Edhesive AP Statistics **Unit 1 – Solutions**

**Multiple Choice:** Choose the best answer choice for the following problems.

1. At a particularly dangerous intersection in town, accidents occur frequently. In an effort to reduce the number of accidents, a city planner proposes installing a 4-way stop at the cost of slowing the flow of traffic. To assess the support for this idea, the city conducts an SRS of 200 residents. 116 are in favor of the stop sign. What is the appropriate test statistic for determining if over half of the population supports the stop sign?

The one proportion z-test equation is where is the sample population proportion, is the hypothesized population proportion, and is the sample size.

1. Of the following, which is *not* a condition necessary to ensure proper significance testing of a population proportion ?
   1. If the sample size is small the population distribution should be approximately Normal.
   2. If you are sampling without replacement from a finite population, you should sample no less than 10% of the population.
   3. The data should be a simple random sample of the population
   4. and
   5. All of these are conditions necessary to ensure proper significance testing of a population proportion.

Sampling without replacement approximates sampling with replacement only while the sample size is small relative to the total population size (chances of picking the same twice are low). Large samples taken without replacement removes the independence of the sampling.

1. The study conducted on the situation about the stop sign in question 1 results in a z statistic of . Which of the following is true?

* 1. The study is not significant at either the or level
  2. The study is significant at both the and level
  3. The study is significant at the level but not at
  4. The study is significant at the level but not at
  5. There is not enough information to determine significance.

The situation described in question 1 means a right-side test is appropriate. A z-value of 2.26 gives a p-value of 0.0119. Thus we have significance at the 0.05 level but have not reached significance at the 0.01 level.

1. A new federal program is set to give funds to cities in which the percentage of people who bike to work exceeds 5%. Studies conducted in cities around the country gave the following 95% confidence intervals. Which city can claim (at the 5% significance level) to be above the threshold?
   1. Minneapolis, MN (0.044,0.048)
   2. Flagstaff, AZ (0.047,0.057)
   3. Chico, CA (0.044,0.050)
   4. Madison, WI (0.051,0.055)
   5. No city here meets the 5% significance level

Madison is the only city whose study results in a CI that lies entirely above 5%.

1. A two-sided test results in a value of z=0.48. Which of the following best describes this result?
   1. With a P-value of 0.04, so we can reject H0 at the 95% confidence level.
   2. With a P-value of 0.02, we cannot reject H0 at the 95% confidence level.
   3. With a P-value of 0.02, we can reject H0 at the 95% confidence level.
   4. With a P-value of 0.04, we cannot reject the H0 at the 95% confidence level.
   5. Not enough information is given to determine the p-value or confidence level.

For a two-sided test we get p-value = 1-2\*z = 0.04. This allows us to reject H0 at the α=0.05 level of significance, or 95% confidence level.

**Free Response – Solutions**

1. A local barber is losing business and wonders if perhaps the number of bald men in his town is uncharacteristically high. On average, 10% of all men are bald. While business is slow watches people as they walk by his shop. Of the 1000 men he watched walk by his shop, 118 were bald. What is the resulting p-value and can he reject at the 5% level.
   1. Is this convincing evidence that the percentage of bald men in this town is higher than average? Support your answer with a test of significance.

Yes. A one proportion z-test gives: , resulting in a 1-tailed test p-value of 0.029, exceeding the α=0.05 significance level required to reject H0.

* 1. Explain what the P-value of this test means in the context of this situation.

A p-value of 0.029 means there is a 2.9% chance that these results were a matter of chance and that we have falsely rejected the null hypothesis.