Psych 315, Winter 2020, Homework 6 Answer Key

Due Friday, February 14th either in section or in your TA’s mailbox by 5pm.

Name ________________________________ ID _______________________

Section [AA] (Jessica), [AB] (Jessica), [AC] (Kelly), [AD] (Kelly)

Problem 1: Suppose you wanted to test the hypothesis that the mean weight of male Maine Coon cats is greater than 20 lbs. You know that the population is normally distributed with a standard deviation of 3 lbs.

You go and measure the weight of 36 male Maine Coon cats and find a mean weight of 21.4 lbs. Is this mean significantly greater than 20? Use an alpha value of $\alpha = 0.05$. Test this hypothesis in the following steps:

a) Specify the null hypothesis ($H_0$).

The mean weight of male Maine Coon cats is 20 pounds, $H_0 : \mu = 20$

b) Specify the alternative hypothesis ($H_A$).

We will use a one-tailed test, so our alternative hypothesis is
The mean weight of male Maine Coon cats is greater than 20 pounds, $H_0 : \mu > 20$

c) What is the standard error of the mean ($\sigma_{\bar{x}}$)?

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{3}{\sqrt{36}} = 0.5$$

d) Convert your statistic into standard units with respect to your null hypothesis.

Since we know the population standard deviation, we’ll use the $z$ statistic:

$$z = \frac{21.4 - 20}{0.5} = 2.80$$
e) What is the critical value of z for rejecting the null hypothesis?

Since this is a one tailed test, from Table A:
\[ z_{crit} = 1.64 \]

f) What is your decision? State it as a full sentence using APA format.

Since \( z (2.80) \) is greater than our critical value of \( z (1.64) \), we reject \( H_0 \).

The mean weight of the male Maine Coon cats is significantly greater than 20 lbs \((z = 2.80, p < 0.05)\).

Problem 2

A Gallup poll estimates that the average American gets 6.8 hours of sleep each night. From our class survey, our sample of 120 respondents has mean of sleep of 6.97 hours of sleep each night with a standard deviation of 1.01 hours. Test the hypothesis that this mean is significantly different from the US population average of 6.8 hours in the following steps. Use an alpha value of 0.05.

a) Specify the null hypothesis \((H_0)\).

Our null hypothesis is that there is no difference between how much Psych 315 students sleep from the US population, \( H_0 : \mu = 6.8 \)

b) Specify the alternative hypothesis \((H_A)\).

We'll use a two-tailed test, so our alternative hypothesis is \( H_A : \mu \neq 6.8 \) hours of sleep.

c) What is the standard error of the mean \((s_{\bar{x}})\)?

\[
s_{\bar{x}} = \frac{s_{\bar{x}}}{\sqrt{n}} = \frac{1.009}{\sqrt{120}} = 0.0921
\]

d) Convert your statistic into standard units with respect to your null hypothesis.

Since we don’t know the population standard deviation, we'll use the t statistic and our standard error of the mean, 0.0921 hours of sleep with \((120-1) = 119\) degrees of freedom.

\[
t = \frac{6.97 - 6.80}{0.0921} = 1.85
\]

e) What is the critical value of t for rejecting the null hypothesis?

Since this is a two tailed test with \( df = 119 \), from Table D, \( t_{crit} \) is \( \pm 1.98 \).
f) What is your decision? State it as a full sentence using APA format

Since the absolute value of t (1.85) is less than our critical value of t (1.98), we fail to reject $H_0$.
The average amount of sleep for the students in our class is not significantly different from 6.80 inches ($t(119) = 1.85, p > 0.05$).

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g) What is the effect size? Is it small, medium or large?

The effect size is $g = \frac{|6.97 - 6.8|}{1.01} = 0.17$

This is a small effect size.

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h) What is the p-value for this result? You can use the Excel calculator in tab D(t).

Using the Excel calculator with $t = 1.85$, two tails and $df = 119$, $p = 0.0661$