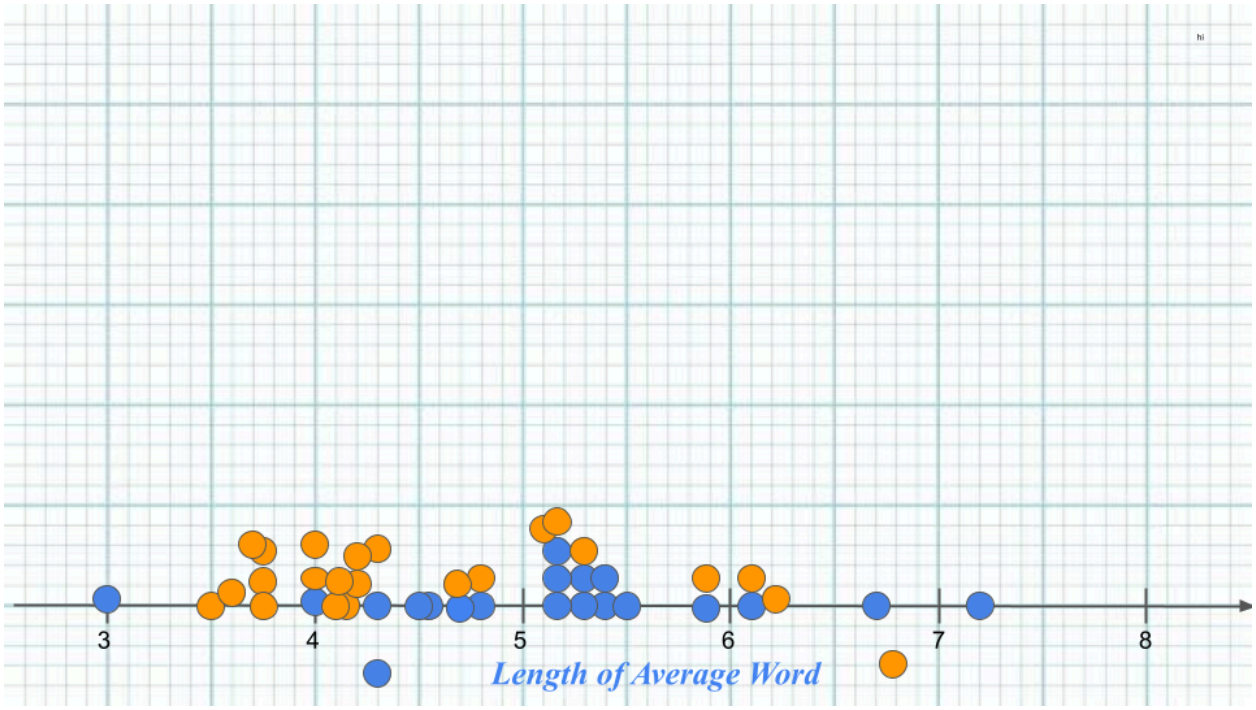
STAT 312 Week 2 Class

Activity: Sampling Words

Consider the population of 268 words in the passage below:

> Four score and seven years ago our fathers brought forth on this continent, a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal.
>
> Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battle-field of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.
>
> But, in a larger sense, we cannot dedicate, we cannot consecrate, we cannot hallow this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did here.
>
> It is for us the living, rather, to be dedicated here to the unfinished work which they who fought here have thus far so nobly advanced. It is rather for us to be here dedicated to the great task remaining before us, that from these honored dead we take increased devotion to that cause for which they gave the last full measure of devotion, that we here highly resolve that these dead shall not have died in vain, that this nation, under God, shall have a new birth of freedom, and that government of the people, by the people, for the people, shall not perish from the earth.

Pick 10 words from this passage to serve as a *simple random sample*. Figure out the lengths of those 10 words. What is the average length of the words in your sample? Add a blue dot representing the sample mean you got to this graph.



Now let's use R to calculate the actual average, as well as to generate an actual random sample of 10 words. Add an orange dot representing the sample mean from R to this graph.

What did you take away from this exercise?

Humans are bad at random sampling. We tend to have biases (in this example, we are naturally drawn to longer words).

When possible, use a computer to do random sampling.

Please Fill Out Survey

Please fill out this survey letting me know how the class is going.

Activity: Coke vs. Pepsi

Can our volunteer tell the difference between Coke and Pepsi? They were presented with 8 cups. They correctly identified 8 of the cups. Is this evidence that they can tell the difference? Or was it a fluke?

The box model applet might come in handy here.

- The null hypothesis is that they can't tell the difference and are just guessing.
- 1 = correct, 0 = wrong
- Create a box with one 1 and one 0. (You could have any number of tickets as long as you have the same number of 1s as 0s.)
- Draw 8 tickets with replacement to represent the 8 cups that they tried.
- Sum the draws and repeat the process.
- The p-value is the probability of getting 8 (or more) correct.
- It is 0.4%, which is very small, so we reject the null hypothesis. The volunteer was not just guessing.

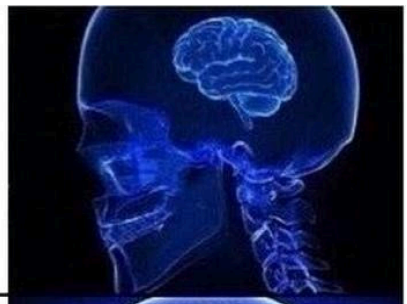
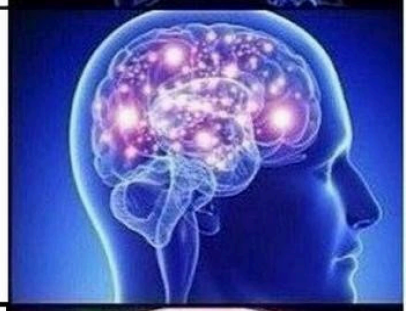
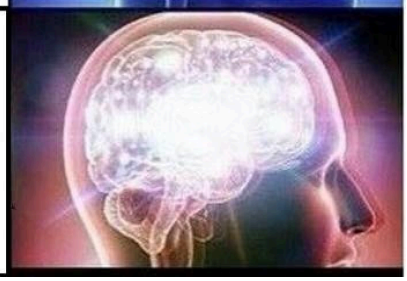
Discuss Interview Quiz 1

The first interview quiz will be next Wednesday, January 19.

Preview of Next Week

Next week will be an introduction to probability.

Roulette

probability of red in 1 spin of a roulette wheel		$\frac{18}{38}$
probability of 2 reds in 2 spins of a roulette wheel		$\frac{18 \cdot 18}{38 \cdot 38} = \frac{18^2}{38^2}$
probability of exactly 1 red in 2 spins of a roulette wheel		$\frac{18 \cdot 20 + 20 \cdot 18}{38 \cdot 38}$

Activity: Birthday Problem

We have 45 people in the room. Is it likely that two people share a birthday?

Let's first figure out if anyone here shares a birthday. Circle your birthday on this calendar. If your birthday is already circled, that means we have a match!

Now let's calculate the probability that there will be a match in a room with 45 people.

$$P(no\ match) = \frac{365 \cdot 364 \cdot 363 \cdot \ldots \cdot 321}{365 \cdot 365 \cdot \ldots \cdot 365} = \frac{365!/320!}{365^{45}} = .059$$

$$\left[\frac{365!}{320!} = \frac{365 \cdot 364 \cdot \ldots \cdot 321 \cdot 320 \cdot 319 \cdot \ldots \cdot 1}{320 \cdot 319 \cdot \ldots \cdot 1}\right]$$

$$P(match) = 1 - P(no\ match) = 1 - .059 = .941$$