Inspiring Greatness
INDEPENDENCE SCHOOL DISTRICT

Math Virtual Learning

AP stats / Sampling Distributions

May 8th, 2020

Lesson: May 8th, 2020

Objective/Learning Target:
Students will review concepts related to sampling distributions and the central limit theorem.

Review #1

We want to know if an ACT prep class improves scores. We get 30 volunteers who take the ACT once before taking the ACT prep course and once after taking the ACT prep course. We are given a table with each participants before and after score.

- State the type of test we should use and the hypotheses for the test.

Review #2

Using the same scenario as question #1, we find a p-value less than 0.05. What should our conclusion be, and what sorts of inferences can be made?

Answers

1. Since the data is before and after scores for the same participants, we have paired data. We need to take the differences of the scores and run a t-test for paired data. Our hypotheses should be H_0: $\mu_{\text{diff}} = 0$, H_a: $\mu_{\text{diff}} > 0$, with differences in the form after - before.
2. With a p-value less than 0.05, there is evidence to suggest the scores after the ACT prep class are on average higher than can be explained by random chance for the 30 people studied. However, this study does not randomly sample or randomly assign groups. The inference from the data is limited to making observations about only the 30 people not the population, and only observations not causal relationships.

Sampling Distributions

Everything in statistical inference tends to be based on Sampling distributions. They are the model we use to compare our data. We have looked at normal sampling distributions, student's t sampling distributions, binomial sampling distributions, and if you continue on in statistics you will learn about many more. Obtaining a basic understanding of how they work, improves your understanding of how we conduct inference. In order to help you review this material, please watch the following video.

Sampling distributions and central limit theorem

Extra Practice

2. A local radio station plays 40 rock-and-roll songs during each 4-hour show. The program director at the station needs to know the total amount of airtime for the 40 songs so that time can also be programmed during the show for news and advertisements. The distribution of the lengths of rock-and-roll songs, in minutes, is roughly symmetric with a mean length of 3.9 minutes and a standard deviation of 1.1 minutes.

   (a) Describe the sampling distribution of the sample mean song lengths for random samples of 40 rock-and-roll songs.

   (b) If the program manager schedules 80 minutes of news and advertisements for the 4-hour (240-minute) show, only 160 minutes are available for music. Approximately what is the probability that the total amount of time needed to play 40 randomly selected rock-and-roll songs exceeds the available airtime?

Answers