Sheet 2

Exercise 1

Are the following statements true or false?

a. In a Boolean retrieval system, stemming never lowers precision.
b. In a Boolean retrieval system, stemming never lowers recall.
c. Stemming increases the size of the vocabulary.
d. Stemming should be invoked at indexing time but not while processing a query.

Exercise 2

Suggest what normalized form should be used for these words (including the word itself as a possibility):

a. ’Cos
b. Shi’ite
c. cont’d
d. Hawai’i
e. O’Rourke

Exercise 3

The following pairs of words are stemmed to the same form by the Porter stemmer. Which pairs would you argue shouldn’t be conflated. Give your reasoning.

a. abandon/abandonment
b. absorbency/absorbent
c. marketing/markets
d. university/universe
e. volume/volumes

Exercise 4

For the Porter stemmer rule group shown in (2.1):

a. What is the purpose of including an identity rule such as SS →SS?

b. Applying just this rule group, what will the following words be stemmed to?

circus canaries boss

c. What rule should be added to correctly stem pony?

d. The stemming for ponies and pony might seem strange. Does it have a deleterious effect on retrieval? Why or why not?

Exercise 5

Why are skip pointers not useful for queries of the form x OR y?

Exercise 6

We have a two-word query. For one term the postings list consists of the following 16 entries:

[4,6,10,12,14,16,18,20,22,32,47,81,120,122,157,180]

and for the other it is the one entry postings list:

[47].

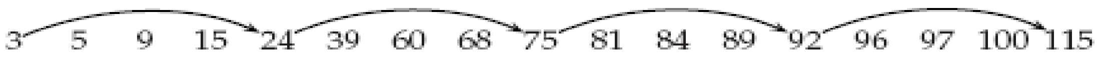
Work out how many comparisons would be done to intersect the two postings lists with the following two strategies. Briefly justify your answers:

a. Using standard postings lists

b. Using postings lists stored with skip pointers, with a skip length of $\sqrt{P}$, as suggested in Section 2.3.

Exercise 7

Consider a postings intersection between this postings list, with skip pointers:



and the following intermediate result postings list (which hence has no skip pointers):

3 5 89 95 97 99 100 101

Trace through the postings intersection algorithm in Figure 2.10 (page 37).

a. How often is a skip pointer followed (i.e., p1 is advanced to skip(p1))?

b. How many postings comparisons will be made by this algorithm while intersecting the two lists?

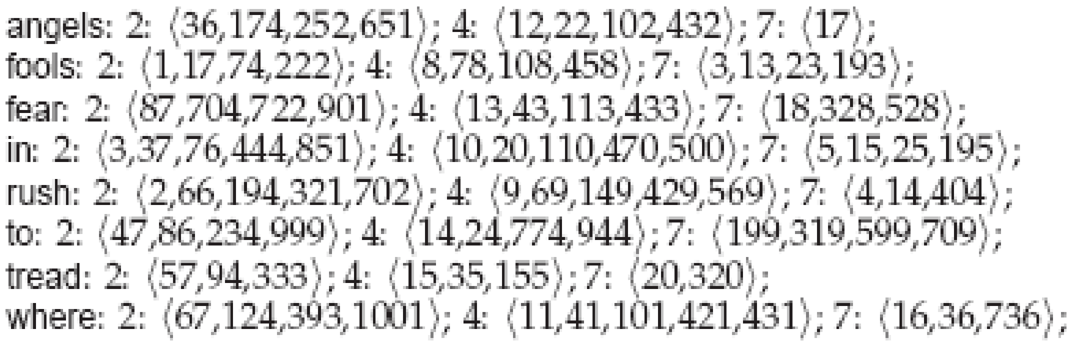
c. How many postings comparisons would be made if the postings lists are intersected without the use of skip pointers?

Exercise 8

Assume a biword index. Give an example of a document which will be returned for a query of New York University but is actually a false positive which should not be returned.

Exercise 9

Shown below is a portion of a positional index in the format: term: doc1: (position1, position2, . . .); doc2: (position1, position2, . . .); etc.



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angels: 2: ⟨36,174,252,651⟩; 4: ⟨12,22,102,432⟩; 7: ⟨17⟩;
fools: 2: ⟨1,17,74,222⟩; 4: ⟨8,78,108,458⟩; 7: ⟨3,13,23,193⟩;
fear: 2: ⟨87,704,722,901⟩; 4: ⟨13,43,113,433⟩; 7: ⟨18,328,528⟩;
in: 2: ⟨3,37,76,444,851⟩; 4: ⟨10,20,110,470,500⟩; 7: ⟨5,15,25,195⟩;
rush: 2: ⟨2,66,194,321,702⟩; 4: ⟨9,69,149,429,569⟩; 7: ⟨4,14,404⟩;
to: 2: ⟨47,86,234,999⟩; 4: ⟨14,24,774,944⟩; 7: ⟨199,319,599,709⟩;
tread: 2: ⟨57,94,333⟩; 4: ⟨15,35,155⟩; 7: ⟨20,320⟩;
where: 2: ⟨67,124,393,1001⟩; 4: ⟨11,41,101,421,431⟩; 7: ⟨16,36,736⟩;
```

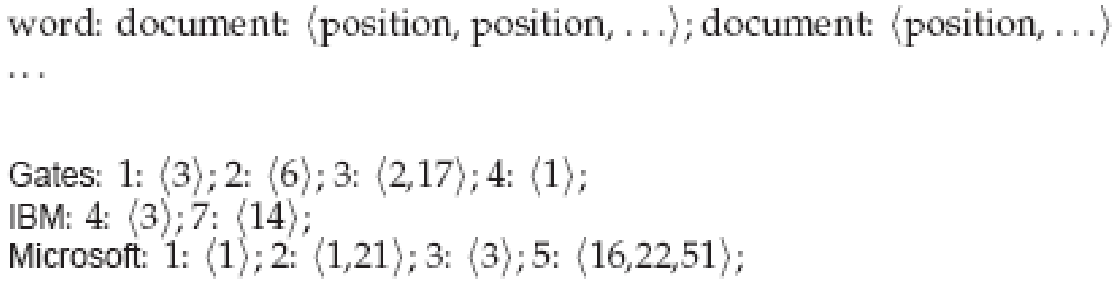
Which document(s) if any match each of the following queries,where each expression within quotes is a phrase query?

a. “fools rush in”

b. “fools rush in” AND “angels fear to tread”

Exercise 10

Consider the following fragment of a positional index with the format:



word: document: ⟨position, position, . . .⟩; document: ⟨position, . . .⟩
. . .

Gates: 1: ⟨3⟩; 2: ⟨6⟩; 3: ⟨2,17⟩; 4: ⟨1⟩;
IBM: 4: ⟨3⟩; 7: ⟨14⟩;
Microsoft: 1: ⟨1⟩; 2: ⟨1,21⟩; 3: ⟨3⟩; 5: ⟨16,22,51⟩;

The /k operator, word1 /k word2 finds occurrences of word1 within k words of word2 (on either side), where k is a positive integer argument. Thus k = 1 demands that word1 be adjacent to word2.

a. Describe the set of documents that satisfy the query Gates /2 Microsoft.

b. Describe each set of values for k for which the query Gates /k Microsoft returns a different set of documents as the answer.

Exercise 12

How could an IR system combine use of a positional index and use of stop words? What is the potential problem, and how could it be handled?

Exercise 13

- Name two data structures that support phrase queries, and explain how they do it.
- Name a data structure that supports proximity queries.