suggested -[difficult, hard] actual -[hard]
 ____ to operate: suggested -[difficult] actual -[difficult]
 ____ to match: suggested -[difficult, hard] actual -[difficult]
 ____ to predict: suggested -[difficult, hard] actual -[difficult]
 ____ to see: suggested -[difficult, hard] actual -[difficult]
 ____ to be: suggested -[difficult, hard, tough] actual -[difficult]
 ____ times because: suggested -[hard] actual -[hard]

Figure 32: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the after bigram feature made the correct suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

```

*==Worst Contexts=*
4 contexts found
___ on mrs: suggested -[hard] actual -[tough]
___ when you: suggested -[difficult] actual -[hard]
___ time justifying: suggested -[hard] actual -[difficult]
___ to administer: suggested -[difficult] actual -[hard]

```

Figure 33: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the after bigram feature made the wrong suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

```

*==Unknown Contexts(not found)==*
22 contexts found
___ we ve
___ choice cut
___ for smaller
___ to trade
___ for wall
___ for executives
___ feelings over
___ driver to
___ running a
___ market and
___ but congressional
___ business tactics
___ hit last
___ by rising
___ unfortunately it
___ the larger
___ she complains
___ life about
___ race to
___ frankly to
___ work blocking
___ new drive

```

Figure 34: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the after bigram feature made no suggestion on the [difficult, hard, tough] synonym set.

4.1.1.3 Split bigram feature

Figures 35-37 show the contexts in the testing data where the split bigram feature correctly suggested the correct near-synonym (Figure 35), the incorrect synonym (Figure 36), and did not make a suggestion (Figure 37).

26 contexts found

more ___ we: suggested -[difficult] actual -[difficult]
 a ___ choice: suggested -[difficult, hard] actual -[hard]
 it ___ for: suggested -[difficult, hard, tough] actual -[difficult]
 increasingly ___ to: suggested -[difficult, hard] actual -[difficult]
 look ___ at: suggested -[hard] actual -[hard]
 more ___ and: suggested -[difficult, hard, tough] actual -[difficult]
 more ___ to: suggested -[difficult, hard] actual -[difficult]
 it ___ for: suggested -[difficult, hard, tough] actual -[difficult]
 is ___ to: suggested -[difficult, hard] actual -[difficult]
 a ___ time: suggested -[hard, difficult, tough] actual -[difficult]
 too ___ for: suggested -[hard, difficult, tough] actual -[hard]
 too ___ for: suggested -[hard, difficult, tough] actual -[hard]
 more ___ to: suggested -[difficult, hard] actual -[difficult]
 seems ___ for: suggested -[difficult, hard] actual -[difficult]
 it ___ to: suggested -[difficult, hard] actual -[hard]
 be ___ for: suggested -[difficult, hard] actual -[difficult]
 is ___ to: suggested -[difficult, hard] actual -[difficult]
 be ___ but: suggested -[difficult] actual -[difficult]
 so ___ to: suggested -[difficult, hard] actual -[hard]
 pretty ___ to: suggested -[hard, difficult] actual -[hard]
 especially ___ hit: suggested -[hard] actual -[hard]
 hit ___ by: suggested -[hard] actual -[hard]
 so ___ to: suggested -[difficult, hard] actual -[difficult]
 be ___ to: suggested -[difficult, hard, tough] actual -[difficult]
 is ___ to: suggested -[difficult, hard] actual -[difficult]
 always ___ to: suggested -[difficult, hard] actual -[difficult]

Figure 35: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the split bigram feature made the correct suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Worst Contexts==

1 contexts found

is ____ on: suggested -[hard, difficult] actual -[tough]

Figure 36: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the split bigram feature made the wrong suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Unknown Contexts(not found)==

23 contexts found

s ____ to

particularly ____ as

suburbia ____ when

s ____ to

of ____ feelings

a ____ driver

s ____ for

how ____ running

desperately ____ to

said ____ work

very ____ market

for ____ business

very ____ unfortunately

gets ____ the

that ____ she

their ____ life

a ____ race

s ____ to

hang ____ on

s ____ frankly

s ____ work

a ____ new

through ____ times

Figure 37: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the split bigram feature made no suggestion on the [difficult, hard, tough] synonym set.

4.1.1.4 Important word feature

Figures 38-40 show the contexts in the testing data where the important word feature correctly suggested the correct near-synonym (Figure 38), the incorrect synonym (Figure 39), and did not make a suggestion (Figure 40).

40 contexts found

more: suggested -[difficult, hard, tough] actual -[difficult]
 put: suggested -[hard, difficult] actual -[hard]
 choice or faced: suggested -[difficult, hard] actual -[hard]
 us or making: suggested -[difficult, hard] actual -[difficult]
 particularly: suggested -[difficult, hard] actual -[difficult]
 increasingly: suggested -[difficult, hard] actual -[difficult]
 keep: suggested -[difficult, hard] actual -[difficult]
 look: suggested -[hard, difficult] actual -[hard]
 more: suggested -[difficult, hard, tough] actual -[difficult]
 more: suggested -[difficult, hard, tough] actual -[difficult]
 trade: suggested -[hard, difficult] actual -[difficult]
 time: suggested -[hard, difficult, tough] actual -[difficult]
 too: suggested -[hard, difficult, tough] actual -[hard]
 too: suggested -[hard, difficult, tough] actual -[hard]
 more: suggested -[difficult, hard, tough] actual -[difficult]
 seems: suggested -[difficult, hard] actual -[difficult]
 believe or found: suggested -[difficult, hard] actual -[hard]
 feelings or evidence: suggested -[hard] actual -[hard]
 people: suggested -[difficult, hard] actual -[hard]
 how: suggested -[difficult, hard, tough] actual -[hard]
 desperately: suggested -[hard] actual -[hard]
 said: suggested -[hard] actual -[hard]
 very: suggested -[difficult, hard, tough] actual -[tough]
 both: suggested -[difficult, hard] actual -[difficult]
 predict: suggested -[difficult, hard] actual -[difficult]
 but: suggested -[hard, difficult, tough] actual -[difficult]
 so: suggested -[hard, difficult, tough] actual -[hard]
 pretty: suggested -[hard, difficult, tough] actual -[hard]
 especially: suggested -[difficult, hard] actual -[hard]
 hit: suggested -[hard, difficult] actual -[hard]
 very: suggested -[difficult, hard, tough] actual -[difficult]
 so: suggested -[hard, difficult, tough] actual -[difficult]
 match: suggested -[difficult, hard] actual -[difficult]
 she or made: suggested -[hard, difficult] actual -[difficult]
 their: suggested -[hard, difficult] actual -[hard]
 predict: suggested -[difficult, hard] actual -[difficult]
 work or gop: suggested -[hard, difficult, tough] actual -[hard]
 see: suggested -[difficult, hard] actual -[difficult]
 always: suggested -[difficult, hard] actual -[difficult]
 through: suggested -[hard, difficult, tough] actual -[hard]

Figure 38: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the important word feature made the correct suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Worst Contexts==

4 contexts found

mrs or goldsmith: suggested -[hard, difficult] actual -[tough]

business or noted: suggested -[difficult, hard] actual -[tough]

hang: suggested -[hard] actual -[tough]

new or launch: suggested -[difficult, hard] actual -[tough]

Figure 39: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the important word feature made the wrong suggestion (suggestions are ordered by frequency) on the [difficult, hard, tough] synonym set.

==Unknown Contexts(not found)==

6 contexts found

suburbia

smaller or make

driver or need

gets

race

frankly

Figure 40: Contexts from the 350 sentence human annotated testing data provided by Inkpen for which the important word feature made no suggestion on the [difficult, hard, tough] synonym set.

These tests were run on this system as a means of comparison. This system unlike previous systems is capable of making multiple word suggestions. It contains a large number of words and is able to be run in real-time. When comparing directly with past systems that can only make one choice, it did not best these scores when only allowed a single suggestion, but when able to make multiple suggestions improved over 17 percentage points on average and even improved the human annotators by 4.5 percentage points on average with a maximum of 14 percentage points. When examining this data these words seem to be far too interchangeable. It is noted in previous papers that many

of these decisions are based purely on writing style of a specific author and even the human annotators they used had relatively low agreement because of this. For example in Inkpen's human annotated data for the set [difficult, hard, tough] the vast majority of the sentences allow for the use of all of these words and accuracy was simply being gauged as the ability to match the word used by one specific human writer in the Wall Street Journal's file.

4.2 New Synonym sets and a different kind of annotation

Historically, to test the performance of solutions to this problem, testing has been conducted on the same set of seven synonyms chosen by Edmonds in the first paper dealing with this problem with a contextual idiomatic approach [3]. These word sets were reported to be chosen to be of "low polysemy" but while this is true on the surface it is not entirely accurate, we believe this has led to a testing bias in the past. This is true of the first word in each set but is usually not for every word in the set. This can be seen in the set [difficult, hard, tough]. The word 'difficult' does not have many senses but 'hard' does. According to Wordnet 3.1 [11] 'difficult' only has 2 distinct senses:

- **S:** (adj) **difficult**, hard (not easy; requiring great physical or mental effort to accomplish or comprehend or endure) *"a difficult task"; "nesting places on the cliffs are difficult of access"; "difficult times"; "why is it so hard for you to keep a secret?"*
- **S:** (adj) unmanageable, **difficult** (hard to control) *"a difficult child"; "an unmanageable situation"*

On the other hand, a search for 'hard' returns 22 different senses that are spread over Adjectives and Adverbs. This list does not even include it as a part of a noun in such words as 'hard drive' which actually appears frequently in the testing data.

This difference in polysemy serves as a major problem towards the way testing was previously done. Since testing of each set was performed by removing all occurrences of the words in a set from the testing data and gauging the system's ability to insert the

correct word back in, a high polysemy of one word and a low polysemy of another blurs the results, by making it artificially easier to distinguish contexts for different words with many senses. Because of this, it was decided to create expanded richer synonyms sets with new human annotated data that allowed for multiple choices of the word that would fit the context.

To test aspects of the system not exercised with the previous data, two new richer synonyms sets were created, each containing seven synonyms. These sets are given in Figure 41. The first of these sets was created by expanding the already existing set from Edmonds, [difficult, hard, tough], and the other was created from scratch based on two very common and very similar synonyms ‘little’ and ‘small’. Synonyms were chosen by comparing the synonym lists of the base word from WordNet 3.1 and the Microsoft Word built-in thesaurus [11].

difficult	little
hard	small
tough	slight
trying	tiny
problematic	minor
challenging	modest
unmanageable	insignificant

Figure 41: The two news larger/richer synonyms sets containing 7 near-synonyms each. Created for new testing conducted in this thesis.

New human annotated data was collected for these two synonym sets to facilitate a direct comparison with how this method would perform. The sentences were collected in a manner which is believed will eliminate the polysemy that interferes with the previous test. It was decided to use sentences from the same Wall Street Journal 1987 source but only ones that contained one of the two base words from each synonym set, i.e ‘difficult’ or ‘little’, to eliminate the possibility of multiple senses for the word. Human annotators judged these sentences to determine which of the seven words could be used to fill each context. The human annotators were not aware that the original sentences had only ‘difficult’ or ‘little’ in the judgment position.

Two human annotators, both skilled in English (a BA of English literature and a PhD candidate of English literature) were asked to judge approximately 150 sentences for each set and choose all the words from each synonym set they believed would fit that context . Figure 42 provides the instructions given to the annotators for this task. The full text from these annotations can be found in Appendices A and B.

Instructions: Please choose all the words you believe can be used to fill the gap in the sentence. Words that 'sound right' to you in the context.

Figure 42: The instructions given to the human annotators when generating new multiple choice near-synonym data for this thesis.

Figure 43 shows a sample of the task presented to the annotators.

2. We're even beginning to see a _____ willingness among individuals to buy stock for their own accounts , he said .

little

small

tiny

slight

modest

minor

insignificant

4. Making out-of-state processors return their shells , the department says , would be _____ at best .

difficult

hard

tough

trying

unmanageable

problematic

challenging

Figure 43: A sample of the sentences (from the 1987 Wall Street Journal corpus) and the near-synonymous words given to the human annotators when generating new multiple choice near-synonym data for this thesis.

4.2.1 New 'difficult' synonym set

The human agreement between annotators on this set was 75.2%. Since multiple choices were allowed the human agreement was calculated in the following way:

$$\frac{c + nc}{s * 7}$$

Where c is the number of words chosen by both humans, nc is the number of words not chosen by either annotator, and s is the number of sentences evaluated for this set.

Word	Occurrences in database	Percentage of set
difficult	22,238	53%
hard	12,865	31%
tough	228	0.54%
trying	6638	16%
problematic	57	0.14%
challenging	57	0.14%
unmanageable	26	0.06%

Figure 44: Number of database occurrences for each word in the new ‘difficult’ synonym set. A low number may indicate a shortcoming in the data or it may also indicate that this word’s usage is fairly idiomatic and often occurs in the same contexts.

Shown in Figure 44 is the number of unique contexts for each word in the database. A low number may indicate a shortcoming in the data or it may also indicate that this word’s usage is fairly idiomatic and often occurs in the same contexts. Some words may have few unique contexts but these contexts may be strongly indicative of the proper word to be chosen from those synonym set. It should be noted that prominence of the word ‘trying’ in the database and in the system’s suggestions can be attributed to this word’s usage as a present participle complement of the verb ‘to be’ rather than as an adjective. Part of speech tagging may be useful to consider in future work to counter this phenomenon.

Figure 45 and Figure 47 show a breakdown of this system’s word selection compared to both the union (Figure 45) and intersection (Figure 47) of the human annotated data. The union is the combination of the human’s annotations; the intersection is what they agreed upon. Each word from the synonym set is given with the following information. ‘occurs’ indicates the number of times that the word was chosen by the program. ‘right’ indicates the number of times that the word was chosen by the program and was also chosen by at

least one human annotator in the union, or both in the intersection. ‘wrong’ indicates the number of times that the word was chosen by the program but not chosen by either human annotator in the union, or both in the intersection.

4.2.1.1 Results based on the Union of Annotations

Evaluation

Total synonym lists evaluated: 154

difficult occurs: 149

difficult right: 149

difficult wrong: 0

100% right

hard occurs: 146

hard right: 119

hard wrong: 27

82% right

tough occurs: 97

tough right: 87

tough wrong: 10

90% right

trying occurs: 135

trying right: 24

trying wrong: 111

18% right

problematic occurs: 47

problematic right: 27

problematic wrong: 20

57% right

challenging occurs: 30

challenging right: 30

challenging wrong: 0

100% right

unmanageable occurs: 31

unmanageable right: 6

unmanageable wrong: 25

19% right

summary of the number of suggestions made by the system

no suggestion 5

1 suggestion 2

2 suggestion 7

3+ suggestion 140
 correct word among suggestions: 150 times 97%
 first suggestion correct: 141 times. 92%

Figure 45: Word selection by the system on the union (combination) of both of the human annotators near-synonym choices for the new ‘difficult’ synonym set created for this thesis.

Figure 46 shows the expected occurrences in the system’s choice based on the distribution in the database compared to the actual number of occurrences in the system’s choice. This is shown to give a baseline for simple guessing of appropriate word substitution without using contexts. This suggests that a low number of the unique contexts stored in the database are not necessarily a limiting factor. For example the words ‘hard’ and ‘difficult’ are chosen by this system approximately the same number of times despite ‘difficult’ occurring over 20% more often in the database.

Word	Occurrences by chance	Occurrences in union
difficult	82	149
hard	48	146
tough	8	97
trying	25	135
problematic	2	47
challenging	2	30
unmanageable	1	31

Figure 46: Expected versus actual occurrences of the words in the new ‘difficult’ synonym set from the system. This is shown to give a baseline for simple guessing of appropriate word substitution without using contexts. This suggests that a low number of the unique contexts stored in the database are not necessarily a limiting factor.

4.2.1.2 Results based on the Intersection of Annotations

Evaluation
 Total synonym lists evaluated: 154
 difficult occurs: 152
 difficult right: 143
 difficult wrong: 9
 94% right

hard occurs: 149
hard right: 51
hard wrong: 98
34% right
tough occurs: 98
tough right: 55
tough wrong: 43
56% right
trying occurs: 138
trying right: 5
trying wrong: 133
4% right
problematic occurs: 48
problematic right: 11
problematic wrong: 37
23% right
challenging occurs: 31
challenging right: 24
challenging wrong: 7
77% right
unmanageable occurs: 32
unmanageable right: 0
unmanageable wrong: 32
0% right
summary of the number of suggestions made by the system
no suggestion 5
1 suggestion 2
2 suggestion 7
3+ suggestion 140
correct word among suggestions: 148 times. 94%
first suggestion correct: 127 times. 81%

Figure 47: Word selection by the system on the intersection (mutual choices) of both of the human annotators near-synonym choices for the new ‘difficult’ synonym set created for this thesis.

Figure 48 presents some examples taken from union data. The first example indicates that certain word groups are not present in the database (‘video games’) in this case. The second example shows a good distribution of feature agreement from the database giving

a good ranking of suggestions. Example 3 shows that ‘trying’ is sometimes an appropriate choice, even for the humans, although not in the sense of it to being as synonym of difficult. Example 4 provides evidence for the value of the ‘important word’ feature. Example 5 shows that there are occasions when all four features agree and could rule out possible bad choices(‘trying’ in this case) but it is recognized that a much larger database would be required to make this feasible for every context.

<p>1.</p> <p>Full sentence: It all reminds us of a young friend who spends hours with a _____ video game called Ultima III .</p> <p>5 word context: with a ____ video game</p> <p>Human suggested synonym: difficult</p> <p>Human suggested synonym: tough</p> <p>Human suggested synonym: challenging</p> <p>Human suggested synonym: problematic</p> <p>Feature: before bigram</p> <p>Context: with a ____</p> <p>Returned synonyms: 3</p> <p>Feature: after bigram</p> <p>Context: ____ video game</p> <p>Returned synonyms: 0</p> <p>Feature: split bigram</p> <p>Context: a ____ video</p> <p>Returned synonyms: 0</p> <p>Feature: important word</p> <p>Context: ____ sell</p> <p>Returned synonyms: 3</p> <p>computer guesses: hard freq: 42.0 ba :0 bb:1 bs:0 bis:0</p> <p>computer guesses: difficult freq: 12.0 ba :0 bb:1 bs:0 bis:0</p> <p>computer guesses: challenging freq: 1.0 ba :0 bb:1 bs:0 bis:0</p>
<p>2.</p> <p>Full sentence: But the committee said that the numerous methods used to calculate interest and other fees makes it _____ for card holders to compare costs .</p> <p>5 word context: makes it ____ for card</p> <p>Human suggested synonym: difficult</p> <p>Human suggested synonym: tough</p> <p>Human suggested synonym: problematic</p> <p>Human suggested synonym: challenging</p> <p>Human suggested synonym: hard</p>

Human suggested synonym: trying

Feature: before bigram

Context: makes it ____

Returned synonyms: 2

Feature: after bigram

Context: ____ for card

Returned synonyms: 0

Feature: split bigram

Context: it ____ for

Returned synonyms: 3

Feature: important word

Context: ____ card

Returned synonyms: 1

computer guesses: difficult freq: 477.0 ba :0 bb:1 bs:1 bis:1

computer guesses: hard freq: 102.0 ba :0 bb:1 bs:1 bis:0

computer guesses: tough freq: 2.0 ba :0 bb:0 bs:1 bis:0

3.

Full sentence: Critics say it is widely ignored and _____ to enforce .

5 word context: ignored and ____ to enforce

Human suggested synonym: difficult

Human suggested synonym: hard

Human suggested synonym: challenging

Human suggested synonym: tough

Human suggested synonym: trying

Human suggested synonym: problematic

Feature: before bigram

Context: ignored and ____

Returned synonyms: 0

Feature: after bigram

Context: ____ to enforce

Returned synonyms: 3

Feature: split bigram

Context: and ____ to

Returned synonyms: 3

Feature: important word

Context: ____ enforce

Returned synonyms: 3

computer guesses: difficult freq: 260.0 ba :1 bb:0 bs:1 bis:1

computer guesses: hard freq: 78.0 ba :1 bb:0 bs:1 bis:1

computer guesses: trying freq: 41.0 ba :1 bb:0 bs:1 bis:1

4.

Full sentence: Integrated oil companies , which managed to do reasonably well last year despite the collapse of oil prices , may have a _____ first quarter this year , Mr. Margoshes says .

5 word context: have a ____ first quarter

Human suggested synonym: difficult

Human suggested synonym: tough

Human suggested synonym: challenging

Human suggested synonym: hard

Human suggested synonym: problematic

Feature: before bigram

Context: have a ____

Returned synonyms: 3

Feature: after bigram

Context: ____ first quarter

Returned synonyms: 0

Feature: split bigram

Context: a ____ first

Returned synonyms: 0

Feature: important word

Context: ____ first

Returned synonyms: 3

computer guesses: hard freq: 120.0 ba :0 bb:1 bs:0 bis:1

computer guesses: difficult freq: 81.0 ba :0 bb:1 bs:0 bis:1

computer guesses: tough freq: 8.0 ba :0 bb:1 bs:0 bis:0

computer guesses: trying freq: 1.0 ba :0 bb:0 bs:0 bis:1

5.

Full sentence: Indeed , Mr. Baldrige has warned that Fujitsu would use Fairchild's marketing organization to help sell its supercomputers in this country , while asserting that the Japanese government makes it _____ to sell American-made supercomputers there .

5 word context: makes it ____ to sell

Human suggested synonym: difficult

Human suggested synonym: hard

Human suggested synonym: tough

Human suggested synonym: challenging

Feature: before bigram

Context: makes it ____

<p>Returned synonyms: 2</p> <p>Feature: after bigram Context: ____ to sell Returned synonyms: 3</p> <p>Feature: split bigram Context: it ____ to Returned synonyms: 3</p> <p>Feature: important word Context: ____ sell Returned synonyms: 3</p> <p>computer guesses: difficult freq: 2241.0 ba :1 bb:1 bs:1 bis:1 computer guesses: hard freq: 680.0 ba :1 bb:1 bs:1 bis:1 computer guesses: trying freq: 77.0 ba :1 bb:0 bs:1 bis:1</p>

Figure 48: Five examples of the output from this system when run on the union of human annotated data on the new ‘difficult’ synonym set. Full sentence from corpus, 5 word context used by the system, all human annotator synonym suggestions, feature details and suggestions by the system are shown.

4.2.2 New ‘little’ synonym set

Human agreement between annotators on this set was 88.3%. The agreement was calculated in the same manner as the [difficult] set. Shown in Figure 49 is the number of unique contexts for each word in the database. As with the previous set a low number may indicate a shortcoming in the data or it may also indicate that this word’s usage is fairly idiomatic and often occurs in the same contexts.

Word	Occurrences in database	Percentage of set
little	72,082	64.43%
small	31,650	28.29%
slight	4667	4.17%
tiny	365	0.33%
minor	1723	1.54%
modest	888	0.79%
insignificant	510	0.46%

Figure 49: Number of database occurrences for each word in the new ‘little’ synonym set. A low number may indicate a shortcoming in the data or it may also

indicate that this word's usage is fairly idiomatic and often occurs in the same contexts.

Figure 50 and Figure 51 show a breakdown of this systems word selection compared to both the union (Figure 50) and intersection (Figure 51) of the human annotated data. The union is the combination of the human's annotations; the intersection is what they agreed upon. Each word from the synonym set is given with the following information. 'occurs' indicates the number of times that the word was chosen by the program. 'right' indicates the number of times that the word was chosen by the program and was also chosen by at least one human annotator in the union, or both in the intersection. 'wrong' indicates the number of times that the word was chosen by the program but not chosen by either human annotator in the union, or both in the intersection.

4.2.2.1.1 Results based on the Union of Annotations

Evaluation

Total synonym lists evaluated: 147

little occurs: 137

little right: 135

little wrong: 2

99% right

small occurs: 127

small right: 22

small wrong: 105

17% right

tiny occurs: 41

tiny right: 9

tiny wrong: 32

22% right

slight occurs: 92

slight right: 19

slight wrong: 73

21%

minor occurs: 62

minor right: 12

minor wrong: 50

20%

modest occurs: 65
 modest right: 10
 modest wrong: 55
 15% right

insignificant occurs: 45
 insignificant right: 2
 insignificant wrong: 43
 4% right

summary of the number of suggestions made by the system
 no suggestion 7
 1 suggestion 14
 2 suggestion 20
 3+ suggestion 106
 correct word among suggestions: 137 times. 93%
 first suggestion correct: 127 times. 86%

Figure 50: Word selection by the system on the union (combination) of both of the human annotators near-synonym choices for the new ‘little’ synonym set created for this thesis.

4.2.2.1.2 Results based on the Intersection of Annotations

Evaluation
 Total synonym lists evaluated: 147

little occurs: 134
 little right: 128
 little wrong: 6
 96% right

small occurs: 124
 small right: 8
 small wrong: 116
 6% right

tiny occurs: 41
 tiny right: 6
 tiny wrong: 35
 15% right

slight occurs: 90
 slight right: 2
 slight wrong: 88
 22% right

minor occurs: 60
 minor right: 4
 minor wrong: 56
 7% right

modest occurs: 63
 modest right: 2
 modest wrong: 61
 3% right

insignificant occurs: 44
 insignificant right: 0
 insignificant wrong: 44
 0% right

summary of the number of suggestions made by the system
 no suggestion 10
 1 suggestion 14
 2 suggestion 19
 3+ suggestion 104
 correct word among suggestions: 132 times. 92%
 first suggestion correct: 120 times. 83%

Figure 51: Word selection by the system on the intersection (mutual choices) of both of the human annotators near-synonym choices for the new ‘little’ synonym set created for this thesis.

Figure 52 presents some examples taken from union data. Example 1 shows that input sentences from the Wall Street Journal consider punctuation as a word, so sometimes the system is at a disadvantage because it lacks important information. Example 2 shows that the system can rank ‘small’ before ‘little’ even though ‘little’ has much higher frequency in the database. Example 3 shows that the database is missing some contexts and could benefit from being bigger. Example 4 shows that sometimes that the five word window lacks any useful information. Example 5 indicates some surprises in the choices by the system.

1.
 Full sentence: A Merrill Lynch spokesman called the revised Quotron agreement a prudent management move it gives us a _____ flexibility .
 5 word context: us a ____ flexibility .

Human suggested synonym: little
 Human suggested synonym: modest

Feature: before bigram

Context: us a ____

Returned synonyms: 3

Feature: after bigram

Context: ____ flexibility ---

Returned synonyms: 1

Feature: split bigram

Context: a ____ flexibility

Returned synonyms: 0

Feature: important word

Context: ____ flexibility

Returned synonyms: 1

computer guesses: little freq: 84.0 ba :1 bb:1 bs:0 bis:1

computer guesses: small freq: 5.0 ba :0 bb:1 bs:0 bis:0

computer guesses: slight freq: 2.0 ba :0 bb:1 bs:0 bis:0

2.

Full sentence: Record-keeping is nonexistent and homeworkers are frightened to speak up , knowing that they may lose the _____ income they have or , in the case of undocumented workers , risk exposure to the Immigration and Naturalization Service .

5 word context: lose the ____ income they

Human suggested synonym: little

Human suggested synonym: small

Human suggested synonym: modest

Human suggested synonym: tiny

Human suggested synonym: slight

Feature: before bigram

Context: lose the ____

Returned synonyms:1

Feature: after bigram

Context: ____ income they

Returned synonyms: 1

Feature: split bigram

Context: the ____ income

Returned synonyms: 1

Feature: important word

Context: ____ income

Returned synonyms: 2

computer guesses: small freq: 34.0 ba :1 bb:1 bs:1 bis:1

computer guesses: little freq: 6.0 ba :0 bb:0 bs:0 bis:1

3.

Full sentence: Eurodollar bonds closed _____ changed and Morgan Guaranty Ltd. tested a novel approach for repackaging perpetual floating-rate Euronotes .

5 word context: bonds closed ____ changed and

Human suggested synonym: little

Feature: before bigram

Context: bonds closed ____

Returned synonyms: 0

Feature: after bigram

Context: ____ changed and

Returned synonyms: 0

Feature: split bigram

Context: closed ____ changed

Returned synonyms: 0

Feature: important word

Context: ____ closed

Returned synonyms: 1

computer guesses: small freq: 3.0 ba :0 bb:0 bs:0 bis:1

4.

Full sentence: A _____ over a year ago Wedtech was considered one of the program's success stories .

5 word context: a ____ over a

Human suggested synonym: little

Feature: before bigram

Context: -----

Returned synonyms: 0

Feature: after bigram

Context: ____ over a

Returned synonyms: 1

Feature: split bigram

Context: a ____ over

Returned synonyms: 1

Feature: important word

Context: ____ over

Returned synonyms: 6

computer guesses: little freq: 752.0 ba :0 bb:0 bs:1 bis:1

computer guesses: small freq: 84.0 ba :0 bb:0 bs:0 bis:1

computer guesses: slight freq: 3.0 ba :0 bb:0 bs:0 bis:1

computer guesses: minor freq: 2.0 ba :0 bb:0 bs:0 bis:1

computer guesses: tiny freq: 2.0 ba :0 bb:0 bs:0 bis:1

computer guesses: insignificant freq: 1.0 ba :0 bb:0 bs:0 bis:1

5.

Full sentence: Reviews of hospital utilization and radical changes in hospital payment mechanisms have been introduced to curb expenses but to _____ avail .

5 word context: but to ____ avail .

Human suggested synonym: little

bb but(1135)to(6) size: 2

ba avail(7134) 15th(0) size: 2

bs to(6) avail(7134) size:: 0

bis avail(7134) size:: 2

computer guesses: little freq: 174.0 ba :1 bb:1 bs:0 bis:1

computer guesses: small freq: 11.0 ba :1 bb:1 bs:0 bis:1

Figure 52: Five examples of the output from this system when run on the union of human annotated data on the new ‘little’ synonym set. Full sentence from corpus, 5 word context used by the system, all human annotator synonym suggestions, feature details and suggestions by the system are shown.

This chapter compared this method with the best of the previous methods that have dealt with the problem of near-synonym choice based on context using the original synonyms sets and human annotated data. In addition to comparing it to the previous methods, also presented 2 new larger synonym sets and new human annotated data which we believe are better suited to testing this problem over the previous.

5 Conclusions and Future Work

5.1 Contributions

This thesis has hopefully demonstrated just how complex this contextual near-synonymy problem actually is. This problem seems to be benefiting greatly from idiomatic approaches like this and the new data and the ever expanding corpora being released every year. Although great steps have been made there is still a lot of room for improvement. Before this method no previous method was able to come anywhere near the gold standard of human synonym choice.

By using copious amounts of very limited contextual linguistic data (only five words long) from the Google n-grams this system was able to achieve state-of-the-art results on previous testing data. This system is believed to be the first of its kind able to make multiple word suggestions. Multiple word suggestions are believed to more accurately reflect human choice because in the majority of real-world linguistic contexts there is a high number of possibilities for near-synonym usage. This thesis also presents new richer synonyms sets as well as new human annotated data with multiple word suggestions that is more conducive to testing this problem and should be of use in future work. This system unlike previous systems is capable of making multiple word suggestions. It contains a huge number of words and is able to be run in real-time. When able to make multiple suggestions improved by 4.5% over previous human annotators also allowed multiple suggestions. To reiterate, the contributions presented in this thesis are as follows:

- This new method, unlike previous methods used on this problem, is capable of making multiple word suggestions which more accurately models human choice.
- This system is capable of running in real-time on a standard computer. This could allow for the use of this system in many future user specific applications, including word processing software.
- This system contains over 170 thousand words and does not need to be trained on any specific synonym set prior to use.
- New expanded synonyms sets and testing data are given that we believe are more suited to testing this problem.

5.2 Future Work

There is little or no doubt that through future work this method could be improved upon. There are several areas on which to focus future work: the n-gram dataset, part-of-speech tagging, particles, and the computer suggested word rankings system.

Working with the full Google n-gram database would most likely yield positive results. This method caters toward speed and portability but if accuracy is the primary goal I would predict a substantial improvement by using larger n-gram dataset.

The consideration of particles would allow the replacement of synonyms with multiword verb particles and vice versa, i.e 'find' : 'look up'. This inclusion would increase the functionality of this system greatly but may be made difficult because words can appear in between the verb and the particle, 'look the word up'.

Part of speech tagging would address some of the problems that we observed in testing with the word 'trying'. It was often used as a present participle complement of the verb 'to be' rather than as an adjective which was desired.

Working more to improve the ranking system would improve this systems single suggestion performance. This would improve its conventional single suggestion accuracy, which would allow this to be used for automatic word correction on existing documents.

In addition there is a plethora of future applications this system could be used for and because of its small storage requirements and speed could be used on a variety of devices.

- **To aid in translation** - in an application such as Google translate a major issue is finding the correct synonym to fit a certain context so the sentence still makes sense. "I got wet outside" rather than "I got rainy outside".

- **Automatic word usage correction on documents** - to automatically scan a document and correct bad word usage based on a user set certainty(25%= one feature, 50%= two features, 75%= three features, 100%= all four features).
- **Tool for ESL students** - a tool for students whose first language is not English and are unfamiliar with the subtle nuances of English grammar.
- **Typing aid for mobile devices** - a tool for mobile devices that suggests words to reduce typing and correct word usage.
- **Word usage correction in word processing** – a real-time system running in the background of the word processor similar to spell and grammar check to notify the user of incorrect word usage and display a list of possible suggestions.

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Appendix A

Appendix A: Human 1 annotated data for new synonym sets

Q1: Enter your first name:

Human 1

Q2: A Merrill Lynch spokesman called the revised Quotron agreement a prudent management move it gives us a _____ flexibility .

little

modest

Q3: Record-keeping is nonexistent and homeworkers are frightened to speak up , knowing that they may lose the _____ income they have or , in the case of undocumented workers , risk exposure to the Immigration and Naturalization Service .

little

small

modest

Q4: Eurodollar bonds closed _____ changed and Morgan Guaranty Ltd. tested a novel approach for repackaging perpetual floating-rate Euronotes .

little

Q5: Dealers reported a _____ profit-taking by domestic institutions and some unwinding of positions by major market-makers who had prepared themselves for further Japanese buying overnight .

slight

Q6: A _____ over a year ago Wedtech was considered one of the program's success stories .

little

Q7: Reviews of hospital utilization and radical changes in hospital payment mechanisms have been introduced to curb expenses but to _____ avail .

little

Q8: And the big Midwestern brewers that dominate the industry often know _____ about the glitzy , fast-paced world of promotion .

little

Q9: The film opens with a staged conversation between Mr. Stein and Al Burton , an executive producer at Universal Studios , in which Mr. Stein halfheartedly pitches a show about a guy who is a venture capitalist , and the adventure each episode is starting some _____ company .

small

minor

Q10: But , as Mr. Walker observes , the system has _____ room for maneuver .

little

Q11: The airline's load factor , or percentage of seats filled , has steadily improved to 53 % , he said , despite _____ advertising and negative publicity .

little
 modest
 minor
 PAGE 2

Q12: Aware that such tactics could aggravate market plunges , WFIA is trying to use a _____ bit of judgment on portfolio-insurance trading , says Rolf Theisen , another WFIA futures specialist .

little

Q13: Instead of dithering , Mr. Horne adds , the German government would be well advised to step on the gas a _____ bit .

little

tiny

Q14: The president , a former air force general with strong ties to the military , makes foreign policy decisions with _____ interference .

little

minor

Q15: They are noisy but have _____ clout , and only three of them are represented in the assembly .

little

minor

Q16: Rates probably will stay as is , with a greater chance they could move down a _____ than move up , says Robert Chandross , chief economist of Lloyds Bank in New York .

little

Q17: At a recent conference , Mr. Levine acknowledged that his forecast was way off target , quipping that it's been a _____ like leaving the landing lights on for Amelia Earhart .

little

Q18: Most interest prices wound up _____ changed once again in light trading volume .

little

Q19: There was a _____ too much promotion involved , he says .

little

Q20: The idea was too new , and there was too _____ time for them to digest the loan proposal , said William Liley , managing director of Chase Manhattan Asia Ltd.'s project-financing division in Hong Kong .

little

Q21: Bankers who declined to support the loan said they have _____ expertise in project financing and much less in assessing energy markets or Indonesia's credit-worthiness .

little

minor

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Q22: The U.S. , over the opposition of Latin American countries and with _____ support from other industrial nations , has been demanding a change in IADB lending policies that would give Washington a larger say in the approval or rejection of loans .

little

minor

Q23: Tutu , who spent the weekend in Zambia for talks with Oliver Tambo and other leaders of the African National Congress , held out _____ hope of a cease-fire .

slight

modest

Q24: Dixons Group PLC , after winning control of Cyclops Corp. Wednesday through a tender offer , is wasting _____ time taking charge of the Pittsburgh-based company .

little

Q25: Oil and gas production was _____ changed last year , Britoil said .

little

Q26: Even more disturbing to him , the Wall Streeters seem concerned with _____ beyond money and their careers .

little

Q27: This compares with the 1960-80 period , when the ratio for full-time workers changed _____ , ranging from a low of 57 % in 1972 to a high of 60 % , which was reached several times during the two decades .

little

Q28: This stagnation suggests that 1960s legislation prohibiting employment discrimination and in some cases mandating affirmative action did _____ to improve the relative earnings of women .

little

Q29: They may also want jobs that will be available in a wide variety of locations so that if the family moves , they can enter the job market easily , with _____ reduction in earning power .

little

minor

insignificant

Q30: Despite the February spurt , many economists contend spending will decline or will change very _____ for the quarter .

little

Q31: In January , withholding had been reduced , partly because many people had made the adjustment and were having too _____ taken out of their paychecks .

little

Q1: First name:

Human 1

Q2: Gradually , with _____ public notice , police managers have lost control over how officers spend their time .

little

minor

Q3: The sale is expected to have _____ effect on BP itself .

little

Q4: There appears _____ doubt now that the monthly fall , which has been running at about 20,000 , will continue , he said .

little

Q5: The reasons for this post-deregulation mess are complex , but there is _____ question that it adds up to major frustration for air travelers .

little

Q6: OPEC and industry sources confirm that the cartel is producing a _____ more than 14.5 million barrels a day , compared with an authorized OPEC ceiling of 15.8 million barrels a day .

little

Q7: The markets have been very quiet , and they're probably going to remain that way until Treasurys get a _____ more volatile , said a trader for one major U.S. investment bank .
little

Q8: Most top executives have a _____ weekend place where they can escape the pressures of the office .
modest

Q9: These days in Italy the stereotype is bending a _____ , and Mr. Gardini prides himself on being part of the vanguard of a new breed of professional manager , not at all a part of the establishment , the few old families that still run much of Italian industry .
little

Q10: Mr. Abboud says that tactful firing requires a sense of artistry and maybe a _____ guile .
little
slight

Q11: Instead of simply carving out one _____ niche like a lot of cable companies , she's taken on a mix of distinguished programming , says Mel Harris , president of Paramount's television group and a member of USA Network's executive committee .
little

small
tiny

PAGE 2

Q12: The BP news has been used as an excuse by the market-makers to put the market a _____ bit lower , a dealer at County Securities said .
little

tiny

Q13: You seem a _____ bit too much in a hurry , the dealer says .
little

Q14: Until recently it was _____ used .
slight
minor

Q15: That left NEC , Hitachi and a MITI lab to refine the technology with _____ foreign competition .
little
minor

Q16: Like their U.S. counterparts , Japanese makers temper their euphoria with warnings that too _____ is known about the new ceramic superconductor to tell when and how the material will be commercialized .
little

Q17: The shares , which first were offered to the public a _____ more than a year ago for \$ 21 each , have been outpacing the booming stock markets in recent months , and have nearly doubled in value since the end of the year .
little

Q18: There's _____ good news for the president on policy matters , according to the poll .
little
minor

Q19: The day I walked out of my office , I felt a _____ tug in my belly , like when I left the family farm in Nebraska to take a job at Westinghouse Electric , he says .

little
small
tiny
slight
minor

Q20: He's as busy as ever , but probably a _____ more relaxed , says Betty Jane , his wife for 43 years , noting that Mr. Norris has more time to swim , fish and go for walks .

little

Q21: A half-hour of aerobic activity lets Mr. Mohr get away from the business of running a financial information-services company and allows him a _____ privacy ; he says his secretary has once walked in on him during 25 years of rope-hopping .

little

PAGE 3

Q22: To have a _____ blow-up now and then is OK , says Peter M. Hoffman , president of Los Angeles-based Carolco Pictures Inc. , the movie company that produced the Rambo films .

little

small

tiny

slight

minor

Q23: We try to have an open attitude here so people can go a _____ nuts or act weird .

little

Q24: So when Mr. Broad , 53 , needs to let off a _____ steam , he simply strolls the halls of the home-building and insurance company to admire the paintings , wall reliefs and posters by Southern California artists .

little

Q25: A _____ bit of laughter can relieve stress , he says .

little

small

tiny

Q26: His reasons for occupying more modest quarters have _____ to do with the fact that his company is now public , as opposed to Mr. Springs's era .

little

Q27: This is truly the media age , a time when there is a place to print or a time to broadcast the most inconsequential doings of anyone remotely deemed to be a public person , as long as he has a _____ style .

little

Q28: Like most oil companies , Phillips invested relatively _____ in exploration last year because of low oil and gas prices .

little

Q29: We're all a _____ disappointed about that , he said .

little

Q30: Mr. Beals concedes that the tariff , which falls to 10 % from 15 % April 1 , is at this point worth _____ or nothing to Harley , the only remaining U.S. motorcycle maker .

little

Q31: Treasury bond prices wound up _____ changed yesterday and short-term interest rates were mixed amid continued uncertainty about the economic and interest rate outlook .

little

slight

PAGE 4

Q32: That was a much smaller increase than many analysts had expected , but bond traders ignored it anyway because the Fed appears to be paying _____ or no attention to M1 .
little

Q33: Earlier predictions among traders had Cuban production dropping to as _____ as six million tons because of drought and harvesting delays .

little

small

Q34: I do see that it really does anything except remove some energy loans from their books and eliminate a _____ additional risk , said Sandra Flannigan , an analyst with PaineWebber Inc. in Houston .

little

small

tiny

slight

minor

Q35: Despite the rebound , led by higher auto sales , spending is expected to fall or change _____ this quarter .

little

Q36: Some market participants said these guidelines were a _____ vague and may still leave plenty of room for surprises at the closing bell .

little

Q37: Although the National Party is in _____ danger of losing its big parliamentary majority , it most likely will get the resounding endorsement it is seeking .

slight

minor

Q38: But now he can just walk out ; Julie and the others expect to get at least a _____ high .

little

minor

Q39: Says William Taylor , PLE's president : When the old lady fixes you dinner and you start playing with the kids , that's when you start feeling a _____ guilty .

little

Q40: He's also gotten a _____ help from his new Ice Cream Academy , a group of 35 foodies and friends who regularly receive a dozen or so tubs of New England Ice Cream and report their findings .

little

Q41: You noted that these tests have attracted _____ attention from civil libertarians .

little

minor

PAGE 5

Q42: The largest are guaranteed only a _____ above 55 cents this season , and that will drop in the future .

little

Q43: I've become a _____ bit more confident about President Miguel de la Madrid's seriousness .

little

tiny

Q44: As an infantry platoon leader in Vietnam , I had it a _____ easier than some of the others .

little

Q45: As Aviation Week says , At home , downplaying the scope of the space program reduces oversight by the Japanese Diet , which to date has focused _____ attention on .

little

minor

insignificant

Q46: Though the makeshift story line sometimes proceeds a _____ clumsily , Hollywood Shuffle crackles with high spirits .

little

Q47: The arrangement pleases the author's uncle , who says , We sold about 10 or 15 already , and they let me make a _____ money , too .

little

Q48: But chain stores have _____ incentive to buy 50 or 100 copies of a single title from outfits such as his .

little

minor

Q49: Publishers will dump most of this year's best sellers on remainder tables next year , where they may fetch as _____ as \$ 1 apiece .

little

Q50: Aside from grumbling , corporate clients are doing _____ to resist the rise in rates .

little

Q51: Mr. Glazer said Xerox's unit shipments will drop under its new strategy , but said that total revenue from personal computers should change _____ because the publishing system will cost more .

little

PAGE 6

Q52: A two-point reduction drew _____ interest in tests .

little

minor

Q53: Michael Goldstein , executive vice president , said the price cutting the company began in January had very _____ effect , if any , on fourth-quarter earnings ..

little

Q54: At current terms , investors could obtain as much as 75 % or as _____ as 25 % of any increase .

little

Q55: Sen. John Danforth R. , Mo. , the coauthor of a pending Senate bill that would penalize Japan for infractions such as these , needed _____ prompting from the administration .

little

slight

minor

Q56: Because these amounts were exactly what many traders anticipated , the news had _____ effect on the credit markets .

little

minor

Q57: But traders said some institutional investors did a _____ bargain-hunting just before the closing bell .

little

Q58: He has been studying the Pan Am Games for such Best Foods brands as Skippy peanut butter and Mazola corn oil , but he complains that the event is overpriced considering how _____ time remains to capitalize on it .

little

Q59: When one is down a _____ , the other will be stronger .

little

Q60: Now a report by Congress's General Accounting Office shows how _____ is known about its extent and effects .

little

Q61: But the big boys were interested in a small-town radio announcer with _____ experience , and he found himself playing a 17th-century gambler in a made-for-TV drama , the only nonspeaking role of his career .

little

Q1: First name:

Human 1

Q2: It's _____ guys like us who are helping win the cholesterol war by providing edible alternatives to high-cholesterol foods .

little

Q3: Which word to you think fits best?

little

Q4: It all reminds us of a young friend who spends hours with a _____ video game called Ultima III .

difficult

tough

challenging

Q5: Which word to you think fits best?

difficult

Q6: The _____ trick is to get four of your men through endless horrors until each one reaches a level of strength adequate to carry them on to victory .

difficult

tough

Q7: Which word to you think fits best?

difficult

Q8: But the committee said that the numerous methods used to calculate interest and other fees makes it _____ for card holders to compare costs .

difficult

tough

problematic

challenging

Q9: Which word to you think fits best?

hard

Q10: If letter-writer Hochland would spend a _____ time with some native Hoosiers from the rolling limestone hill country , he would find them neither dirty persons nor tramps quite the contrary .

little

Q11: Which word to you think fits best?

little

Q12: Critics say it is widely ignored and _____ to enforce .

difficult

hard

challenging

Q13: Which word to you think fits best?

difficult

Q14: Despite a traditional position of strength , that operation is in very _____ waters because of Brazil's monetary and fiscal squeeze , he said .

difficult

trying

Q15: Which word to you think fits best?

trying

Q16: But San Francisco General's Dr. Kaplan worries : It's more _____ for patients with ARC .

difficult

challenging

Q17: Which word to you think fits best?

challenging

Q18: This threshold makes it _____ for the country's small opposition parties to win any seats at all .

difficult

tough

challenging

Q19: Which word to you think fits best?

tough

Q20: At a recent hearing , architect Charles Gwathmey made excavating two floors sound as _____ as drilling a hole to China .

difficult

problematic

Q21: Which word to you think fits best?

difficult

PAGE 2

Q22: In contrast to the floating-rate note drama , fixed-rate Eurodollar bond prices were _____ changed in light turnover .

little

Q23: Which word to you think fits best?

little

Q24: However , because the dumping involves actions by private concerns rather than by the Japanese government , it has proved _____ to enforce .

difficult

challenging

Q25: Which word to you think fits best?

difficult

Q26: Such a cut could severely damage Brazil's trade-related businesses and make a solution to the country's debt crisis much more _____ to achieve .

difficult

problematic

challenging

Q27: Which word to you think fits best?

difficult

Q28: Import financing has become increasingly _____ to obtain , and maturities have been severely shortened , according to executives .

difficult

hard

tough

challenging

Q29: Which word to you think fits best?

difficult

Q30: Although they reported _____ business during the speech , they said there was a little domestic buying at the higher levels after it .

little

minor

Q31: Which word to you think fits best?

little

Q32: One of the few things many analysts agree on is that interpreting economic reports lately has been especially _____ because of the tax law that became effective Jan. 1 .

difficult

hard

tough

challenging

Q33: Which word to you think fits best?

hard

Q34: It will be _____ and will take time , says Kasumasa Togano , a government scientist .

difficult

hard

tough

challenging

Q35: Which word to you think fits best?

challenging

Q36: Suddenly , a firm that could make _____ block trades efficiently at unusual hours was in an enviable position .

difficult

tough

Q37: Which word to you think fits best?

tough

Q38: Yet the public sees millions wasted in ways that become increasingly _____ to justify .

difficult

hard

problematic

Q39: Which word to you think fits best?

problematic

Q40: The head of the California Highway Patrol , J.M. Barnett , believes the current limit uses up patrol resources on activities that have _____ effect on safety , while ignoring activities that would make a real difference in saving lives such as the pursuit of drunk drivers .

little

minor

Q41: Which word to you think fits best?

little

PAGE 3

Q42: Neil Kinnock , leader of the opposition Labor Party , scorned the budget for having _____ to do with the general good and everything to do with the general election expected later this year .

little

Q43: Which word to you think fits best?

little

Q44: Undercover work is the most _____ , exposed , dangerous assignment the public asks one of its representatives to take , says Peter Bensinger , a former head of the federal Drug Enforcement Agency .

difficult

tough

challenging

Q45: Which word to you think fits best?

challenging

Q46: Skadden and many other big firms that specialize in large transactions frequently charge clients a premium for work on matters that are especially _____ or that require around-the-clock attention .

difficult

tough

trying

challenging

Q47: Which word to you think fits best?

challenging

Q48: Thus , the president is facing a _____ choice , and the delay in naming a successor to Mr. Sayad seems to reflect this .

difficult

tough

Q49: Which word to you think fits best?

tough

Q50: With the economy rising fast through the early 1970s , there was enough new business to accommodate big and _____ retailers alike .

little

small

tiny

Q51: Which word to you think fits best?

small

Q52: Its dominance of the Cleveland market would make it _____ for any of the other major Ohio bank holding companies to take over AmeriTrust because of banking regulators' concerns .

difficult

tough

Q53: Which word to you think fits best?

tough

Q54: In a one-paragraph statement describing Mr. Deaver as a friend for twenty years , Mr. Reagan said yesterday , Nancy and I will keep him and his family in our thoughts during these _____ times .

difficult

hard

tough

trying

challenging

Q55: Which word to you think fits best?

difficult

Q56: The trade representative warned that if those provisions are eliminated or substantially changed , I would find it exceedingly _____ to recommend that the president sign any trade bill including them , Mr. Yeutter stated in the letter .

difficult

challenging

Q57: Which word to you think fits best?

difficult

Q58: The centers try to clear up errors and questions but may forward more _____ cases to auditors .

difficult

unmanageable

problematic

challenging

Q59: Which word to you think fits best?

difficult

Q60: So far , his Wall Street followers have dismissed them as minor flaws in an exceptional record , but the role of market guru is _____ to sustain for long .

little

tiny

Q61: Which word to you think fits best?

tiny

Q1: First name:

Human 1

Q2: We're trying to make it a _____ tougher for even the small-time crooks , says David Friedson , Windmere's president .

little

Q3: Which word to you think fits best?

little

Q4: Notes Michael Seagly , the operations manager at WZZM-TV in Grand Rapids , Mich. : It's very _____ to separate programs for teen-agers from programs for children .

difficult

problematic

challenging

Q5: Which word to you think fits best?

challenging

Q6: At the planning agency , economists said it was _____ to determine from the latest data whether the economy can expand 3 % in the fiscal year .

difficult

challenging

Q7: Which word to you think fits best?

difficult

Q8: Nonetheless , he said that although growth in the current fiscal year may be higher than the 2 % that Industrial Bank has predicted , it will be _____ to achieve a 3 % expansion .

hard

tough

Q9: Which word to you think fits best?

hard

Q10: The House voted 304-100 for the legislation , a scaled-down version of a measure that also would have offered similar subsidies to farmers who decide to plant _____ or no wheat in 1987 , as a way of shrinking some of the nation's huge farm surplus and reducing the government's costs of taking over and storing surplus grain .

little

Q11: Which word to you think fits best?

little

Q12: He said in reviewing computer printouts , it was _____ to sort out the Maine customers .

difficult

tough

challenging

Q13: Which word to you think fits best?

difficult

Q14: However , the Fed is pressing a lawsuit filed last month that could nullify the elaborate plan , one of the most _____ bank restructurings worked out .

problematic

challenging

Q15: Which word to you think fits best?

challenging

Q16: Ashland Oil illustrates the _____ outlook to which Mr. Good referred .

difficult

tough

Q17: Which word to you think fits best?

tough

Q18: But few senior executives leave Edper's fold by choice because it is _____ to match the compensation and autonomy they enjoy .

difficult

Q19: Which word to you think fits best?

difficult

Q20: But it's very _____ to quantify .

difficult

challenging

Q21: Which word to you think fits best?

difficult

PAGE 2

Q22: Most analysts in several surveys expect the report to show _____ or no change from the anemic 1.3 % annual growth rate previously estimated by the department .

little

Q23: Which word to you think fits best?

little

Q24: Mr. Miller said it is _____ to estimate a potential total sale price because the various land development operations may be sold separately .

difficult

Q25: Which word to you think fits best?

difficult

Q26: He said , however , that it is _____ to determine whether that amount will be sufficient to offset the expected operating loss .

difficult

tough

Q27: Which word to you think fits best?

difficult

Q28: He faces several _____ personnel appointments , the most crucial being the next head of the Federal Bureau of Investigation .

difficult

Q29: Which word to you think fits best?

difficult

Q30: Tell me how a _____ guy like me could pressure a one-and-a-half-billion dollar company like Clark ?

little

Q31: Which word to you think fits best?

little

Q32: Sources familiar with USAir and its agreement with Winston-Salem , N.C.-based Piedmont said that while USAir is eager to eliminate TWA as a major shareholder , it could be _____ for the company to buy back TWA's USAir shares .

difficult

hard

problematic

Q33: Which word to you think fits best?

hard

Q34: He also criticized the company for discontinuing its comparable testing of a placebo drug four months into the study , making it _____ to discern how much of the new growth witnessed actually came from Rogaine .

difficult

tough

challenging

Q35: Which word to you think fits best?

difficult

Q36: Producing CMOS chips is a _____ technological task , critics say , one that Advanced Micro already is late in tackling .

difficult

hard

challenging

Q37: Which word to you think fits best?

difficult

Q38: Their work paid off because they not only skate superbly , they even perform break dancing and _____ acrobatics on skates .

difficult

tough

Q39: Which word to you think fits best?

difficult

Q40: The election of Mr. Lubensky thus represented an about-face and the steelmaker's third top-management change in a _____ more than two months .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: The pool of such funds represents a potential bonanza for cash managers , offering sizable management fees for relatively _____ risk or effort .

little

Q43: Which word to you think fits best?

little

Q44: In the past couple of years , cautious investors have found it increasingly _____ to locate bonds rated AAA , or even AA or A . Integrated oil companies , which managed to do reasonably well last year despite the collapse of oil prices , may have a _____ first quarter this year , Mr. Margoshes says .

difficult

tough

challenging

Q45: Which word to you think fits best?

tough

Q46: Perhaps the most _____ thing to remember was that I did have a client , and my job was to carry out their objectives , Mr. Parker said .

difficult

Q47: Which word to you think fits best?

difficult

Q48: It is , in fact , sometimes _____ to decipher the premier's meaning .

difficult

tough

Q49: Which word to you think fits best?

difficult

Q50: Their basic thesis , which we find even less palatable from the pen of a foreign observer , is that grass roots Latin America has _____ or nothing to do with Western civilization and freedom under the rule of law .

little

Q51: Which word to you think fits best?

little

Q52: Officials say it is now often _____ to find beds for new patients of any kind .

difficult

hard

unmanageable

challenging

Q53: Which word to you think fits best?

challenging

Q54: The Reagan administration opposes an import fee , and Sen. Bentsen conceded that it would be _____ to get one through Congress without White House support .

difficult

tough

Q55: Which word to you think fits best?

difficult

Q56: Joseph Wright Jr. , deputy director of the Office of Management and Budget , told reporters the legislation is needed because under the current system , it is _____ to tell the real cost of loan and loan-guarantee programs .

difficult

challenging

Q57: Which word to you think fits best?

challenging

Q58: The broad-based tax was considered as part of tax overhaul last year , but rejected as too ambitious , politically risky and _____ to administer .

tough

Q59: Which word to you think fits best?

tough

Q60: When Americans began to build large , ambitious enterprises , very _____ stood in their way .

little

Q61: Which word to you think fits best?

little

Q1: First name:

Human 1

Q2: It's easy for a _____ over-the-counter company with a forgettable name to get lost in the vast Nasdaq trading system .

little

small

modest

minor

insignificant

Q3: Which word to you think fits best?

insignificant

Q4: The concentration of women in low-paid clerical and service jobs is extremely rigid and extremely _____ for women to escape , says Sylvia Walby , director of the Women's Studies Research Center at Britain's Lancaster University .

difficult

hard

tough

challenging

Q5: Which word to you think fits best?

hard

Q6: It is always _____ to deal with innuendo and untruths , because it's always easy to say about your neighbor , ' There's a possibility he may have herpes , ' he says .

difficult

hard

tough

Q7: Which word to you think fits best?

tough

Q8: Indeed , Mr. Baldrige has warned that Fujitsu would use Fairchild's marketing organization to help sell its supercomputers in this country , while asserting that the Japanese government makes it _____ to sell American-made supercomputers there .

difficult

hard

tough

challenging

Q9: Which word to you think fits best?

tough

Q10: In the absence of an exact science and lacking the descent of a professor of disability ethics from Mt. Olympus , I've developed a rule : Coddle people a _____ but aim to keep them active and productive .

little

Q11: Which word to you think fits best?

little

Q12: Without action now , the nation's civil space program especially that in space science , which has till now been a shining example of U.S. space leadership will be damaged to a degree from which recovery will be extremely _____ and expensive , warned Daniel Fink , chairman of the council , in a letter to NASA Administrator James Fletcher that accompanied the report .

difficult

challenging

Q13: Which word to you think fits best?

difficult

Q14: The chaos that has fostered pit abuses has also made them more _____ to detect , traders say .

difficult

challenging

Q15: Which word to you think fits best?

difficult

Q16: And , with most foreign-exchange operations now controlled by the central bank , it has become _____ to reassure suppliers that payments will be made promptly .

difficult

tough

challenging

Q17: Which word to you think fits best?

tough

Q18: Mr. Feldman acknowledges that such assessments would be more _____ to administer than conventional aptitude tests .

difficult

challenging

Q19: Which word to you think fits best?

difficult

Q20: Jones & Vining said , The board indicated that although it believes the transaction with Vulcan would be very _____ to consummate , it has requested further information from Vulcan in order to thoroughly explore its proposal .

difficult

hard

challenging

Q21: Which word to you think fits best?

hard

PAGE 2

Q22: Ashland , which is primarily a refiner and marketer , produces _____ of its own crude .

little

Q23: Which word to you think fits best?

little

Q24: But the analysts noted that despite the company's desire to stay independent , it would be _____ to refuse an offer at the right price .

difficult

hard

tough

challenging

Q25: Which word to you think fits best?

hard

Q26: Moreover , IBM is expected to modify the internal workings of its machines and make the computers more _____ to clone .

difficult

hard

tough

challenging

Q27: Which word to you think fits best?

difficult

Q28: Notes Michael Seagly , the operations manager at WZZM-TV in Grand Rapids , Mich. : It's very _____ to separate programs for teen-agers from programs for children .

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trying

problematic

challenging

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tough

challenging

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difficult

tough

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challenging

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challenging

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little

tiny

modest

insignificant

Q61: Which word to you think fits best?

little

Q1: First name:

Human 1

Q2: Conventional wisdom here has it that the government helps big business but does _____ for anyone else .

little

Q3: Which word to you think fits best?

little

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difficult

tough

problematic

challenging

Q5: Which word to you think fits best?

problematic

Q6: The legislation would cover about 2.5 million truck and bus drivers , including hundreds of thousands of independent owner-operators , for whom critics contend it will be _____ to arrange testing .

difficult

tough

unmanageable

challenging

Q7: Which word to you think fits best?

unmanageable

Q8: Democratic budget writers in the House are finding it more _____ to cut defense spending than they had anticipated .

difficult

unmanageable

challenging

Q9: Which word to you think fits best?

unmanageable

Q10: Because the foreign-trade overhaul left the government handling oil exports and nothing else , the destruction of the pipeline left the government with _____ hard currency coming in from abroad .

little

insignificant

Q11: Which word to you think fits best?

insignificant

Q12: It's _____ to see when interest will rise , a dealer at a major U.S. bank said .

difficult

hard

tough

challenging

Q13: Which word to you think fits best?

challenging

Q14: It's going to be very _____ to get \$ 9 billion out of defense , said Rep. Jim Slattery D. , Kan .

difficult

hard

tough

challenging

Q15: Which word to you think fits best?

tough

Q16: Mr. Pearson said Fleming lacked a research operation in food stocks , making it _____ to compete with firms that had analyst coverage .

difficult

tough

problematic

Q17: Which word to you think fits best?

difficult

Q18: That will get wide support from corporate management , which has an understandable interest in making it _____ to take over a company that does want to be taken over .

difficult

tough

challenging

Q19: Which word to you think fits best?

difficult

Q20: Mounting the world's largest land mammal is as _____ as might be imagined .

difficult

hard

challenging

Q21: Which word to you think fits best?

hard

PAGE 2

Q22: Most of the resulting imports have come from Cuba , with very _____ contributed by Western markets .

little

Q23: Which word to you think fits best?

little

Q24: However , ignoring data because they are _____ to estimate is like choosing to navigate the streets of Manhattan with a superbly detailed map of Paris rather than with a less-detailed map of New York .

hard

challenging

Q25: Which word to you think fits best?

challenging

Q26: The assent of the Crosby estate and family appears to resolve a _____ period of uncertainty for Atlantic City-based Resorts , which for several months had been the target of a similar but unwelcome takeover offer by Pratt Hotel Corp. .

difficult

trying

challenging

Q27: Which word to you think fits best?

trying

Q28: It'll be very _____ to compete with him there .

difficult

hard

tough

challenging

Q29: Which word to you think fits best?

difficult

Q30: Most appear geared more to managers and white-collar employees ; many are still _____ more than executive perks or pilot projects being tested at headquarters .

little

Q31: Which word to you think fits best?

little

Q32: When asked why Renault had failed again in the U.S. , Mr. Levy cited only _____ market and economic conditions .

difficult

tough

challenging

Q33: Which word to you think fits best?

tough

Q34: The action by Mr. Cruz , who has bipartisan support in Congress as a reformer of the rebel movement , makes even more _____ President Reagan's uphill fight to win \$ 105 million for the rebels for next year .

difficult

challenging

Q35: Which word to you think fits best?

challenging

Q36: The management of CBS News accepted this painful and _____ assignment .

difficult

hard

tough

trying

problematic

challenging

Q37: Which word to you think fits best?

trying

Q38: Insurance industry sources said it would be _____ to determine merely by looking at a company's annual financial statement whether reinsurance agreements conform with state regulations .

difficult

hard

tough

challenging

Q39: Which word to you think fits best?

difficult

Q40: Ms. Hill says the odds are a _____ in favor of a decline at expiration , but we do see a large move either on the up or down side .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: But then you see people being very protective of the _____ boxes they get with gifts in them that are worth maybe \$ 20 .

little

small

tiny

modest

Q43: Which word to you think fits best?

little

Q44: The new law also made it more _____ for pension sponsors to unload their liabilities onto the system .

difficult

challenging

Q45: Which word to you think fits best?

difficult

Q46: And even though it would be _____ to make the case that there has been a national Republican realignment , you could make a case that there has been realignment toward the Republican Party in the South .

difficult

hard

tough

challenging

Q47: Which word to you think fits best?

hard

Q48: Industry strategists want to incorporate the measure into the omnibus trade bill to make it more _____ for the president to veto .

difficult

tough

challenging

Q49: Which word to you think fits best?

difficult

Q50: The election of Mr. Lubensky thus represented an about-face and the steelmaker's third top-management change in a _____ more than two months .

little

Q51: Which word to you think fits best?

little

Q52: But they concede that their efforts will be more _____ if the textile measure is incorporated into the trade bill .

difficult

challenging

Q53: Which word to you think fits best?

challenging

Q54: Moody's added that the rating changes recognize the effect that the company's _____ operating environment will have on its asset quality , core earnings and equity base. .

difficult

unmanageable

problematic

challenging

Q55: Which word to you think fits best?

problematic

Q56: Because it's structured as a limited partnership , the fund can invest in a variety of instruments and use such trading tactics as arbitrage and short-selling , which are _____ or forbidden to most mutual funds .

difficult

problematic

challenging

Q57: Which word to you think fits best?

difficult

Q58: The London exchange said in a statement that the Big Board's rule interpretation was extremely _____ to understand .

difficult

hard

tough

challenging

Q59: Which word to you think fits best?

difficult

Q60: But there is _____ doubt that he wants to do things his own way , and there is strong evidence that he is bringing a new marketing emphasis to Arco that will loosen the company's once-tight supply chain from the crude oil well to the gas pump .

little

Q61: Which word to you think fits best?

little

Q1: First name:

Human 1

Q2: Mr. Cook , by contrast , was _____ known outside the company until he was named to head it ; he likes to work on community projects .

little

Q3: Which word to you think fits best?

little

Q4: A merger of the two companies would be a _____ hurdle for him , said a source close to Mr. Icahn .

difficult

tough

trying

unmanageable

problematic

challenging

Q5: Which word to you think fits best?

difficult

Q6: It's become much more _____ to think of the middle class as some big monolithic group of people , says Susan Gianinno , director of research services at the advertising agency Young & Rubicam .

difficult

problematic

Q7: Which word to you think fits best?

problematic

Q8: The tropical vegetation was so damaged by a 1983 freeze that even today it is _____ to tell the palm trees from the telephone poles .

difficult

hard

Q9: Which word to you think fits best?

hard

Q10: But if you dried up the volume , getting out of a position would be a lot more _____ because the other side might not be there to trade with .

minor

Q11: Which word to you think fits best?

minor

Q12: De Beers has a sales arrangement with the Soviets , but Moscow has dumped diamonds before and may prove _____ to keep in line .

difficult

tough

Q13: Which word to you think fits best?

difficult

Q14: Mr. Redstone acknowledges that some Viacom operations pose a _____ challenge

.

difficult

tough

Q15: Which word to you think fits best?

tough

Q16: As previously reported , the change of heart at MCI reflects a growing realization among its executives that more steep price cuts would be _____ to withstand .

difficult

hard

Q17: Which word to you think fits best?

hard

Q18: To complicate matters further , many analysts agree that it is especially _____ to analyze recent economic statistics because of several special factors , such as the new tax law that took effect Jan. 1 and problems with seasonal adjustments .

difficult

problematic

challenging

Q19: Which word to you think fits best?

challenging

Q20: Humor is a very _____ act to follow , especially when you have a rigid one-joke format like the Bud Light ads , says Roy Grace , chairman of Grace & Rothschild , a New York ad agency .

difficult

tough

Q21: Which word to you think fits best?

tough

PAGE 2

Q22: Mr. Dove , 58 years old , joins MCC at a time when it is still _____ to judge the success of the consortium .

insignificant

Q23: Which word to you think fits best?

insignificant

Q24: As the record shows , it is _____ to stick a policy of never negotiating .

difficult

hard

tough

problematic

challenging

Q25: Which word to you think fits best?

tough

Q26: This _____ problem has perplexed many democratic leaders , here and abroad .

difficult

tough

trying

Q27: Which word to you think fits best?

trying

Q28: But they cautioned that trading was so listless that it is _____ to explain the rise .

difficult

tough

Q29: Which word to you think fits best?

difficult

Q30: Administration officials also note that the National Bipartisan Commission on Central America , chaired by former Secretary of State Henry Kissinger , concluded in 1984 that if the U.S. simply tried to contain Nicaragua , there would be _____ incentive for the Sandinistas to act responsibly .

little

Q31: Which word to you think fits best?

little

Q32: But Gulf States has found it _____ to obtain financing on favorable terms when all potential lenders know it has no choice but to obtain financing at any cost .

difficult

hard

challenging

Q33: Which word to you think fits best?

difficult

Q34: If the airlines could be put together with the employees under TWA's labor contracts which would be easy to postulate but _____ to accomplish they could be a big force in the marketplace , said Paul Schlesinger , a securities analyst at DLJ Securities .

difficult

Q35: Which word to you think fits best?

difficult

Q36: Producers of these goods have generally found it more _____ to raise prices .

difficult

tough

problematic

challenging

Q37: Which word to you think fits best?

tough

Q38: Yet the Tower report concludes , The legal requirements pertaining to the sale of arms to Iran are complex ; the availability of legal authority , including that which may flow from the president's constitutional powers , is _____ to delineate .

difficult

hard

tough

problematic

Q39: Which word to you think fits best?

problematic

Q40: That obviously sounded a _____ too optimistic to one editor , so it was changed to are expected to ease .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: Mr. Yurachek absolutely favors a standardized formula for computing yields , although he admits that might mean a _____ less profit for us .

little

Q43: Which word to you think fits best?

little

Q44: Terms such as operation and implementation are _____ to define , and a legislative proscription might preclude some future president from making a very constructive use of the NSC staff .

difficult

problematic

Q45: Which word to you think fits best?

problematic

Q46: But , he adds , politically , it is very _____ for a bank to accept .

difficult

hard

problematic

Q47: Which word to you think fits best?

problematic

Q48: Food companies , he added , are presented with a very _____ problem .

difficult

tough

challenging

Q49: Which word to you think fits best?

challenging

Q50: The pound dropped 2.1 % from about 2.98 marks to 2.9187 in _____ more than 24 hours .

little

Q51: Which word to you think fits best?

little

Q52: But the employment statistics are very _____ to predict , and individual estimates vary widely .

difficult

hard

tough

challenging

Q53: Which word to you think fits best?

difficult

Q54: Mistrust is deep-seated , and perceptions so highly skeptical and distorted that it's often _____ to believe the two countries were one until 1947 when British India was partitioned .

difficult

hard

tough

Q55: Which word to you think fits best?

hard

Q56: And European public opinion may be so in favor of an accord as to make it _____ for governments to resist .

difficult

tough

challenging

Q57: Which word to you think fits best?

challenging

Q58: Running a big international corporation becomes very _____ when exchange rates are fluctuating wildly , he complains .

difficult

hard

tough

challenging

Q59: Which word to you think fits best?

challenging

Q60: The first quarter is looking a _____ bit weak , said Wendy Beale , an automotive analyst for Smith Barney , Harris Upham & Co. .

little

tiny

Q61: Which word to you think fits best?

little

Q1: First name:

Human 1

Q2: A 150-point advance by a 21,000-plus Nikkei average is an increasingly small affair , a trader said , adding that the average could retreat 150 on mild profit-taking Friday with _____ impact on investor sentiment .

little

insignificant

Q3: Which word to you think fits best?

little

Q4: It will be politically _____ for Britain and West Germany to be seen as opposing a pullout on any grounds , says John Roper of London's Royal Institute for International Affairs , a foreign-policy research concern .

difficult

tough

problematic

Q5: Which word to you think fits best?

problematic

Q6: By using story-theater narration rather than standard dialogue , she relieves her actors of the _____ task of inventing personalities for Kafka's faceless protagonists .

difficult

tough

challenging

Q7: Which word to you think fits best?

challenging

Q8: Although it is _____ to draw definite conclusions from recent Supreme Court opinions , it seems likely the court will resolve McMahon in favor of arbitration .

difficult

hard

tough

challenging

Q9: Which word to you think fits best?

difficult

Q10: Only two generations removed from the Depression , today's middle-class kids know _____ about poverty or the potential for it .

little

Q11: Which word to you think fits best?

little

Q12: Then he got the idea to push the cola business into Japan and began a long , _____ series of negotiations with the Japanese government .

difficult

tough

challenging

Q13: Which word to you think fits best?

difficult

Q14: It's going to be very _____ for them the consortium to build an aircraft with up-to-date avionics without U.S. equipment , the Hughes executive says .

difficult

tough

challenging

Q15: Which word to you think fits best?

difficult

Q16: Mr. Tower's reaction when he was offered the job fueled speculation that the Reagan administration , with only two years left and facing growing political woes , is finding it _____ to attract top candidates for senior posts .

difficult

tough

challenging

Q17: Which word to you think fits best?

tough

Q18: The switch from a staff job , which usually involves a support function , to an important line post is unusual and often _____ at major corporations .

difficult

problematic

challenging

Q19: Which word to you think fits best?

difficult

Q20: The company said the remoteness of those stores made it _____ to incorporate them in long-term strategy .

difficult

tough

challenging

Q21: Which word to you think fits best?

challenging

PAGE 2

Q22: While we may never fully understand the reasons for the six days of anguish experienced by Jerry Seib , we are certain that this episode only demonstrates how _____ we understand about the people involved in this eternal conflict .

little

Q23: Which word to you think fits best?

little

Q24: But the more important and _____ challenge is to devise a procedure by which air-traffic controllers can charge a toll for any flight passing through crowded airspace , even though the flight neither takes off from nor lands at the airport beneath that crowded airspace .

difficult

problematic

Q25: Which word to you think fits best?

problematic

Q26: For many , the value of their acreage is the key to getting that credit because low commodity prices make it _____ at best to predict whether farmers' crops will bring enough to repay planting loans .

difficult

hard

tough

challenging

Q27: Which word to you think fits best?

challenging

Q28: She notes that the federal government is pushing pipelines to give customers like Kopp access to low-priced gas , while making it _____ for the pipelines themselves to get out of high-priced purchase agreements they signed during the energy crisis .

difficult

tough

challenging

Q29: Which word to you think fits best?

tough

Q30: They have to go through customs and immigration in some sweaty _____ nation run by some tin-horn dictator whom they are forced to be extremely nice to so that Barbara Walters does get to interview him first for her Celebrity Tin-Horns Special .

little

Q31: Which word to you think fits best?

little

Q32: If there is any price competition in the future , Purolator is going to have a more _____ time of being profitable .

difficult

tough

challenging

Q33: Which word to you think fits best?

tough

Q34: The Federal Reserve is faced with a very , very _____ period here , Stephen H. Axilrod , vice chairman of Nikko Securities Co. International , says .

difficult

hard

tough

challenging

Q35: Which word to you think fits best?

challenging

Q36: These are very _____ issues that we have tried our best , in good faith , to resolve , Mr. Rule told the senators .

difficult

tough

challenging

Q37: Which word to you think fits best?

challenging

Q38: Although White House aides said they did think the president was trying to send any kind of new signals with his remarks , their sweeping nature makes it very _____ politically for the Democratic-controlled Congress to vote a big tax increase toward reducing the budget deficit .

difficult

tough

Q39: Which word to you think fits best?

tough

Q40: As a lay pastor , he sometimes delivers the sermon in the _____ Lutheran church nearby , while Lady Flo plays hymns on the organ .

little

Q41: Which word to you think fits best?

tiny

PAGE 3

Q42: Some hospitals now offer counseling to their staffs , but those who deal with the repeated crises of the acutely ill have _____ time to do more than suppress their own despair .

little

Q43: Which word to you think fits best?

little

Q44: But assessing land and stock values is _____ in such a speculative environment , and investors are crying for help .

difficult

tough

unmanageable

challenging

Q45: Which word to you think fits best?

unmanageable

Q46: However , with Chase's loan-loss reserve action Wednesday , it is becoming increasingly _____ to justify a near-zero reserve against troubled Third World debt .

difficult

tough

problematic

challenging

Q47: Which word to you think fits best?

problematic

Q48: All of which must be weighed by Mr. Sullivan , who knew his deadline was short and would be _____ to meet .

difficult

tough

challenging

Q49: Which word to you think fits best?

difficult

Q50: German brewers , however , asserted that the decision would have _____ immediate impact on the German market and would change the way beer is brewed in Germany .

.

little

Q51: Which word to you think fits best?

little

Q52: It's going to be very _____ to try to do studies with this drug .

difficult

tough

problematic

challenging

Q53: Which word to you think fits best?

difficult

Q54: Moreover , Mr. Davis says , in some cases dad is always running interference , and that makes it _____ for his daughter to assume responsibility and learn from experience .

difficult

hard

tough

challenging

Q55: Which word to you think fits best?

challenging

Q56: Increases in drug prices and use are unpredictable , Dr. Bowen added , making the cost of the benefit _____ to estimate accurately .

hard

tough

challenging

Q57: Which word to you think fits best?

challenging

Q58: Advertisers contend the tax will be complicated to compute and _____ to collect , and some predict it will be repealed for that reason .

difficult

hard

tough

challenging

Q59: Which word to you think fits best?

tough

Q60: They said there seemed to be _____ futures-related activity , and no obvious leadership in the market .

little

minor

insignificant

Q61: Which word to you think fits best?

minor

Q1: First name:

Human 1

Q2: We're even beginning to see a _____ willingness among individuals to buy stock for their own accounts , he said .

little

Q3: Which word to you think fits best?

little

Q4: Making out-of-state processors return their shells , the department says , would be _____ at best .

difficult

trying

problematic

Q5: Which word to you think fits best?

problematic

Q6: Whereas 12 months ago we were forecasting steadily declining earnings and a _____ period ahead , we see the next 12 months as a period that will reflect steady growth in sales , improved operating results and a significant strengthening of our liquidity and overall financial condition , Mr. Greenberg said .

difficult

tough

Q7: Which word to you think fits best?

difficult

Q8: Does your reserve decision make it more _____ to get a consensus of the banks ?

difficult

tough

problematic

Q9: Which word to you think fits best?

tough

Q10: Meanwhile , a strike by Brazilian merchant seamen , which currently is having _____ impact on shipments , will have to be watched , Mr. O' Neill of Elders said .

little

Q11: Which word to you think fits best?

little

Q12: New CIA Director William Webster , long regarded as a law-and-order man , faces a _____ choice between purging top officials linked to the Iran-Contra scandal and trying to maintain stability at the intelligence agency .

difficult

tough

trying

problematic

Q13: Which word to you think fits best?

difficult

Q14: But winning a consent solicitation can be more _____ than winning a proxy contest because the solicitors need to deliver consents representing a majority of the company's shares outstanding , rather than simply a majority of the voting shares .

difficult

tough

problematic

challenging

Q15: Which word to you think fits best?

difficult

Q16: Calling AZT yesterday's drug is _____ to understand because it is today's AIDS therapy .

difficult

problematic

challenging

Q17: Which word to you think fits best?

challenging

Q18: Debt relief is crucial to Egypt because of its severe cash shortage , which makes it _____ for the country to both pay its foreign creditors and foot its mammoth bill for food imports .

difficult

hard

challenging

Q19: Which word to you think fits best?

difficult

Q20: It's _____ to keep the business running if London is here , a Frankfurt broker said .

difficult

hard

tough

challenging

Q21: Which word to you think fits best?

difficult

PAGE 2

Q22: Slow auto sales and a late Easter could mean weak retail sales for March as well , signaling _____ upward pressure on interest rates , Miss Gibbs said .

little

Q23: Which word to you think fits best?

little

Q24: Israeli officials reportedly also asserted that the Norwegian heavy water , which has not been inspected since 1961 , has since become mixed with other heavy water and would be too _____ to isolate .

difficult

tough

problematic

Q25: Which word to you think fits best?

tough

Q26: The answer , he suggests , is that GM's size makes it _____ to turn around .

difficult

hard

tough

Q27: Which word to you think fits best?

difficult

Q28: It also has created an increasingly _____ business climate .

tough

unmanageable

problematic

challenging

Q29: Which word to you think fits best?

unmanageable

Q30: Buying in the April contract resulted from expectations that Monday's Agriculture Department cattle inventory report , to be released after trading's close , will show _____ change in stock brought to market from a year earlier , analysts said .

little

Q31: Which word to you think fits best?

little

Q32: Corporate restructurings are making it more _____ to have a managerial career , and the pressures are hitting each generation in different ways , says Daniel Levinson , a Yale University psychologist and author of The Seasons of a Man's Life .

difficult

tough

unmanageable

Q33: Which word to you think fits best?

tough

Q34: What makes that learning process so _____ today is the pressure young managers feel to make their mark swiftly .

difficult

tough

trying

challenging

Q35: Which word to you think fits best?

difficult

Q36: And their impatience comes at a _____ time , with many industries being forced by sluggish economic growth and corporate cutbacks to slow the fast track .

difficult

tough

problematic

Q37: Which word to you think fits best?

difficult

Q38: It's very _____ to have a personal life , she admits , but I figure now is the time in my life to make this kind of sacrifice .

difficult

hard

tough

problematic

Q39: Which word to you think fits best?

tough

Q40: Treasury bond prices ended _____ changed as retail sales data for January and February failed to send a clear message to a lethargic , trendless market .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: But dealers said the small rally faded later in the day as institutional investors showed _____ appetite for bonds .

little

Q43: Which word to you think fits best?

little

Q44: Labor contracts have become so complicated that any attempts to revise them are _____ and time-consuming .

difficult

problematic

challenging

Q45: Which word to you think fits best?

problematic

Q46: But bankers said the rules are _____ to get around .

difficult

hard

tough

challenging

Q47: Which word to you think fits best?

difficult

Q48: By a margin of 60 % to 33 % , more Americans in the poll are worried that the country is headed for _____ times than are confident that good times lie ahead ; 56 % agree with the statement that most of our leaders in government and business do really understand or care about people like me , while 39 % disagree with that .

difficult

hard

tough

challenging

Q49: Which word to you think fits best?

tough

Q50: Bond traders paid _____ attention to money supply figures reported late yesterday by the Federal Reserve .

little

Q51: Which word to you think fits best?

little

Q52: Mr. Loeb said he considered Zayre undervalued and noted that the planned sale may make it more _____ for a corporate raider to attempt a hostile takeover because of the increased value of TJX .

difficult

tough

challenging

Q53: Which word to you think fits best?

difficult

Q54: Another publishing company will want to move the operation to New York and Mr. Jovanovich is going to allow that , he said , adding , Jovanovich can be a _____ fellow to deal with .

difficult

tough

challenging

Q55: Which word to you think fits best?

tough

Q56: Cannon , however , did provide the restated financial results for 1985 , making it _____ to assess the effect of the accounting changes .

difficult

hard

tough

problematic

challenging

Q57: Which word to you think fits best?

challenging

Q58: Eleven instances of trading could suggest a pattern that is more _____ to explain as luck or shrewd analysis , they said .

difficult

tough

problematic

challenging

Q59: Which word to you think fits best?

tough

Q60: Interest rates on short-term Treasury bills also were _____ changed .

little

Q61: Which word to you think fits best?

little

Appendix B

Appendix B: Human 2 annotated data for new synonym sets

Q1: Enter your first name:

Human 2

Q2: A Merrill Lynch spokesman called the revised Quotron agreement a prudent management move it gives us a _____ flexibility .

little

Q3: Record-keeping is nonexistent and homeworkers are frightened to speak up , knowing that they may lose the _____ income they have or , in the case of undocumented workers , risk exposure to the Immigration and Naturalization Service .

little

small

tiny

slight

modest

Q4: Eurodollar bonds closed _____ changed and Morgan Guaranty Ltd. tested a novel approach for repackaging perpetual floating-rate Euronotes .

Respondent skipped this question

Q5: Dealers reported a _____ profit-taking by domestic institutions and some unwinding of positions by major market-makers who had prepared themselves for further Japanese buying overnight .

small

tiny

slight

modest

minor

insignificant

Q6: A _____ over a year ago Wedtech was considered one of the program's success stories .

little

Q7: Reviews of hospital utilization and radical changes in hospital payment mechanisms have been introduced to curb expenses but to _____ avail .

little

Q8: And the big Midwestern brewers that dominate the industry often know _____ about the glitzy , fast-paced world of promotion .

little

Q9: The film opens with a staged conversation between Mr. Stein and Al Burton , an executive producer at Universal Studios , in which Mr. Stein halfheartedly pitches a show about a guy who is a venture capitalist , and the adventure each episode is starting some _____ company .

little

small

tiny

modest

minor

insignificant

Q10: But , as Mr. Walker observes , the system has _____ room for maneuver .

little

slight

modest

Q11: The airline's load factor , or percentage of seats filled , has steadily improved to 53 % , he said , despite _____ advertising and negative publicity .

little

modest

minor

PAGE 2

Q12: Aware that such tactics could aggravate market plunges , WFIA is trying to use a _____ bit of judgment on portfolio-insurance trading , says Rolf Theisen , another WFIA futures specialist .

little

tiny

slight

modest

Q13: Instead of dithering , Mr. Horne adds , the German government would be well advised to step on the gas a _____ bit .

little

tiny

Q14: The president , a former air force general with strong ties to the military , makes foreign policy decisions with _____ interference .

little

slight

minor

Q15: They are noisy but have _____ clout , and only three of them are represented in the assembly .

little

minor

insignificant

Q16: Rates probably will stay as is , with a greater chance they could move down a _____ than move up , says Robert Chandross , chief economist of Lloyds Bank in New York .

little

Q17: At a recent conference , Mr. Levine acknowledged that his forecast was way off target , quipping that it's been a _____ like leaving the landing lights on for Amelia Earhart .

little

Q18: Most interest prices wound up _____ changed once again in light trading volume .

little

Q19: There was a _____ too much promotion involved , he says .

little

Q20: The idea was too new , and there was too _____ time for them to digest the loan proposal , said William Liley , managing director of Chase Manhattan Asia Ltd.'s project-financing division in Hong Kong .

little

Q21: Bankers who declined to support the loan said they have _____ expertise in project financing and much less in assessing energy markets or Indonesia's credit-worthiness .

little

minor

PAGE 3

Q22: The U.S. , over the opposition of Latin American countries and with _____ support from other industrial nations , has been demanding a change in IADB lending policies that would give Washington a larger say in the approval or rejection of loans .

little

slight

modest

minor

Q23: Tutu , who spent the weekend in Zambia for talks with Oliver Tambo and other leaders of the African National Congress , held out _____ hope of a cease-fire .

little

small

modest

Q24: Dixons Group PLC , after winning control of Cyclops Corp. Wednesday through a tender offer , is wasting _____ time taking charge of the Pittsburgh-based company .

little

Q25: Oil and gas production was _____ changed last year , Britoil said .

little

Q26: Even more disturbing to him , the Wall Streeters seem concerned with _____ beyond money and their careers .

little

Q27: This compares with the 1960-80 period , when the ratio for full-time workers changed _____ , ranging from a low of 57 % in 1972 to a high of 60 % , which was reached several times during the two decades .

little

Q28: This stagnation suggests that 1960s legislation prohibiting employment discrimination and in some cases mandating affirmative action did _____ to improve the relative earnings of women .

little

Q29: They may also want jobs that will be available in a wide variety of locations so that if the family moves , they can enter the job market easily , with _____ reduction in earning power .

little

Q30: Despite the February spurt , many economists contend spending will decline or will change very _____ for the quarter .

little

Q31: In January , withholding had been reduced , partly because many people had made the adjustment and were having too _____ taken out of their paychecks .

little

Q1: First name:

Human 2

Q2: Gradually , with _____ public notice , police managers have lost control over how officers spend their time .

little

slight
minor

Q3: The sale is expected to have _____ effect on BP itself .

little

Q4: There appears _____ doubt now that the monthly fall , which has been running at about 20,000 , will continue , he said .

little

Q5: The reasons for this post-deregulation mess are complex , but there is _____ question that it adds up to major frustration for air travelers .

little

Q6: OPEC and industry sources confirm that the cartel is producing a _____ more than 14.5 million barrels a day , compared with an authorized OPEC ceiling of 15.8 million barrels a day .

little

Q7: The markets have been very quiet , and they're probably going to remain that way until Treasuries get a _____ more volatile , said a trader for one major U.S. investment bank .

little

Q8: Most top executives have a _____ weekend place where they can escape the pressures of the office .

little

small

modest

Q9: These days in Italy the stereotype is bending a _____ , and Mr. Gardini prides himself on being part of the vanguard of a new breed of professional manager , not at all a part of the establishment , the few old families that still run much of Italian industry .

little

Q10: Mr. Abboud says that tactful firing requires a sense of artistry and maybe a _____ guile .

little

Q11: Instead of simply carving out one _____ niche like a lot of cable companies , she's taken on a mix of distinguished programming , says Mel Harris , president of Paramount's television group and a member of USA Network's executive committee .

little

small

tiny

modest

minor

insignificant

PAGE 2

Q12: The BP news has been used as an excuse by the market-makers to put the market a _____ bit lower , a dealer at County Securities said .

little

Q13: You seem a _____ bit too much in a hurry , the dealer says .

little

Q14: Until recently it was _____ used .

little

Q15: That left NEC , Hitachi and a MITI lab to refine the technology with _____ foreign competition .

little
slight
modest
minor
insignificant

Q16: Like their U.S. counterparts , Japanese makers temper their euphoria with warnings that too _____ is known about the new ceramic superconductor to tell when and how the material will be commercialized .

little

Q17: The shares , which first were offered to the public a _____ more than a year ago for \$ 21 each , have been outpacing the booming stock markets in recent months , and have nearly doubled in value since the end of the year .

little

Q18: There's _____ good news for the president on policy matters , according to the poll .

little

slight

Q19: The day I walked out of my office , I felt a _____ tug in my belly , like when I left the family farm in Nebraska to take a job at Westinghouse Electric , he says .

little

small

tiny

slight

modest

minor

Q20: He's as busy as ever , but probably a _____ more relaxed , says Betty Jane , his wife for 43 years , noting that Mr. Norris has more time to swim , fish and go for walks .

little

Q21: A half-hour of aerobic activity lets Mr. Mohr get away from the business of running a financial information-services company and allows him a _____ privacy ; he says his secretary has once walked in on him during 25 years of rope-hopping .

little

PAGE 3

Q22: To have a _____ blow-up now and then is OK , says Peter M. Hoffman , president of Los Angeles-based Carolco Pictures Inc. , the movie company that produced the Rambo films .

little

small

tiny

slight

modest

minor

Q23: We try to have an open attitude here so people can go a _____ nuts or act weird .

little

Q24: So when Mr. Broad , 53 , needs to let off a _____ steam , he simply strolls the halls of the home-building and insurance company to admire the paintings , wall reliefs and posters by Southern California artists .

little

Q25: A _____ bit of laughter can relieve stress , he says .

little
small
tiny
slight
modest

Q26: His reasons for occupying more modest quarters have _____ to do with the fact that his company is now public , as opposed to Mr. Springs's era .

little

Q27: This is truly the media age , a time when there is a place to print or a time to broadcast the most inconsequential doings of anyone remotely deemed to be a public person , as long as he has a _____ style .

little

Q28: Like most oil companies , Phillips invested relatively _____ in exploration last year because of low oil and gas prices .

little

Q29: We're all a _____ disappointed about that , he said .

little

Q30: Mr. Beals concedes that the tariff , which falls to 10 % from 15 % April 1 , is at this point worth _____ or nothing to Harley , the only remaining U.S. motorcycle maker .

little

Q31: Treasury bond prices wound up _____ changed yesterday and short-term interest rates were mixed amid continued uncertainty about the economic and interest rate outlook .

little

PAGE 4

Q32: That was a much smaller increase than many analysts had expected , but bond traders ignored it anyway because the Fed appears to be paying _____ or no attention to M1 .

little

Q33: Earlier predictions among traders had Cuban production dropping to as _____ as six million tons because of drought and harvesting delays .

little

Q34: I do see that it really does anything except remove some energy loans from their books and eliminate a _____ additional risk , said Sandra Flannigan , an analyst with PaineWebber Inc. in Houston .

little

Q35: Despite the rebound , led by higher auto sales , spending is expected to fall or change _____ this quarter .

little

Q36: Some market participants said these guidelines were a _____ vague and may still leave plenty of room for surprises at the closing bell .

little

Q37: Although the National Party is in _____ danger of losing its big parliamentary majority , it most likely will get the resounding endorsement it is seeking .

little

small
slight
minor

Q38: But now he can just walk out ; Julie and the others expect to get at least a _____ high .

little

Q39: Says William Taylor , PLE's president : When the old lady fixes you dinner and you start playing with the kids , that's when you start feeling a _____ guilty .

little

Q40: He's also gotten a _____ help from his new Ice Cream Academy , a group of 35 foodies and friends who regularly receive a dozen or so tubs of New England Ice Cream and report their findings .

little

slight

Q41: You noted that these tests have attracted _____ attention from civil libertarians .

little

modest

minor

PAGE 5

Q42: The largest are guaranteed only a _____ above 55 cents this season , and that will drop in the future .

little

Q43: I've become a _____ bit more confident about President Miguel de la Madrid's seriousness .

little

tiny

slight

Q44: As an infantry platoon leader in Vietnam , I had it a _____ easier than some of the others .

little

Q45: As Aviation Week says , At home , downplaying the scope of the space program reduces oversight by the Japanese Diet , which to date has focused _____ attention on .

little

slight

modest

minor

Q46: Though the makeshift story line sometimes proceeds a _____ clumsily , Hollywood Shuffle crackles with high spirits .

little

Q47: The arrangement pleases the author's uncle , who says , We sold about 10 or 15 already , and they let me make a _____ money , too .

little

Q48: But chain stores have _____ incentive to buy 50 or 100 copies of a single title from outfits such as his .

little

Q49: Publishers will dump most of this year's best sellers on remainder tables next year , where they may fetch as _____ as \$ 1 apiece .

little

Q50: Aside from grumbling , corporate clients are doing _____ to resist the rise in rates .

little

Q51: Mr. Glazer said Xerox's unit shipments will drop under its new strategy , but said that total revenue from personal computers should change _____ because the publishing system will cost more .

little

PAGE 6

Q52: A two-point reduction drew _____ interest in tests .

little

Q53: Michael Goldstein , executive vice president , said the price cutting the company began in January had very _____ effect , if any , on fourth-quarter earnings ..

little

slight

Q54: At current terms , investors could obtain as much as 75 % or as _____ as 25 % of any increase .

little

Q55: Sen. John Danforth R. , Mo. , the coauthor of a pending Senate bill that would penalize Japan for infractions such as these , needed _____ prompting from the administration .

little

slight

modest

Q56: Because these amounts were exactly what many traders anticipated , the news had _____ effect on the credit markets .

little

Q57: But traders said some institutional investors did a _____ bargain-hunting just before the closing bell .

little

Q58: He has been studying the Pan Am Games for such Best Foods brands as Skippy peanut butter and Mazola corn oil , but he complains that the event is overpriced considering how _____ time remains to capitalize on it .

little

Q59: When one is down a _____ , the other will be stronger .

little

Q60: Now a report by Congress's General Accounting Office shows how _____ is known about its extent and effects .

little

Q61: But the big boys were interested in a small-town radio announcer with _____ experience , and he found himself playing a 17th-century gambler in a made-for-TV drama , the only nonspeaking role of his career .

little

slight

modest

Q1: First name:

Human 2

Q2: It's _____ guys like us who are helping win the cholesterol war by providing edible alternatives to high-cholesterol foods .

little

small

minor

Q3: Which word to you think fits best?

small

Q4: It all reminds us of a young friend who spends hours with a _____ video game called Ultima III .

difficult

tough

problematic

challenging

Q5: Which word to you think fits best?

challenging

Q6: The _____ trick is to get four of your men through endless horrors until each one reaches a level of strength adequate to carry them on to victory .

difficult

hard

tough

challenging

Q7: Which word to you think fits best?

difficult

Q8: But the committee said that the numerous methods used to calculate interest and other fees makes it _____ for card holders to compare costs .

difficult

hard

tough

trying

problematic

challenging

Q9: Which word to you think fits best?

challenging

Q10: If letter-writer Hochland would spend a _____ time with some native Hoosiers from the rolling limestone hill country , he would find them neither dirty persons nor tramps quite the contrary .

little

Q11: Which word to you think fits best?

little

Q12: Critics say it is widely ignored and _____ to enforce .

difficult

hard

tough

trying

problematic

challenging

Q13: Which word to you think fits best?

difficult

Q14: Despite a traditional position of strength , that operation is in very _____ waters because of Brazil's monetary and fiscal squeeze , he said .

difficult

tough

trying

problematic

challenging

Q15: Which word to you think fits best?

difficult

Q16: But San Francisco General's Dr. Kaplan worries : It's more _____ for patients with ARC .

difficult

trying

unmanageable

problematic

challenging

Q17: Which word to you think fits best?

challenging

Q18: This threshold makes it _____ for the country's small opposition parties to win any seats at all .

difficult

hard

tough

problematic

challenging

Q19: Which word to you think fits best?

difficult

Q20: At a recent hearing , architect Charles Gwathmey made excavating two floors sound as _____ as drilling a hole to China .

difficult

hard

tough

problematic

challenging

Q21: Which word to you think fits best?

difficult

PAGE 2

Q22: In contrast to the floating-rate note drama , fixed-rate Eurodollar bond prices were _____ changed in light turnover .

little

Q23: Which word to you think fits best?

little

Q24: However , because the dumping involves actions by private concerns rather than by the Japanese government , it has proved _____ to enforce .

difficult

hard

tough

problematic

challenging

Q25: Which word to you think fits best?

challenging

Q26: Such a cut could severely damage Brazil's trade-related businesses and make a solution to the country's debt crisis much more _____ to achieve .

difficult

tough

challenging

Q27: Which word to you think fits best?

difficult

Q28: Import financing has become increasingly _____ to obtain , and maturities have been severely shortened , according to executives .

difficult

hard

tough

challenging

Q29: Which word to you think fits best?

tough

Q30: Although they reported _____ business during the speech , they said there was a little domestic buying at the higher levels after it .

little

modest

Q31: Which word to you think fits best?

little

Q32: One of the few things many analysts agree on is that interpreting economic reports lately has been especially _____ because of the tax law that became effective Jan. 1 .

difficult

hard

tough

trying

problematic

challenging

Q33: Which word to you think fits best?

problematic

Q34: It will be _____ and will take time , says Kasumasa Togano , a government scientist

.

difficult

hard

tough

problematic

challenging

Q35: Which word to you think fits best?

challenging

Q36: Suddenly , a firm that could make _____ block trades efficiently at unusual hours was in an enviable position .

difficult

hard

tough

challenging

Q37: Which word to you think fits best?

difficult

Q38: Yet the public sees millions wasted in ways that become increasingly _____ to justify .

difficult

hard
tough
problematic
challenging

Q39: Which word to you think fits best?

difficult

Q40: The head of the California Highway Patrol , J.M. Barnett , believes the current limit uses up patrol resources on activities that have _____ effect on safety , while ignoring activities that would make a real difference in saving lives such as the pursuit of drunk drivers .

little
small
modest
minor

Q41: Which word to you think fits best?

little

PAGE 3

Q42: Neil Kinnock , leader of the opposition Labor Party , scorned the budget for having _____ to do with the general good and everything to do with the general election expected later this year .

little

Q43: Which word to you think fits best?

little

Q44: Undercover work is the most _____ , exposed , dangerous assignment the public asks one of its representatives to take , says Peter Bensinger , a former head of the federal Drug Enforcement Agency .

difficult
tough
trying

problematic
challenging

Q45: Which word to you think fits best?

problematic

Q46: Skadden and many other big firms that specialize in large transactions frequently charge clients a premium for work on matters that are especially _____ or that require around-the-clock attention .

difficult
hard
tough
trying
problematic
challenging

Q47: Which word to you think fits best?

challenging

Q48: Thus , the president is facing a _____ choice , and the delay in naming a successor to Mr. Sayad seems to reflect this .

difficult
hard
tough

challenging

Q49: Which word to you think fits best?

difficult

Q50: With the economy rising fast through the early 1970s , there was enough new business to accommodate big and _____ retailers alike .

small

Q51: Which word to you think fits best?

small

Q52: Its dominance of the Cleveland market would make it _____ for any of the other major Ohio bank holding companies to take over AmeriTrust because of banking regulators' concerns .

difficult

hard

tough

problematic

challenging

Q53: Which word to you think fits best?

challenging

Q54: In a one-paragraph statement describing Mr. Deaver as a friend for twenty years , Mr. Reagan said yesterday , Nancy and I will keep him and his family in our thoughts during these _____ times .

difficult

hard

tough

trying

challenging

Q55: Which word to you think fits best?

difficult

Q56: The trade representative warned that if those provisions are eliminated or substantially changed , I would find it exceedingly _____ to recommend that the president sign any trade bill including them , Mr. Yeutter stated in the letter .

difficult

hard

tough

problematic

challenging

Q57: Which word to you think fits best?

difficult

Q58: The centers try to clear up errors and questions but may forward more _____ cases to auditors .

difficult

hard

tough

trying

problematic

challenging

Q59: Which word to you think fits best?

challenging

Q60: So far , his Wall Street followers have dismissed them as minor flaws in an exceptional record , but the role of market guru is _____ to sustain for long .

Respondent skipped this question

Q61: Which word to you think fits best?

Respondent skipped this question

Q1: First name:

Human 2

Q2: We're trying to make it a _____ tougher for even the small-time crooks , says David Friedson , Windmere's president .

little

Q3: Which word to you think fits best?

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difficult

hard

tough

challenging

Q7: Which word to you think fits best?

challenging

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tough

problematic

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Q10: The House voted 304-100 for the legislation , a scaled-down version of a measure that also would have offered similar subsidies to farmers who decide to plant _____ or no wheat in 1987 , as a way of shrinking some of the nation's huge farm surplus and reducing the government's costs of taking over and storing surplus grain .

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hard

tough

problematic

challenging

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difficult

problematic

challenging

Q15: Which word to you think fits best?

challenging

Q16: Ashland Oil illustrates the _____ outlook to which Mr. Good referred .

difficult

tough

problematic

challenging

Q17: Which word to you think fits best?

problematic

Q18: But few senior executives leave Edper's fold by choice because it is _____ to match the compensation and autonomy they enjoy .

difficult

hard

tough

challenging

Q19: Which word to you think fits best?

difficult

Q20: But it's very _____ to quantify .

difficult

hard

tough

challenging

Q21: Which word to you think fits best?

tough

PAGE 2

Q22: Most analysts in several surveys expect the report to show _____ or no change from the anemic 1.3 % annual growth rate previously estimated by the department .

little

Q23: Which word to you think fits best?

little

Q24: Mr. Miller said it is _____ to estimate a potential total sale price because the various land development operations may be sold separately .

difficult

hard

tough

challenging

Q25: Which word to you think fits best?

difficult

Q26: He said , however , that it is _____ to determine whether that amount will be sufficient to offset the expected operating loss .

difficult

hard

tough

challenging

Q27: Which word to you think fits best?

challenging

Q28: He faces several _____ personnel appointments , the most crucial being the next head of the Federal Bureau of Investigation .

difficult

hard

tough

problematic

challenging

Q29: Which word to you think fits best?

difficult

Q30: Tell me how a _____ guy like me could pressure a one-and-a-half-billion dollar company like Clark ?

little

small

tiny

insignificant

Q31: Which word to you think fits best?

tiny

Q32: Sources familiar with USAir and its agreement with Winston-Salem , N.C.-based Piedmont said that while USAir is eager to eliminate TWA as a major shareholder , it could be _____ for the company to buy back TWA's USAir shares .

difficult

hard

tough

problematic

challenging

Q33: Which word to you think fits best?

challenging

Q34: He also criticized the company for discontinuing its comparable testing of a placebo drug four months into the study , making it _____ to discern how much of the new growth witnessed actually came from Rogaine .

difficult

hard

tough

challenging

Q35: Which word to you think fits best?

difficult

Q36: Producing CMOS chips is a _____ technological task , critics say , one that Advanced Micro already is late in tackling .

difficult

hard

tough

challenging

Q37: Which word to you think fits best?

difficult

Q38: Their work paid off because they not only skate superbly , they even perform break dancing and _____ acrobatics on skates .

difficult

challenging

Q39: Which word to you think fits best?

challenging

Q40: The election of Mr. Lubensky thus represented an about-face and the steelmaker's third top-management change in a _____ more than two months .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: The pool of such funds represents a potential bonanza for cash managers , offering sizable management fees for relatively _____ risk or effort .

little

small

tiny

slight

modest

minor

Q43: Which word to you think fits best?

little

Q44: In the past couple of years , cautious investors have found it increasingly _____ to locate bonds rated AAA , or even AA or A . Integrated oil companies , which managed to do reasonably well last year despite the collapse of oil prices , may have a _____ first quarter this year , Mr. Margoshes says .

difficult

hard

tough

problematic

challenging

Q45: Which word to you think fits best?

difficult

Q46: Perhaps the most _____ thing to remember was that I did have a client , and my job was to carry out their objectives , Mr. Parker said .

difficult

challenging

Q47: Which word to you think fits best?

difficult

Q48: It is , in fact , sometimes _____ to decipher the premier's meaning .

difficult

hard

tough

challenging

Q49: Which word to you think fits best?

difficult

Q50: Their basic thesis , which we find even less palatable from the pen of a foreign observer , is that grass roots Latin America has _____ or nothing to do with Western civilization and freedom under the rule of law .

little

Q51: Which word to you think fits best?

little

Q52: Officials say it is now often _____ to find beds for new patients of any kind .

difficult

hard

tough

challenging

Q53: Which word to you think fits best?

challenging

Q54: The Reagan administration opposes an import fee , and Sen. Bentsen conceded that it would be _____ to get one through Congress without White House support .

difficult

hard

tough

problematic

challenging

Q55: Which word to you think fits best?

difficult

Q56: Joseph Wright Jr. , deputy director of the Office of Management and Budget , told reporters the legislation is needed because under the current system , it is _____ to tell the real cost of loan and loan-guarantee programs .

difficult

hard

tough

challenging

Q57: Which word to you think fits best?

hard

Q58: The broad-based tax was considered as part of tax overhaul last year , but rejected as too ambitious , politically risky and _____ to administer .

difficult

hard

tough

problematic

challenging

Q59: Which word to you think fits best?

difficult

Q60: When Americans began to build large , ambitious enterprises , very _____ stood in their way .

little

Q61: Which word to you think fits best?

little

Q1: First name:

Human 2

Q2: It's easy for a _____ over-the-counter company with a forgettable name to get lost in the vast Nasdaq trading system .

little

small

tiny

modest

minor

insignificant

Q3: Which word to you think fits best?

small

Q4: The concentration of women in low-paid clerical and service jobs is extremely rigid and extremely _____ for women to escape , says Sylvia Walby , director of the Women's Studies Research Center at Britain's Lancaster University .

difficult

hard

tough

challenging

Q5: Which word to you think fits best?

difficult

Q6: It is always _____ to deal with innuendo and untruths , because it's always easy to say about your neighbor , ' There's a possibility he may have herpes , ' he says .

difficult

hard

tough

challenging

Q7: Which word to you think fits best?

tough

Q8: Indeed , Mr. Baldrige has warned that Fujitsu would use Fairchild's marketing organization to help sell its supercomputers in this country , while asserting that the Japanese government makes it _____ to sell American-made supercomputers there .

difficult

hard

tough

challenging

Q9: Which word to you think fits best?

difficult

Q10: In the absence of an exact science and lacking the descent of a professor of disability ethics from Mt. Olympus , I've developed a rule : Coddle people a _____ but aim to keep them active and productive .

little

Q11: Which word to you think fits best?

little

Q12: Without action now , the nation's civil space program especially that in space science , which has till now been a shining example of U.S. space leadership will be damaged to a degree from which recovery will be extremely _____ and expensive , warned Daniel Fink ,

chairman of the council , in a letter to NASA Administrator James Fletcher that accompanied the report .

difficult

hard

tough

problematic

challenging

Q13: Which word to you think fits best?

challenging

Q14: The chaos that has fostered pit abuses has also made them more _____ to detect , traders say .

difficult

challenging

Q15: Which word to you think fits best?

challenging

Q16: And , with most foreign-exchange operations now controlled by the central bank , it has become _____ to reassure suppliers that payments will be made promptly .

difficult

hard

tough

challenging

Q17: Which word to you think fits best?

difficult

Q18: Mr. Feldman acknowledges that such assessments would be more _____ to administer than conventional aptitude tests .

difficult

problematic

challenging

Q19: Which word to you think fits best?

difficult

Q20: Jones & Vining said , The board indicated that although it believes the transaction with Vulcan would be very _____ to consummate , it has requested further information from Vulcan in order to thoroughly explore its proposal .

difficult

hard

tough

problematic

challenging

Q21: Which word to you think fits best?

challenging

PAGE 2

Q22: Ashland , which is primarily a refiner and marketer , produces _____ of its own crude .

little

Q23: Which word to you think fits best?

little

Q24: But the analysts noted that despite the company's desire to stay independent , it would be _____ to refuse an offer at the right price .

difficult

hard

tough

challenging

Q25: Which word to you think fits best?

hard

Q26: Moreover , IBM is expected to modify the internal workings of its machines and make the computers more _____ to clone .

difficult

challenging

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difficult

hard

tough

problematic

challenging

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difficult

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difficult

hard

tough

challenging

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hard

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difficult

hard

tough

problematic

challenging

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difficult

hard

tough

challenging

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hard

tough

problematic

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little

small

tiny

modest

minor

insignificant

Q61: Which word to you think fits best?

small

Q1: First name:

Human 2

Q2: Conventional wisdom here has it that the government helps big business but does _____ for anyone else .

little

Q3: Which word to you think fits best?

little

Q4: He also criticized the company for discontinuing its comparable testing of a placebo drug four months into the study , making it _____ to discern how much of the new growth witnessed actually came from Rogaine .

difficult

hard

tough

problematic

challenging

Q5: Which word to you think fits best?

difficult

Q6: The legislation would cover about 2.5 million truck and bus drivers , including hundreds of thousands of independent owner-operators , for whom critics contend it will be _____ to arrange testing .

difficult

hard

tough

problematic

challenging

Q7: Which word to you think fits best?

difficult

Q8: Democratic budget writers in the House are finding it more _____ to cut defense spending than they had anticipated .

difficult

problematic

challenging

Q9: Which word to you think fits best?

difficult

Q10: Because the foreign-trade overhaul left the government handling oil exports and nothing else , the destruction of the pipeline left the government with _____ hard currency coming in from abroad .

little

Q11: Which word to you think fits best?

little

Q12: It's _____ to see when interest will rise , a dealer at a major U.S. bank said .

difficult

hard

tough

Q13: Which word to you think fits best?

hard

Q14: It's going to be very _____ to get \$ 9 billion out of defense , said Rep. Jim Slattery D. , Kan .

difficult

hard

tough

challenging

Q15: Which word to you think fits best?

challenging

Q16: Mr. Pearson said Fleming lacked a research operation in food stocks , making it _____ to compete with firms that had analyst coverage .

difficult

hard

tough

challenging

Q17: Which word to you think fits best?

hard

Q18: That will get wide support from corporate management , which has an understandable interest in making it _____ to take over a company that does want to be taken over .

difficult

hard

tough

challenging

Q19: Which word to you think fits best?

difficult

Q20: Mounting the world's largest land mammal is as _____ as might be imagined .

difficult

hard

trying

problematic

challenging

Q21: Which word to you think fits best?

challenging

PAGE 2

Q22: Most of the resulting imports have come from Cuba , with very _____ contributed by Western markets .

little

Q23: Which word to you think fits best?

little

Q24: However , ignoring data because they are _____ to estimate is like choosing to navigate the streets of Manhattan with a superbly detailed map of Paris rather than with a less-detailed map of New York .

difficult

hard

tough

challenging

Q25: Which word to you think fits best?

difficult

Q26: The assent of the Crosby estate and family appears to resolve a _____ period of uncertainty for Atlantic City-based Resorts , which for several months had been the target of a similar but unwelcome takeover offer by Pratt Hotel Corp. .

difficult

hard

tough

trying

problematic

challenging

Q27: Which word to you think fits best?

difficult

Q28: It'll be very _____ to compete with him there .

difficult

hard

tough

problematic

challenging

Q29: Which word to you think fits best?

tough

Q30: Most appear geared more to managers and white-collar employees ; many are still _____ more than executive perks or pilot projects being tested at headquarters .

little

Q31: Which word to you think fits best?

little

Q32: When asked why Renault had failed again in the U.S. , Mr. Levy cited only _____ market and economic conditions .

difficult

hard

tough

trying

problematic

challenging

Q33: Which word to you think fits best?

challenging

Q34: The action by Mr. Cruz , who has bipartisan support in Congress as a reformer of the rebel movement , makes even more _____ President Reagan's uphill fight to win \$ 105 million for the rebels for next year .

difficult

problematic

challenging

Q35: Which word to you think fits best?

difficult

Q36: The management of CBS News accepted this painful and _____ assignment .

difficult

hard

tough

trying

problematic

challenging

Q37: Which word to you think fits best?

problematic

Q38: Insurance industry sources said it would be _____ to determine merely by looking at a company's annual financial statement whether reinsurance agreements conform with state regulations .

difficult

hard
tough
problematic
challenging

Q39: Which word to you think fits best?

difficult

Q40: Ms. Hill says the odds are a _____ in favor of a decline at expiration , but we do see a large move either on the up or down side .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: But then you see people being very protective of the _____ boxes they get with gifts in them that are worth maybe \$ 20 .

little

small

tiny

modest

Q43: Which word to you think fits best?

small

Q44: The new law also made it more _____ for pension sponsors to unload their liabilities onto the system .

difficult

problematic

challenging

Q45: Which word to you think fits best?

difficult

Q46: And even though it would be _____ to make the case that there has been a national Republican realignment , you could make a case that there has been realignment toward the Republican Party in the South .

difficult

hard

tough

problematic

challenging

Q47: Which word to you think fits best?

difficult

Q48: Industry strategists want to incorporate the measure into the omnibus trade bill to make it more _____ for the president to veto .

difficult

challenging

Q49: Which word to you think fits best?

challenging

Q50: The election of Mr. Lubensky thus represented an about-face and the steelmaker's third top-management change in a _____ more than two months .

little

Q51: Which word to you think fits best?

little

Q52: But they concede that their efforts will be more _____ if the textile measure is incorporated into the trade bill .

difficult

problematic

challenging

Q53: Which word to you think fits best?

difficult

Q54: Moody's added that the rating changes recognize the effect that the company's _____ operating environment will have on its asset quality , core earnings and equity base. .

difficult

hard

tough

problematic

challenging

Q55: Which word to you think fits best?

challenging

Q56: Because it's structured as a limited partnership , the fund can invest in a variety of instruments and use such trading tactics as arbitrage and short-selling , which are _____ or forbidden to most mutual funds .

difficult

problematic

challenging

Q57: Which word to you think fits best?

problematic

Q58: The London exchange said in a statement that the Big Board's rule interpretation was extremely _____ to understand .

difficult

hard

tough

challenging

Q59: Which word to you think fits best?

hard

Q60: But there is _____ doubt that he wants to do things his own way , and there is strong evidence that he is bringing a new marketing emphasis to Arco that will loosen the company's once-tight supply chain from the crude oil well to the gas pump .

little

slight

Q61: Which word to you think fits best?

little

Q1: First name:

Human 2

Q2: Mr. Cook , by contrast , was _____ known outside the company until he was named to head it ; he likes to work on community projects .

little

Q3: Which word to you think fits best?

little

Q4: A merger of the two companies would be a _____ hurdle for him , said a source close to Mr. Icahn .

difficult

tough

problematic

challenging

Q5: Which word to you think fits best?

difficult

Q6: It's become much more _____ to think of the middle class as some big monolithic group of people , says Susan Gianinno , director of research services at the advertising agency Young & Rubicam .

difficult

problematic

challenging

Q7: Which word to you think fits best?

problematic

Q8: The tropical vegetation was so damaged by a 1983 freeze that even today it is _____ to tell the palm trees from the telephone poles .

difficult

hard

tough

challenging

Q9: Which word to you think fits best?

hard

Q10: But if you dried up the volume , getting out of a position would be a lot more _____ because the other side might not be there to trade with .

Respondent skipped this question

Q11: Which word to you think fits best?

Respondent skipped this question

Q12: De Beers has a sales arrangement with the Soviets , but Moscow has dumped diamonds before and may prove _____ to keep in line .

difficult

hard

tough

problematic

challenging

Q13: Which word to you think fits best?

hard

Q14: Mr. Redstone acknowledges that some Viacom operations pose a _____ challenge .

difficult

hard

tough

Q15: Which word to you think fits best?

difficult

Q16: As previously reported , the change of heart at MCI reflects a growing realization among its executives that more steep price cuts would be _____ to withstand .

difficult

hard
tough
problematic
challenging

Q17: Which word to you think fits best?

hard

Q18: To complicate matters further , many analysts agree that it is especially _____ to analyze recent economic statistics because of several special factors , such as the new tax law that took effect Jan. 1 and problems with seasonal adjustments .

difficult

hard

tough

problematic

challenging

Q19: Which word to you think fits best?

difficult

Q20: Humor is a very _____ act to follow , especially when you have a rigid one-joke format like the Bud Light ads , says Roy Grace , chairman of Grace & Rothschild , a New York ad agency .

difficult

hard

tough

challenging

Q21: Which word to you think fits best?

tough

PAGE 2

Q22: Mr. Dove , 58 years old , joins MCC at a time when it is still _____ to judge the success of the consortium .

Respondent skipped this question

Q23: Which word to you think fits best?

Respondent skipped this question

Q24: As the record shows , it is _____ to stick a policy of never negotiating .

difficult

hard

tough

problematic

challenging

Q25: Which word to you think fits best?

challenging

Q26: This _____ problem has perplexed many democratic leaders , here and abroad .

difficult

hard

tough

unmanageable

challenging

Q27: Which word to you think fits best?

difficult

Q28: But they cautioned that trading was so listless that it is _____ to explain the rise .

difficult

hard

tough

challenging

Q29: Which word to you think fits best?

hard

Q30: Administration officials also note that the National Bipartisan Commission on Central America , chaired by former Secretary of State Henry Kissinger , concluded in 1984 that if the U.S. simply tried to contain Nicaragua , there would be _____ incentive for the Sandinistas to act responsibly .

little

small

slight

Q31: Which word to you think fits best?

small

Q32: But Gulf States has found it _____ to obtain financing on favorable terms when all potential lenders know it has no choice but to obtain financing at any cost .

difficult

hard

tough

problematic

challenging

Q33: Which word to you think fits best?

difficult

Q34: If the airlines could be put together with the employees under TWA's labor contracts which would be easy to postulate but _____ to accomplish they could be a big force in the marketplace , said Paul Schlesinger , a securities analyst at DLJ Securities .

difficult

hard

tough

challenging

Q35: Which word to you think fits best?

hard

Q36: Producers of these goods have generally found it more _____ to raise prices .

difficult

problematic

challenging

Q37: Which word to you think fits best?

difficult

Q38: Yet the Tower report concludes , The legal requirements pertaining to the sale of arms to Iran are complex ; the availability of legal authority , including that which may flow from the president's constitutional powers , is _____ to delineate .

difficult

hard

tough

problematic

challenging

Q39: Which word to you think fits best?

hard

Q40: That obviously sounded a _____ too optimistic to one editor , so it was changed to are expected to ease .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: Mr. Yurachek absolutely favors a standardized formula for computing yields , although he admits that might mean a _____ less profit for us .

little

Q43: Which word to you think fits best?

little

Q44: Terms such as operation and implementation are _____ to define , and a legislative proscription might preclude some future president from making a very constructive use of the NSC staff .

difficult

hard

tough

problematic

challenging

Q45: Which word to you think fits best?

difficult

Q46: But , he adds , politically , it is very _____ for a bank to accept .

difficult

hard

tough

problematic

challenging

Q47: Which word to you think fits best?

hard

Q48: Food companies , he added , are presented with a very _____ problem .

difficult

hard

tough

trying

challenging

Q49: Which word to you think fits best?

difficult

Q50: The pound dropped 2.1 % from about 2.98 marks to 2.9187 in _____ more than 24 hours .

little

Q51: Which word to you think fits best?

little

Q52: But the employment statistics are very _____ to predict , and individual estimates vary widely .

difficult

hard

tough

challenging

Q53: Which word to you think fits best?

difficult

Q54: Mistrust is deep-seated , and perceptions so highly skeptical and distorted that it's often _____ to believe the two countries were one until 1947 when British India was partitioned .

difficult

hard

tough

challenging

Q55: Which word to you think fits best?

hard

Q56: And European public opinion may be so in favor of an accord as to make it _____ for governments to resist .

difficult

hard

tough

problematic

challenging

Q57: Which word to you think fits best?

difficult

Q58: Running a big international corporation becomes very _____ when exchange rates are fluctuating wildly , he complains .

difficult

hard

tough

trying

problematic

challenging

Q59: Which word to you think fits best?

difficult

Q60: The first quarter is looking a _____ bit weak , said Wendy Beale , an automotive analyst for Smith Barney , Harris Upham & Co. .

little

Q61: Which word to you think fits best?

little

Q1: First name:

Human 2

Q2: A 150-point advance by a 21,000-plus Nikkei average is an increasingly small affair , a trader said , adding that the average could retreat 150 on mild profit-taking Friday with _____ impact on investor sentiment .

little

small

slight

minor

Q3: Which word to you think fits best?

little

Q4: It will be politically _____ for Britain and West Germany to be seen as opposing a pullout on any grounds , says John Roper of London's Royal Institute for International Affairs , a foreign-policy research concern .

difficult
tough
unmanageable
problematic
challenging

Q5: Which word to you think fits best?

unmanageable

Q6: By using story-theater narration rather than standard dialogue , she relieves her actors of the _____ task of inventing personalities for Kafka's faceless protagonists .

difficult
hard
tough
trying
problematic
challenging

Q7: Which word to you think fits best?

difficult

Q8: Although it is _____ to draw definite conclusions from recent Supreme Court opinions , it seems likely the court will resolve McMahon in favor of arbitration .

difficult
hard
tough
challenging

Q9: Which word to you think fits best?

hard

Q10: Only two generations removed from the Depression , today's middle-class kids know _____ about poverty or the potential for it .

little

Q11: Which word to you think fits best?

little

Q12: Then he got the idea to push the cola business into Japan and began a long , _____ series of negotiations with the Japanese government .

difficult
hard
tough
problematic
challenging

Q13: Which word to you think fits best?

difficult

Q14: It's going to be very _____ for them the consortium to build an aircraft with up-to-date avionics without U.S. equipment , the Hughes executive says .

difficult
hard
tough
problematic

challenging

Q15: Which word to you think fits best?

hard

Q16: Mr. Tower's reaction when he was offered the job fueled speculation that the Reagan administration , with only two years left and facing growing political woes , is finding it _____ to attract top candidates for senior posts .

difficult

hard

tough

challenging

Q17: Which word to you think fits best?

hard

Q18: The switch from a staff job , which usually involves a support function , to an important line post is unusual and often _____ at major corporations .

difficult

hard

tough

problematic

challenging

Q19: Which word to you think fits best?

challenging

Q20: The company said the remoteness of those stores made it _____ to incorporate them in long-term strategy .

difficult

hard

tough

challenging

Q21: Which word to you think fits best?

difficult

PAGE 2

Q22: While we may never fully understand the reasons for the six days of anguish experienced by Jerry Seib , we are certain that this episode only demonstrates how _____ we understand about the people involved in this eternal conflict .

little

Q23: Which word to you think fits best?

little

Q24: But the more important and _____ challenge is to devise a procedure by which air-traffic controllers can charge a toll for any flight passing through crowded airspace , even though the flight neither takes off from nor lands at the airport beneath that crowded airspace .

difficult

problematic

Q25: Which word to you think fits best?

difficult

Q26: For many , the value of their acreage is the key to getting that credit because low commodity prices make it _____ at best to predict whether farmers' crops will bring enough to repay planting loans .

difficult

challenging

Q27: Which word to you think fits best?

difficult

Q28: She notes that the federal government is pushing pipelines to give customers like Kopp access to low-priced gas , while making it _____ for the pipelines themselves to get out of high-priced purchase agreements they signed during the energy crisis .

difficult

hard

tough

challenging

Q29: Which word to you think fits best?

hard

Q30: They have to go through customs and immigration in some sweaty _____ nation run by some tin-horn dictator whom they are forced to be extremely nice to so that Barbara Walters does get to interview him first for her Celebrity Tin-Horns Special .

little

small

tiny

minor

insignificant

Q31: Which word to you think fits best?

little

Q32: If there is any price competition in the future , Purolator is going to have a more _____ time of being profitable .

difficult

challenging

Q33: Which word to you think fits best?

difficult

Q34: The Federal Reserve is faced with a very , very _____ period here , Stephen H. Axilrod , vice chairman of Nikko Securities Co. International , says .

difficult

tough

trying

problematic

challenging

Q35: Which word to you think fits best?

challenging

Q36: These are very _____ issues that we have tried our best , in good faith , to resolve , Mr. Rule told the senators .

difficult

tough

problematic

challenging

Q37: Which word to you think fits best?

tough

Q38: Although White House aides said they did think the president was trying to send any kind of new signals with his remarks , their sweeping nature makes it very _____ politically for the Democratic-controlled Congress to vote a big tax increase toward reducing the budget deficit .

difficult

tough

problematic

challenging

Q39: Which word to you think fits best?

problematic

Q40: As a lay pastor , he sometimes delivers the sermon in the _____ Lutheran church nearby , while Lady Flo plays hymns on the organ .

little

small

tiny

modest

Q41: Which word to you think fits best?

small

PAGE 3

Q42: Some hospitals now offer counseling to their staffs , but those who deal with the repeated crises of the acutely ill have _____ time to do more than suppress their own despair .

little

Q43: Which word to you think fits best?

little

Q44: But assessing land and stock values is _____ in such a speculative environment , and investors are crying for help .

difficult

hard

tough

problematic

challenging

Q45: Which word to you think fits best?

difficult

Q46: However , with Chase's loan-loss reserve action Wednesday , it is becoming increasingly _____ to justify a near-zero reserve against troubled Third World debt .

difficult

hard

tough

problematic

challenging

Q47: Which word to you think fits best?

difficult

Q48: All of which must be weighed by Mr. Sullivan , who knew his deadline was short and would be _____ to meet .

difficult

hard

tough

challenging

Q49: Which word to you think fits best?

tough

Q50: German brewers , however , asserted that the decision would have _____ immediate impact on the German market and would change the way beer is brewed in Germany .

little

small

slight

Q51: Which word to you think fits best?

little

Q52: It's going to be very _____ to try to do studies with this drug .

difficult

hard

tough

problematic

challenging

Q53: Which word to you think fits best?

problematic

Q54: Moreover , Mr. Davis says , in some cases dad is always running interference , and that makes it _____ for his daughter to assume responsibility and learn from experience .

difficult

hard

tough

challenging

Q55: Which word to you think fits best?

hard

Q56: Increases in drug prices and use are unpredictable , Dr. Bowen added , making the cost of the benefit _____ to estimate accurately .

difficult

hard

tough

challenging

Q57: Which word to you think fits best?

difficult

Q58: Advertisers contend the tax will be complicated to compute and _____ to collect , and some predict it will be repealed for that reason .

difficult

hard

tough

problematic

challenging

Q59: Which word to you think fits best?

difficult

Q60: They said there seemed to be _____ futures-related activity , and no obvious leadership in the market .

little

slight

minor

Q61: Which word to you think fits best?

little

Q1: First name:

Human 2

Q2: We're even beginning to see a _____ willingness among individuals to buy stock for their own accounts , he said .

little

slight

Q3: Which word to you think fits best?

little

Q4: Making out-of-state processors return their shells , the department says , would be _____ at best .

difficult

tough

problematic

challenging

Q5: Which word to you think fits best?

difficult

Q6: Whereas 12 months ago we were forecasting steadily declining earnings and a _____ period ahead , we see the next 12 months as a period that will reflect steady growth in sales , improved operating results and a significant strengthening of our liquidity and overall financial condition , Mr. Greenberg said .

difficult

hard

tough

trying

challenging

Q7: Which word to you think fits best?

difficult

Q8: Does your reserve decision make it more _____ to get a consensus of the banks ?

difficult

tough

problematic

challenging

Q9: Which word to you think fits best?

difficult

Q10: Meanwhile , a strike by Brazilian merchant seamen , which currently is having _____ impact on shipments , will have to be watched , Mr. O' Neill of Elders said .

little

slight

Q11: Which word to you think fits best?

little

Q12: New CIA Director William Webster , long regarded as a law-and-order man , faces a _____ choice between purging top officials linked to the Iran-Contra scandal and trying to maintain stability at the intelligence agency .

difficult

hard

tough

challenging

Q13: Which word to you think fits best?

tough

Q14: But winning a consent solicitation can be more _____ than winning a proxy contest because the solicitors need to deliver consents representing a majority of the company's shares outstanding , rather than simply a majority of the voting shares .

difficult

hard

tough

problematic

challenging

Q15: Which word to you think fits best?

difficult

Q16: Calling AZT yesterday's drug is _____ to understand because it is today's AIDS therapy .

difficult

hard

tough

problematic

Q17: Which word to you think fits best?

problematic

Q18: Debt relief is crucial to Egypt because of its severe cash shortage , which makes it _____ for the country to both pay its foreign creditors and foot its mammoth bill for food imports .

difficult

hard

tough

challenging

Q19: Which word to you think fits best?

difficult

Q20: It's _____ to keep the business running if London is here , a Frankfurt broker said .

difficult

hard

tough

challenging

Q21: Which word to you think fits best?

hard

PAGE 2

Q22: Slow auto sales and a late Easter could mean weak retail sales for March as well , signaling _____ upward pressure on interest rates , Miss Gibbs said .

little

slight

modest

minor

Q23: Which word to you think fits best?

little

Q24: Israeli officials reportedly also asserted that the Norwegian heavy water , which has not been inspected since 1961 , has since become mixed with other heavy water and would be too _____ to isolate .

difficult

hard

tough

challenging

Q25: Which word to you think fits best?

hard

Q26: The answer , he suggests , is that GM's size makes it _____ to turn around .

difficult

hard

tough

challenging

Q27: Which word to you think fits best?

difficult

Q28: It also has created an increasingly _____ business climate .

difficult

hard

tough

trying

unmanageable

problematic

challenging

Q29: Which word to you think fits best?

challenging

Q30: Buying in the April contract resulted from expectations that Monday's Agriculture

Department cattle inventory report , to be released after trading's close , will show

_____ change in stock brought to market from a year earlier , analysts said .

little

slight

Q31: Which word to you think fits best?

little

Q32: Corporate restructurings are making it more _____ to have a managerial career ,

and the pressures are hitting each generation in different ways , says Daniel Levinson , a Yale

University psychologist and author of The Seasons of a Man's Life .

difficult

challenging

Q33: Which word to you think fits best?

difficult

Q34: What makes that learning process so _____ today is the pressure young managers

feel to make their mark swiftly .

difficult

hard

tough

trying

unmanageable

problematic

challenging

Q35: Which word to you think fits best?

challenging

Q36: And their impatience comes at a _____ time , with many industries being forced by sluggish economic growth and corporate cutbacks to slow the fast track .

difficult

hard

tough

trying

challenging

Q37: Which word to you think fits best?

difficult

Q38: It's very _____ to have a personal life , she admits , but I figure now is the time in my life to make this kind of sacrifice .

difficult

hard

tough

challenging

Q39: Which word to you think fits best?

challenging

Q40: Treasury bond prices ended _____ changed as retail sales data for January and February failed to send a clear message to a lethargic , trendless market .

little

Q41: Which word to you think fits best?

little

PAGE 3

Q42: But dealers said the small rally faded later in the day as institutional investors showed _____ appetite for bonds .

little

Q43: Which word to you think fits best?

little

Q44: Labor contracts have become so complicated that any attempts to revise them are _____ and time-consuming .

difficult

hard

tough

problematic

challenging

Q45: Which word to you think fits best?

problematic

Q46: But bankers said the rules are _____ to get around .

difficult

hard

tough

problematic

challenging

Q47: Which word to you think fits best?

difficult

Q48: By a margin of 60 % to 33 % , more Americans in the poll are worried that the country is headed for _____ times than are confident that good times lie ahead ; 56 % agree with

the statement that most of our leaders in government and business do really understand or care about people like me , while 39 % disagree with that .

difficult

hard

tough

trying

challenging

Q49: Which word to you think fits best?

hard

Q50: Bond traders paid _____ attention to money supply figures reported late yesterday by the Federal Reserve .

little

slight

Q51: Which word to you think fits best?

little

Q52: Mr. Loeb said he considered Zayre undervalued and noted that the planned sale may make it more _____ for a corporate raider to attempt a hostile takeover because of the increased value of TJX .

difficult

problematic

challenging

Q53: Which word to you think fits best?

challenging

Q54: Another publishing company will want to move the operation to New York and Mr. Jovanovich is going to allow that , he said , adding , Jovanovich can be a _____ fellow to deal with .

difficult

hard

tough

trying

challenging

Q55: Which word to you think fits best?

trying

Q56: Cannon , however , did provide the restated financial results for 1985 , making it _____ to assess the effect of the accounting changes .

difficult

hard

tough

problematic

challenging

Q57: Which word to you think fits best?

hard

Q58: Eleven instances of trading could suggest a pattern that is more _____ to explain as luck or shrewd analysis , they said .

difficult

challenging

Q59: Which word to you think fits best?

difficult

Q60: Interest rates on short-term Treasury bills also were _____ changed .
little

Q61: Which word to you think fits best?

little

Curriculum Vitae

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2004-2007 Bachelor of Computing

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