

## The Hardest Jumbles

A well-known puzzle, and form of cryptography, is to unscramble the letters of a word (e.g., HLMNOTY → MONTHLY). We begin with the huge Google (English) books data set (743 billion words), as analyzed in [1]. We restrict to 7-letter words, noting in passing that the population of distinct 7-letter words is larger than for any other word length. We also restrict to words with at least 200,000 mentions in the data set and with distinct letters.

We compare the correct order for the letters with the  $7! = 5040$  potential orderings. We consider a puzzle difficult if its letters are in unexpected positions (e.g., a W appearing in position 7, the least likely place for it to appear in 7-letter words in our data set), and if pairs of letters appear in unexpected positions (e.g., a TH appearing in positions 2 and 3). By this measure, the six hardest puzzles are:

ETHANOL, ANGELOU, ESTONIA, UTENSIL, OPHELIA, TSUNAMI

### REFERENCES

---

1. Norvig, P. (2013). English letter frequency counts. [norvig.com/mayzner.html](http://norvig.com/mayzner.html)

—Submitted by Brendan LeTourneau and Vadim Ponomarenko

---

doi.org/10.XXXXX/amer.math.monthly.122.XX.XXX  
MSC: Primary 62Q05, Secondary 94A60