AP Statistics Name _____

Confidence Intervals for a Population Mean

When should we use a t^* critical value rather than a z^* critical value for calculating a CI for a population mean?

Finding t*

One-Sample t Interval for a Population Mean

1. Fruit flies are used frequently in genetic research because of their quick reproductive cycle. The length of the thorax (in millimeters) was measured for each fly in a random sample of 49 male fruit flies. The mean length was $\bar{x} = 0.8004$ mm, with a standard deviation of $s_x = 0.0782$ mm.

(a) Construct and interpret a 90% confidence interval for the true mean thorax length of a male fruit fly.

2. As part of their final project in AP Statistics, Christina and Rachel randomly selected 18 rolls of a generic brand of toilet paper to measure how well this brand could absorb water. To do this, they poured 1/4 cup of water onto a hard surface and counted how many squares it took to completely absorb the water. Using the data below, construct and interpret a 99% confidence interval for the mean number of squares of generic toilet paper needed to absorb 1/4 cup of water.

29	20	25	29	21	24	27	25	24
29	24	27	28	21	25	26	22	23

3. Administrators at your school want to estimate how much time students spend on homework, on average, during a typical week. They want to estimate μ at the 90% confidence level with a margin of error of at most 30 minutes. A pilot study indicated that the standard deviation of time spent on homework per week is about 154 minutes. How many students need to be surveyed to estimate the mean number of minutes spent on homework per week with 90% confidence and a margin of error of at most 30 minutes?

Which cookie has the most chips?

VS

Is there a difference in the number of chocolate chips in Chips Ahoy cookies versus the number of chocolate chips in Chips Deluxe cookies? Each pair of students will count the number of chocolate chips in a Chips Ahoy cookie and a Chips Deluxe cookie. Due to the factories processes, we can assume the population distributions of # of chips are approximately normal and that the samples are random.

1. Record the number of chocolate chips in each cookie. Put them in the computer.

in Chips Ahoy = _____ # in Chips Deluxe = _____

2. Find the mean number of chocolate chips for each type of cookie, the standard deviation and the difference.

Chips Ahoy: $\bar{x}_1 =$ Chips Deluxe: $\bar{x}_2 =$ Difference: $\bar{x}_1 - \bar{x}_2 =$

$s_1 =$ $s_2 =$

3. If we repeated this process many times and created a dotplot, we would have the sampling distribution of $\bar{x}_1 - \bar{x}_2$. Describe the shape, center and spread of the sampling distribution.

Shape: Center: Spread:

4. Have the conditions for constructing a confidence interval been met? Explain.

5. Construct a 95% confidence interval for the true difference in the mean number of chocolate chips in Chips Ahoy and Chips Deluxe.

6. Do we have evidence that there is a difference in the average number of chocolate chips in a Chips Ahoy and a Chips Deluxe cookie?

Paired Data

Analyzing Paired Data

One-Sample t Interval for a Mean Difference (Paired t Interval for a Mean Difference)

5. For their second semester project, Libby and Kathryn decided to investigate which line was faster in the supermarket: the express lane or the regular lane. To collect data, they randomly selected 15 times during a week, went to the same store, and bought the same item. However, one of them used the express lane and the other used a regular lane. To decide which lane each of them would use, they flipped a coin. They entered their randomly assigned lanes at the same time, and each recorded the time in seconds it took them to complete the transaction.

(a) Calculate and interpret a 99% CI for the true mean difference in time.

Time in express lane (sec)	**Time in regular lane (sec)**
337	342
226	472
502	456
408	529
151	181
284	339
150	229
357	263
349	332
257	352
321	341
383	397
565	694
363	324
85	127

(b) Based on your interval, is there convincing evidence that the mean time is different for the two types of lanes? Explain.

6. In each of the following, decide whether you should use a paired t procedures or two-sample t procedures to perform inference.

a. To compare the average weight gain of pigs fed two different rations, nine pairs of pigs were used. The pigs in each pair were littermates. A coin toss was used to decide which pig in each pair got Ration A and which got Ration B.

b. Separate random samples of male and female college professors are taken. We wish to compare the average salaries of male and female teachers.

c. To test the effects of a new fertilizer, 100 plots are treated with the new fertilizer, and 100 plots are treated with another fertilizer. A computer's random number generator is used to determine which plots get which fertilizer.

d. Students take a MCat prep course. We want to see if taking the MCat prep course helps them on the MCat. Their before and after scores are compared.

e. We want to see if male or female students do better on the AP Statistics midterm. 20 male and 20 female students in the AP Statistics take the midterm.

f. We want to see if husbands get more sleep than their wives. We randomly select 50 couples from the population. Each spouse is asked the number of hours of sleep they get each night.

g. Does a mild sedative help insomnia patients sleep more? 50 randomly selected insomnia patients are given a placebo and 50 randomly selected insomnia patients are given a mild sedative.