Name: Class quiz 6 October 27, 2017

I) Athletes performing in bright sunlight often smear black eye grease under their eyes to reduce glare. **Does eye grease really help raise the sensitivity to contrast**? In one study, 16 student subjects took a test of sensitivity to contrast after three hours facing into bright sun, both with and without eye grease. This is a matched pairs design. We record the differences in sensitivity, **with eye grease minus without eye grease**, and we find that the mean of the sample is $\overline{x} = 0.091$.

a) What are the null and alternative hypotheses?

$H_0: \mu = 0 \leftarrow H_0$

$H_a: \mu > 0 \leftarrow$ for this one they might give the answers $\mu \neq 0$ or $\mu < 0$ partial credit.

b) Suppose that the subjects are an SRS of all young people with normal vision, that contrast differences follow a Normal distribution in this population, and that the standard deviation of differences is $\sigma = 0.22$.

i) What is the value of the test statistic $z$? (Round your answer to two decimal places.)

$$z = \frac{\overline{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{0.091 - 0}{0.22/\sqrt{16}} = \frac{0.091}{0.22/4} = 1.6545$$

if $H_a: \mu < 0$, P-value $= P(z < \cdot)$

if $H_a: \mu \neq 0$, P-value $= 2P(z > 1.6545)$

ii) What is the P-value of the test? (Round your answer to four decimal places.)

$$\text{P-value} = P(z > 1.6545) = 1 - P(z < 1.6545) = 1 - 0.951 = 0.049$$

c) Is this data set significant at a 5% significance level.

Yes it is significant at 5% significance level because P-value $< 0.05$.

II) A class survey in a large class for first-year college students asked, "About how many hours do you study during a typical week?" There were 464 responses to the class survey. Suppose that we know that the study time follows a Normal distribution with standard deviation $\sigma = 8.4$ hours in the population of all first-year students at this university.

From the sample we get $\overline{x} = 36.3$ hours for all 464 students. What is the 99% confidence interval for the population mean? (Round your answers to two decimal places.)

The confidence interval is

$$\left[\overline{x} - z^* \frac{\sigma}{\sqrt{n}}, \overline{x} + z^* \frac{\sigma}{\sqrt{n}}\right]$$

$z^*$ for 99% confidence is 2.567

so C.I. : $\left[36.3 - 2.567\left(\frac{8.4}{\sqrt{464}}\right), 36.3 + 2.567\left(\frac{8.4}{\sqrt{464}}\right)\right]$