Problem Set #5: Solutions

1. It is known that if people are asked to make an estimate of something, for example, “how tall is Johnson Chapel?” the average guess of a group of people is more accurate than an individual’s guess. Vul and Pashler (2008) wondered if the same held for multiple guesses by the same person. They asked people to make guesses about known facts. For example “what percentage of the world’s airports are in the United States?” Three weeks later the researchers asked the same people the same questions and averaged each person’s responses over the two sessions. They asked whether this average was more accurate than the first guess by itself.
   1. Using the principles of hypothesis testing we have learned (not necessarily the rules for one type of test), in English, what would be the null and alternative hypothesis?

Ho: the accuracy of the average of two guesses is the same as (equal to) the accuracy of one guess

Ha: the accuracy of the average of two guesses is not equal to one guess

* 1. What conclusion would represent a Type I and a Type II error for this study?

A Type I error is when we reject the null even though it is true. So we would conclude that the accuracy of the average of two guesses is NOT the same as one guess when actually the two kinds of guesses are equally accurate.

A Type II error is when we fail to reject the null even though it is false. So even though two guesses may be more (or less) accurate than one guess, we would erroneously make the conclusion that they are equally accurate.

1. Williamson (2008) conducted a study to examine psychological adjustment among children of parents with depression. Williamson expected that children with at least one parent with depression would show unusually high levels of behavior problems. To examine this, a sample of 166 children with at least one parent with depression was recruited. They were given the Youth Self-Report Inventory, which is a nationally normed measure with a population mean of 50 and a standard deviation of 10; higher scores on this measure indicate greater behavior problems. Williamson obtained a sample mean of 55.71. Conduct a one-sample hypothesis test to determine if children of parents with depression have greater behavior problems than typical children (Steps 1 to 8). Set alpha to .05.

\*BECAUSE N> 30 AND POP SD IS KNOWN, WE CAN USE Z

Step 1: Decide whether you are conducting a one- or a two-tailed test.

You should do a two-tailed

Step 2: Specify the ***NULL*** hypothesis (HO)

Ho: μ = 50

Step 3: Specify the ***ALTERNATIVE*** hypothesis (HA)

Ha: μ ≠ 50

Step 4: Designate the rejection region by selecting α.

α= .05

Step 5: Determine the critical value of your test statistic

zcrit = ±1.96

Step 6: Use sample statistics to calculate test statistic.

= = = 7.36

Step 7: Compare *observed* value with *critical* value

Because Zobs falls in the rejection region, we would reject the null: z=7.36, p < .05.

Step 8: Interpret your decision regarding the null

Children of depressed parents have significantly more behavior problems than the average child, z = 7.36, p < .05.

1. You get a job as a traveling salesperson for Callahan Brake pads.  You try to sell your first client on the idea that Callahan Brake pads are superior in quality.  The client is concerned about price.  So, you conduct a study to convince him that Callahan brake pads do not cost any more or less than the average brake pad.  Callahan Brake pads cost $15 per pair.  The average cost of your 5 leading competitors $13.62 with s = 1.09.  Conduct a one-sample hypothesis test (alpha = .05) to determine if the cost of Callahan Brake pads are in fact different from average (Steps 1 through 8). Be sure to interpret your results and to report the test statistics appropriately.

Step 1: Decide whether you are conducting a one- or a two-tailed test.

You should do a two-tailed test.

Step 2: Specify the ***NULL*** hypothesis (HO)

Ho: μ = 15 (NOTE: we cannot use 13.62 because that is our sample data mean; we must use $15 as the reference point)

Step 3: Specify the ***ALTERNATIVE*** hypothesis (HA)

Ha: μ ≠ 15

Step 4: Designate the rejection region by selecting α.

α= .05

Step 5: Determine the critical value of your test statistic

df (4); tcrit = 2.776

Step 6: Use sample statistics to calculate test statistic.

tobs = (M - μ) / [s / sqrt(n)]

= 13.62 - 15 / (1.09 / sqrt(5)

= -1.38 / (1.09 / 2.24)

= -1.38 / .49

= -2.82 (MAKE SURE YOU DIDN’T SET IT UP BACKWARDS: 15- 13.62)

Step 7: Compare *observed* value with *critical* value

Because tobs falls in the rejection region, we would reject the null: t(4) = -2.82, p < .05.

Step 8: Interpret your decision regarding the null

Calahan brake pads are significantly more expensive than the average of their leading competitor’s brake pads, t(4) = -2.82, p < .05.