Homework 5 Problem 1 — Luke Canfield

Question 1. H_0: Mean engagement of students who become knowledgeable in the material is equal to 0.75

H_A: Mean engagement of students who become knowledgeable in the material is not equal to 0.75. * We can use z-test

Question 2. Sample Size (N) = 937 — z-score = 1.67819

Sample Mean (avg-1) = 0.743 — p-value = 0.04665

Standard Error (SE_1) = 0.00415

The results are significant at a level of 0.1 and 0.05. However they are not significant at a level of 0.01. At the levels of 0.1 and 0.05 we can conclude that the mean engagement of students is equal to 0.75. At a level of 0.01 we would not conclude this.

Question 3 z_score = 1.65 $\rightsquigarrow$ p-value = 0.95053 (closest p-value that is still significant at a level of 0.05)

Sample Mean (avg-1) = 0.743

$z = \frac{|\bar{x} - u|}{SE}$ $\quad 1.65 = \frac{|0.743 - 0.75|}{SE}$ $\quad SE = 0.00422$ $\quad SE = \frac{\sigma}{\sqrt{n}}$

$0.00422 = \frac{0.12713}{\sqrt{n}}$ $\quad n = 905.78$ $\quad$ Largest SE: 0.00422

Smallest Sample: 906

Question 4. H_0: Mean engagement between groups of students are equal

H_A: Mean engagement between groups of students is not equal

We can use a z-test

Question 5. Engagement 0 Sample Size (N_0) = 1977

Engagement 1 Sample Size (N_1) = 937

Engagement 0 Sample Mean (avg-0) = 0.63995

Engagement 1 Sample Mean (avg-1) = 0.74303

Standard Error (SE_avg) = 0.00493

z-score = 20.88879

p-value = 0

We can conclude that results are not significant at levels 0.1, 0.05, and 0.01. More importantly we reject H_0 and conclude that the engagement level between the groups of students is not equal.

* File HW5 Problem 1 was used to answer all Questions on this page

Homework 5 Problem 2 — Luke Canfield

Question 1. I will use a t-test because the population standard deviation is unknown.
Sample Mean (avg) = -5.83333 standard statistic (t-stat) = 1.36343
Standard Error (SE) = 5.06299 interval = [1.06969, -12.73636]

Question 2. I will use a t-test because the population standard deviation is unknown.
Sample Mean (avg) = -5.83333 Standard statistic (t-stat) = 1.77588
Standard Error (SE) = 5.06299 interval = [3.25921, -14.92588]
The intervals are pretty similar but the interval from question 2 is a little bit larger in size.

Question 3. We are now able to use a z-test because we are given the population standard deviation. The standard error will change because of this and we will now have a z-score instead of a t-score.
Sample Mean (avg) = -5.83333 Standard Statistic (zScore) = 1.64485
Standard Error (SE) = 4.86013 interval = [2.49454, -14.92587]
The results are very similar to the results from part 2. The results are not as close to part 1 though.

Question 4. $CI = (\bar{x} + SE \cdot t_c, \bar{x} - SE \cdot t_c)$ $\bar{x}$ = Sample Mean = -5.83333
Standard Error (SE) = 5.06299

$0 = \bar{x} + SE \cdot t_c$

$0 = -5.83333 + 5.06299(t_c)$ p = t.cdf(1.15217, N-1)

$t_c = \frac{5.83333}{5.0629} = 1.15217$ p = 0.86316

We can say with a 86.32% confidence level that the team is expected to lose on average

* File HW5 Problem 2 was used to answer all questions on this page