

Confidence Interval Extra practice.

Decide whether you are dealing with a proportion or a mean and use the appropriate STAT test.

(STAT>TEST> 8 or A) For each problem: Find the confidence interval, write a confidence statement, state the margin of error.

Example:

Shoplifting is an escalating problem for retailers. According to *U.S. News and World Report* (February 21, 1977), one New York City store randomly selected 500 shoppers and observed them while they were in the store. One in twelve was seen stealing. How accurate is this estimate? Find a 95% confidence interval for θ , the proportion of all the store's customers who are shoplifters. Interpret this interval.

Proportion

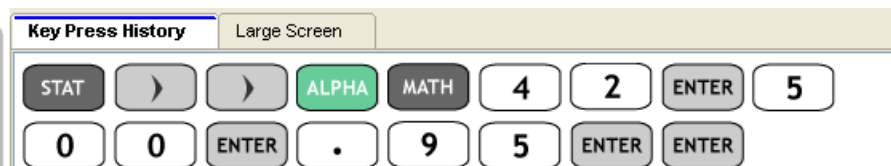
$$\hat{p} = \frac{1}{12} = 0.08333$$

$$x = 0.0833 * 500 \text{ or about } 42$$

$$n = 500$$

$$\text{Confidence level} = 0.95$$

STAT>TEST A



We are 95% confident the true percentage of shoplifters was between 5.97% to 10.31%.

The margin of error is $(10.83\% - 5.97\%)/2 = 2.43\%$

Example 2: Means

A health researcher wished to estimate the mean number of cavities per child for children under the age of twelve who live in a specified environment. The number of cavities per child for a random sample of *thirty-five* children under the age of twelve gave a *mean* equal to *eighteen* and a *standard deviation* equal to *six*. Construct a 90% confidence interval for the mean number of cavities per child under the age of twelve who live in the sampled environment.

$$\bar{x} = 18$$

$$s = 6 \quad \text{Confidence level } 0.90$$

$$n = 35$$

STAT>TEST>1



We are 90% confident the true average number of cavities is between 16.3 to 19.7.

$$\text{margin of error} = (19.715 - 16.285)/2 = 1.715$$

Do the following on another piece of paper.:

- 7.84. A sample of 300 transistors are tested and twelve are found to be defective. Find a 95% confidence interval for θ , the true fraction defective. Interpret this interval.
- 7.89. Failure to meet payments on student loans guaranteed by the government has been a problem for both the banks and the United States government. A random sample of $n = 1,000$ loans to college students in one region of the United States indicates that 273 loans are in default. Find a 95% confidence interval for the proportion of all student loans in the region that are in default. Interpret this interval.
- 7.93. A university is considering a change in the way students pay for their education. Presently, the students pay \$16 per credit hour. The university is contemplating charging each student a set fee of \$240 per quarter, regardless of how many credit hours each takes. To see if this would be economically feasible, the university would like to know how many credit hours, on the average, each student takes per quarter. A random sample of 250 students yields a mean of 14.1 credit hours and a standard deviation of 2.3. Estimate the mean credit hours per student per quarter using a 90% confidence interval. Use this confidence interval to obtain an interval estimate for the mean tuition fee per student per quarter. Interpret the result.
- 7.95. Recently, a price war has developed across the United States among retailers selling Levi's denim jeans. A buyer for a major chain wishes to estimate the mean price of Levi's during this period to compare it to the normal selling price of \$17. A random sample of eight major retailers across the country produces a mean retail price for their Levi's denim jeans equal to \$12.50 with a standard deviation of \$2.50. Calculate a 95% confidence interval for the average retail price of Levi's during the price war. Interpret this interval.

- 7.96. The Chamber of Commerce of a small seaside resort would like to know the mean daily number of hours of labor required to clear litter from its public beach on weekends. A random sample of the labor expended on each of fifteen randomly selected Sunday mornings produced a mean of 25.7 hours and a standard deviation of 5.6 hours. Estimate the mean amount of labor required per Sunday morning to clear the beach of litter. Use a 95% confidence interval. Interpret this interval.
- 7.97. The strength of a pesticide dosage is often measured by the proportion of pests that dosage will kill. To determine this proportion for a particular dosage of rat poison, 250 rats are fed the dosage of poison and 215 die. Use a 90% confidence interval to estimate the true proportion of rats that will succumb to the dosage. Interpret your result. Interpret this interval.
- 7.99. It is necessary to estimate the mean length of life of a particular mechanical component used in a space craft. Due to the prohibitive cost of the components, only three can be tested under simulated space conditions. The lifetimes (hours) of the components were recorded with the following results: $\bar{x} = 1,173.6$, $s = 36.3$. Estimate the mean lifetime with a 95% confidence level. Interpret this interval.
- 7.116. Many people think that a national lobby's successful fight against gun control legislation is reflecting the will of a minority of Americans. A random sample of 4,000 citizens yielded 2,250 who are in favor of gun control legislation. Use a 95% confidence interval to estimate the true proportion of Americans who favor gun control legislation. Interpret the result.