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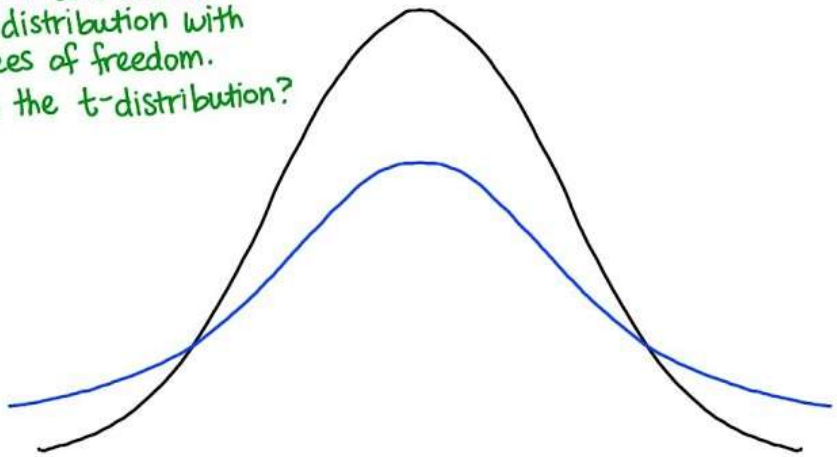
Problem Set – Lesson 10 a

Q1.

One of these is a normal distribution and the other is a t-distribution with 10 degrees of freedom. Which is the t-distribution?



Q2.

When do we use t-tests as opposed to z-tests?

Z-tests are used when we know/do not know population parameters.

T-tests are used when we know/do not know population parameters.

Problem 3-11

How do kids' vocabularies improve over time? Early childhood education researchers took a random sample of 4-year-olds in the United States (n = 1000) and had them say a few sentences. On average, the 4-year-olds used 3 words per sentence with standard deviation 1.2. Four years later, when the kids were 8, the researchers repeated this with those same kids and this time they used 12 words per sentence on average, with standard deviation 2.7.

Q3.

What kind of study is this? Check all that apply.

- ☐ Longitudinal
- ☐ Dependent-samples t-test
- ☐ Pre-test, post-test

Q4.

What is the independent variable?

- o Number of sentences
- o Kids' ages
- o Number of words kids use per sentence on average
- o Time

Q5.

What is the dependent variable?

- o Number of sentences
- o Kids' ages
- o Number of words kids use per sentence on average
- o Time

Q6.

What could the null hypothesis be?
- Kids' vocabularies improve between age 4 and 8.
- Kids' vocabularies worsen between age 4 and 8.
- Kids' vocabularies do not change between age 4 and 8.

Q7.

What should the alternative hypothesis be?
- Kids' vocabularies improve between age 4 and 8.
- Kids' vocabularies worsen between age 4 and 8.
- Kids' vocabularies do not change between age 4 and 8.

Q8.

$H_0: \mu_2 - \mu_1 \leq 0$
$H_A: \mu_2 - \mu_1 > 0$

Based on these hypotheses, will we conduct a one-tailed or two-tailed t-test? (Note: μ_2 symbolizes the mean vocabulary of all 8-year-olds and μ_1 symolizes the mean vocabulary of all 4-year-olds.)
- one-tailed
- two-tailed

Q9.

$H_0: \mu_2 - \mu_1 \leq 0$
$H_A: \mu_2 - \mu_1 > 0$

Calculate the t-critical value at an alpha level of 0.05.

Q10.

If we subtract one normal distribution from another, the new mean will be $\bar{x}_D = \bar{x}_2 - \bar{x}_1$ and the new standard deviation will be $s_D = \sqrt{s_1^2 + s_2^2}$. Find the mean and standard deviation of the differences. $\bar{x}_D =$ $s_D =$ (both should be positive)

Q11.

$H_0: \mu_D \leq 0$
$H_A: \mu_D \geq 0$

Using $\bar{x}_D$ and S_D that you calculated, find the t-statistic. $t = \frac{\bar{x}_D - 0}{S_D/\sqrt{n}} =$

Do we reject or accept the null?
- Accept H_0
- Reject H_0