

Quiz 3

Name:

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1. Suppose you wanted to increase the power of your t-test, which of the following could you do (mark all that apply):

- a. Increase n, your sample size (assuming budget allowed)
- b. Assume a larger δ
- c. Decrease α

3. The χ^2 -distribution has one parameter, what is it?

Degrees of freedom, or ν

4. You wish to investigate the response of a certain shade intolerant species by comparing mean annual growth rate on west- versus east-facing slopes. Is this considered a true experiment or a comparative survey? Why? Comparative survey.

You cannot randomly assign east/west to the experimental units.

5. You wish to compare the spatial arrangement of trees in an old growth forest to a nearby mature forest that is 80 years old. In each forest, you randomly selected 30 trees to measure the distance between each tree and its nearest neighboring tree and found a mean distance of 10.2m with $s = 4$ in old growth and 7.1m with $s = 5$ in the mature forest.

a. What hypothesis should you test?

$H_0: \mu_{old} = \mu_{mature}$ or $\mu_{old} - \mu_{mature} = 0$

$H_a: \mu_{old} \neq \mu_{mature}$ or $\mu_{old} - \mu_{mature} \neq 0$

b. Test your hypothesis at $\alpha = 0.05$. What is the p-value? It is okay to report p as a range.

$$t_{obs} = \frac{|\bar{x}_1 - \bar{x}_2| - (\delta_0)}{s_{\bar{x}_1 - \bar{x}_2}} = \frac{|10.2 - 7.1| - (0)}{1.169} = 2.652$$

$$s_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = \sqrt{\frac{16}{30} + \frac{25}{30}} = 1.169$$

$$\text{"effective" } df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1 - 1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2 - 2}} = \frac{(41/30)^2}{\frac{(16/30)^2}{29} + \frac{(25/30)^2}{29}} = 55.334 \Rightarrow \text{use } 55$$

c. What do you conclude about the spatial arrangement of trees in these two forests?

$0.01 < p < 0.02$. There is strong evidence at $\alpha = 0.05$ to suggest different spacing in mature and old growth forests.