

Math 55: Homework 8

Due Wednesday, July 22

In Jorge Luis Borges' "The Library of Babel," the narrator describes a massive library: Every book in the library has 410 pages, each page has 40 lines, and each line has 80 characters. Besides lowercase letters, the only characters appearing in the books are the period, the comma, and the space.

In order to catch up with the 21st century, the Library got itself a Twitter account (@LibraryofBabel!) It appears to have been active for only a short time, but while it was running it diligently tweeted one 140-character message per day. Assume that it uses only the 26 letters of the English alphabet (plus the period, comma, and space) and that any 140-character combination is possible (e.g. “asdfasdf...as” and “.....” are both perfectly valid).

1. How many possible tweets are there?
2. How many tweets use no spaces?
3. How many tweets consist entirely of whitespace?
4. How many tweets begin and/or end with the characters “yolo”?
5. How many tweets neither begin nor end with the letter “e”?
6. Let T be some particular tweet. How many tweets differ from T by exactly one character?
7. How many have exactly six spaces and five commas?
8. A *trigram* is any sequence of three characters, such as “abc” or “o.o”. How many tweets *must* the Library send out in order to guarantee that there is a trigram that appears at least twice? (How many trigrams are in each tweet?)