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ECE20875 Homework 5

10/3/2019

Problem 1: Hypothesis Testing

1. Hypothesis for one sided test

Null Hypothesis

Mean engagement of students who become knowledgeable in the material is not 0.75

Alternative Hypothesis

Mean engagement of students who become knowledgeable in the material is 0.75

A z-test can be used.

2. Statistical test using eng1 sample

Sample size: 937

Sample mean: 0.7430

Standard error: 0.0042

Standard score: -1.6782

OP-value = 0.0933

We can conclude that the data collected has a p-value of 0.09, which makes it insignificant at a = 0.1 but significant at a = 0.05 and 0.01. Thus, the data somewhat supports the null hypothesis.

3. Largest SE for test to be significant at a = 0.05

Largest standard of error = 0.0036

Minimum Size = 1278

4. Hypothesis for t-test

Null Hypothesis

Mean engagement is the same between students who become and those who do not

Alternative Hypothesis

Mean engagement is different between students who become and those who do not

A t-test can be used.

5. Statistical test using eng0 and eng1 samples

Sample sizes: 937, 1977

Sample means: 0.7430, 0.6400

Standard error: 0.0001

t-value: -14.5888

p-value: 0.0436

Problem 2: Confidence Intervals

1. Use sample to construct 95% confidence interval

Sample mean: 7.3636

Standard error: 4.8400

Standard statistic: 16.0526

Interval: (-2.1227, 16.8499)

1. Use sample to construct 90% confidence interval

Sample mean: 7.3636

Standard error: 4.8400

Standard statistic: 16.0526

Interval: (-0.5975, 15.3248)

It is observed that the confidence interval has gotten narrower as the level of confidence decreased, which falls within expectation. As the interval gets narrower, the likelihood of the actual population mean falling within the reduced range becomes smaller as well.

1. Population standard deviation is 16.836

Sample mean: 7.3636

Standard error: 5.0762

Standard statistic: 16.8360

Interval: (-2.5856, 17.3129)

It is observed that the confidence interval has slightly widened. With an increase in variance, the chances of the population mean falling within the interval decreases. To account for the decrease in likelihood while keeping the level of confidence constant, the interval is widened.

1. Level of confidence = 0.8114