

① Your Turn

Mississippi

$$\frac{11!}{4! 4! 2!} = 34650$$

s i l

12 people into 3 equally sized groups

$$\frac{(12 \times 11 \times 10 \times 9)}{4!} \times \frac{(8 \times 7 \times 6 \times 5)}{4!} \times 1$$

$$3!$$

$$= \frac{495 \times 70}{6} = 5775$$

COMBINATIONS

$$\binom{n}{n} = n C_n = n \text{ choose } n$$

$$= \frac{n!}{(n-r)! r!}$$

Jan 12

SAMPLING WITH REPLACEMENT

②

* From the alphabet

$$|S| = 26^8$$

$$|F| = 1$$

$$P(F) = \frac{|F|}{|S|} = \frac{1}{26^8} = 4.79 \times 10^{-12}$$

* From the Gettysburg corpus

$$|S| = 1,000^8 = 10^{38} = 10^{24}$$

$$= (10^3)^8 \neq 10^{(3^8)}$$

$$|F| = \underset{i}{63} \times \underset{f}{38} \times \underset{u}{70} \times \underset{c}{35} \times \underset{k}{7} \times \underset{y}{16} \times \underset{o}{63} \times \underset{u}{174}$$

$$= 1.16 \times 10^{11}$$

$$P(F) = \frac{1.16 \times 10^{11}}{10^{24}} = 1.16 \times 10^{-13}$$

③ PERMUTATIONS

* Lines

$$|S| = 8!$$

$$|F| = 1 \times 1 \times 2 \times 1 \times 1 \times 1 \times 1 \times 1 = 2$$

$$P(F) = 4.96 \times 10^{-5}$$

* Words

$$|S| = 87!$$

$$|F| = 6 \times 3 \times 2 \times 8 \times 1 \times 2 \times 3 \times 1 \times 79!$$

i f u c k y o n

$$P(F) = \frac{1728 \times 79!}{87 \cdot 86 \cdots 80} = 6.38 \times 10^{-11}$$

* Words within lines

$$|S| = 9! 16! 13! 15! 6! 13! 14! 8!$$

$$= 9.74 \times 10^{68}$$

$$|F| = 1 \times 8! \cdot 2 \times 15! \cdot 1 \times 12! \cdot 1 \times 14! \cdot 1 \times 5! \cdot 2 \times 12!$$

$$\cdot 1 \times 13! \cdot 1 \times 7! = 5.06 \times 10^7$$

$$P(F) = 5.20 \times 10^{-22}$$

COMBINATIONS

* Position of line breaks

$$87 \text{ words} \rightarrow 86 \text{ ~~positions~~ gaps}$$

$$8 \text{ lines} \rightarrow 7 \text{ line breaks}$$

$$|S| = \binom{86}{7} = 5.37 \times 10^7$$

YOUR TURN

$$|F| = 1 \times 2 \times 1 \times 3 \times 1$$

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n 2 x 1

jet year uncomy

$$= 12$$

$$P(F) = 2.23 \times 10^{-9}$$