

First identify if you are dealing with one or two populations, with means or proportions, with constructing a confidence interval or finding the sample size.

In problems about constructing confidence intervals for one population you are supposed to solve with the formula, and then check with a feature of the calculator. In problems about two populations, you solve with a feature of the calculator. Always list the statistics provided in the problem, and indicate the feature used and the results obtained.

Answers to confidence intervals should be written with one of the two notations used in the book. Practice both please.

Remember to define the population(s), and the variable or the success attribute if you are dealing with proportions.

- 1) The following confidence interval is obtained for a population proportion, p :

$$0.556 < p < 0.584$$

Use these confidence interval limits to find the point estimate and the margin of error.

Provide an appropriate response.

- 2) A poll of 700 persons attending the Taste of Chicago showed that 455 persons, 65% of the sample, believed that the food was overpriced. It is estimated that 1,250,000 persons attend the Taste. Statistics suggest that, although 65% plus or minus 5% of attendees believe that the food is overpriced, the Taste is a popular event.
- The sample statistic for the study is
 - The margin of error is
 - The confidence interval is
- 3) A survey of 300 union members in New York State reveals that 112 favor the Republican candidate for governor.
- Construct the 98% confidence interval for the true population proportion of all New York State union members who favor the Republican candidate.
 - Is the interval indicating the the majority of the union members in New York favor the republican candidate for governor? Explain.
 - How many union members should be selected if we want to be 98% confident that the point estimate p -hat will be within a distance of .03 from p ?
 - Answer part (c) if we have no preliminary estimate for p -hat.
- 4) A researcher is interested in estimating the proportion of voters who favor a tax on e-commerce. Based on a sample of 250 people, she obtains the following 99% confidence interval for the population proportion p :

$$0.113 < p < 0.171$$

Which of the statements below is a valid interpretation of this confidence interval?

- There is a 99% chance that the true value of p lies between 0.113 and 0.171
- If many different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, 99% of the time the true value of p would lie between 0.113 and 0.171
- If many different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, in the long run 99% of the confidence intervals would contain the true value of p .
- If 100 different samples of size 250 were selected and, based on each sample, a confidence interval were constructed, exactly 99 of these confidence intervals would contain the true value of p .

- 5) The principal of a certain high school claims that his students had an average score of 87 in the State's testing. The data below consists of the test scores of 32 students selected at random from the school. Construct a 99% confidence interval for the mean score of all student in the high school. Does the interval support the principal's claim?

80	74	61	93	96	70	80	64		
51	98	93	87	72	77	84	96		
100	67	71	79	99	85	66	70		
	57	75	86	92	94	63	80	97	

- 6) The packages of a certain brand of light bulbs claims that the mean life of the light bulbs is 460 hours. A random sample of 118 light bulbs had a mean life of $\bar{x} = 449$ hours with a standard deviation of $\sigma = 33$ hours.
- Construct a 99 percent confidence interval for the mean life, μ , of all light bulbs of this type.
 - Is the claim of the package misleading? Explain.
 - What is the margin of error in this case?
 - If you are interested in producing an estimate which is within 5 hours of the true population mean, what size should be the sample selected?

- 7) In a random sample of 300 women, 50% favored stricter gun control legislation. In a random sample of 200 men, 30% favored stricter gun control legislation.
- Give the point estimate.
 - Construct a 98% confidence interval for the difference between the population proportions $p_1 - p_2$.
 - What does the interval suggest about the percentages of women and men who favor stricter gun control legislation? Explain.
 - Circle one of the following:
Statistically, **there is/there is not** a significant difference between the percentages of women and men who favor stricter gun control legislation.

- 8) The packaging of a certain type of juice bottles claims that bottles contain a volume of 16 ounces. A customer advocate is questioning this claim. He selects eight randomly selected juice bottles and obtains the following amounts (in ounces):

15.1 15.3 15.8 15.7
15.6 15.5 15.2 15.7

Construct a 98 percent confidence interval for the mean amount of juice in all such bottles. Assume the distribution of volumes is normally distributed. What claim does the interval support? The one on the bottle or the one of the customer advocate? Explain.

- 9) Of 82 adults selected randomly from one town, 66 have health insurance.
- Find a 90% confidence interval for the true proportion of all adults in the town who have health insurance. Can we say that the majority of adults in the town have health insurance?
 - Complete the following, which is typical of a newspaper article:
-----% of adults in this town have health insurance with a margin of error of.....%
 - How large of a sample is necessary to be 90% sure that the point estimate is within 5% of the true porportion of adults from the town who have health insurance? Use the estimate for p given in the problem.
 - Now answer question (c) if no preliminary study is made to estimate p .

- 10) A savings and loan association needs information concerning the checking account balances of its local customers. A random sample of 14 accounts was checked and yielded a mean balance of \$664.14. Assume the standard deviation of the population is \$297.29. Find a 98% confidence interval for the true mean checking account balance for local customers. What assumption should be made in order to be able to calculate the confidence interval with the methods of chapter 8?

- 11) Two types of flares are tested for their burning times (in minutes) and sample results are given below. What assumption is needed in order to be able to use the methods of chapter 8?

<u>Brand X</u>	<u>Brand Y</u>
$n = 35$	$n = 40$
$\bar{x} = 19.4$	$\bar{x} = 15.1$
$s = 1.4$	$s = 0.8$

Construct a 95% confidence interval for the differences $\mu_X - \mu_Y$ based on the sample data. What is the interval suggesting about the means of the two populations? $\mu_X = \mu_Y$ $\mu_X < \mu_Y$
 $\mu_X > \mu_Y$

Provide an appropriate response.

- 12) A poll of 700 persons attending the Taste of Chicago showed that 455 persons, 65% of the sample, believed that the food was overpriced. It is estimated that 1,250,000 persons attend the Taste. Statistics suggest that, although 65% plus or minus 5% of attendees believe that the food is overpriced, the Taste is a popular event. The goal of the study was to
- A) determine whether the Taste is popular despite the price.
 - B) determine whether the food is overpriced.
 - C) determine the percentage of attendees who believed the food is overpriced.
 - D) determine the number of attendees who believe the food is overpriced.

Answer the question.

- 13) Following the Republican National Convention, a poll of 700 voters in a Central Illinois community showed that 64% expected the Republican ticket to win over the Democrat ticket no matter whom the Democrats chose for vice-president. The margin of error was 5 percentage points. There are 21,000 registered voters in the community. What is the range likely to contain the population parameter?
- A) 12,390 to 14,490 B) 413 to 483 C) 20,300 to 21,700 D) 59% to 69%
- 14) In a recent published poll of 200 students at a midwestern university, 150, or 75%, said they would try to purchase used textbooks before buying new textbooks. The report stated that somewhere between 70% and 80% of the students at the university would first try to purchase used books. What is the margin of error?
- A) 75% B) 25% C) 10% D) 5%

Provide an appropriate response.

- 15) A U.S. government report stated that "With bank interest rates at 3.0%, 21% of wage earners believe it worthwhile to keep money in a savings account. However, at 5.0% interest, 27% of wage earners believe it worthwhile to keep money in a savings account. The margin of error for both studies is 4 percentage points." A proper conclusion from the studies is that
- A) the interest rate difference between 3% and 5% may well have no effect on the number of persons saving money in a savings account.
 - B) increasing the interest rate may well have no effect on the number of persons saving money in a savings account.
 - C) increasing the interest rate by 2 percentage points will increase the number of persons saving money in a savings account.
 - D) increasing the interest rate will increase the number of persons saving money in a savings account.

Answer the question.

- 16) If 68% of the persons in a 100-person sample say that they approve of the actions of the city council with a margin of error of 5%, one can conclude that the number of persons in a population of 2500 that approve of council policies is
- A) probably in the interval 1600 to 1800.
 - B) 1700.
 - C) probably in the interval 1575 to 1825.
 - D) 250.

Provide an appropriate response.

- 17) A poll of 700 persons attending the Taste of Chicago showed that 455 persons, 65% of the sample, believed that the food was overpriced. It is estimated that 1,250,000 persons attend the Taste. Statistics suggest that, although 65% plus or minus 5% of attendees believe that the food is overpriced, the Taste is a popular event. The sample statistic for the study is
- A) the 65% (of the sample).
 - B) the plus or minus 5%.
 - C) the 455.
 - D) the 65% (of the attendees).

- 1) P.E.: $\hat{p} = 0.570$; $E = 0.014$
- 2) a) The sample statistic is 65%; (b) $E = 5\%$; (c) CI: (60%, 70%)
- 3) a) $0.308 < p < 0.438$; (b) No, it's suggesting between 30.8% and 43.8%. It's not a majority because all possible values for the percentage are lower than 50%; (c) 1412 union members (if you do not round \hat{p} and \hat{q}); (d) 1509 union members
- 4) C
- 5) $73.3 < \mu < 86.5$ – No, 87 is above the interval.
- 6) a) $441.17 < \mu < 456.83$, (b) Yes, the interval suggests that the mean life of the light bulbs is lower than 460 (since 460 is above the interval), (c) 7.83 hours, (d) 290 light bulbs
- 7) a) .20; (b) $0.099 < p_1 - p_2 < 0.301$; (c) $p_1 > p_2$ (because all values in the interval are positive); (d) **there is**
- 8) $15.21 < \mu < 15.76$; The interval supports the claim of the consumers' advocate because it is completely below 16
- 9) a) $0.733 < p < 0.877$; (b) 80.5% 7.2%; (c) 170 adults; (d) 271 adults
- 10) $\$479.3 < \mu < \848.98 – Since the sample size is small we have to assume that the population is normally distributed
- 11) $3.8 < \mu_X - \mu_Y < 4.8$ – since all values are positive, it suggests that $\mu_X > \mu_Y$
- 12) C
- 13) D
- 14) D
- 15) A
- 16) C
- 17) A