

- cereal is 24 ounces with a standard deviation of 1 ounce. Construct a 99 percent confidence interval for the population mean weight. Compare your answer to your answer in question 47. Why are they different?
49. A sample of 100 former basketball players from Slam Dunk University shows that 55 of the players graduated in 4 years. Construct a 90 percent confidence interval for the proportion of basketball players graduating in 4 years from Slam Dunk U.
50. A sample of 20 cups of coffee from a coffee machine has a mean amount of coffee of 6 ounces. The standard deviation is known to be .5 ounces. Construct a 99 percent confidence interval for the mean amount of coffee per cup.
51. Reconsider question 50. This time, assume that the standard deviation is not known and that .5 ounces is the sample standard deviation. Again construct a 99 percent confidence interval for the mean amount of coffee per cup. Compare your answer to your answer in question 50.
52. Suppose a sample of 500 companies listed on the NYSE is found to contain 327 companies paying dividends that have increased over the last year. Construct a 95 percent confidence interval for the mean proportion of companies that paid dividends that increased over the last year.
53. A sample of 100 steel-belted radial tires yields a mean life of 35,000 miles with a sample standard deviation of 4,000 miles. Construct a 90 percent confidence interval for the mean life of steel-belted radial tires.
54. Suppose a bowler takes a random sample of 15 games she has bowled and finds the sample mean to be 172. She knows that the standard deviation of her score is 8. Construct a 99 percent confidence interval for her score.
55. Flip a coin 50 times and record the number of tails. Construct a 99 percent confidence interval for the proportion of tails in the tossing of a coin.
56. A random sample of 450 people who took Dollar Dave's CPA review course reveals that 310 of them passed the CPA exam on the first try. Construct a 90 percent confidence interval for the proportion of people who pass the CPA exam on the first try after taking Dollar Dave's course.

57. A random sample of 225 people who went to the Match Maker Dating Service finds that 100 of those people found their spouse through the service. Construct a 95 percent confidence interval for the proportion of people who find a spouse through this dating service.
58. A random sample of 200 observations from a population yielded the following summary statistics:

$$\Sigma x = 1,202 \quad \Sigma x^2 = 121,020$$

Construct a 90 percent confidence interval for the population mean μ .

59. A random sample of 80 observations from a population yielded the following summary statistics:

$$\Sigma x = 475 \quad \Sigma (x_i - \bar{x})^2 = 772$$

Construct a 95 percent confidence interval for the population mean μ .

60. A random sample of 100 bullets in a case of 1,000 includes 5 that are defective. Construct a 99 percent confidence interval for the proportion of defective bullets in a case.
61. Suppose a golfer on the University of Houston golf team plays 70 rounds of golf and breaks par 32 times. Construct a 90 percent confidence interval for the proportion of rounds in which this golfer will break par.
62. You roll a die 100 times and get the following results.

Number on Die	Number of Rolls
1	13
2	16
3	15
4	14
5	22
6	20

Construct a 90 percent confidence interval for the proportion of rolls that will be 1's.

63. Use the information given in question 62 to construct a 90 percent confidence interval for the proportion of rolls that will come up 6.
64. A surge in health insurance premiums imposes an additional burden on a business. A random sample of 10 employees indicates that the aver-

- age cost increase per employee is about \$2,345 with a standard deviation of \$245. Assuming a normal distribution for the per-employee increase, construct a 90 percent confidence interval for the average increase.
65. The owner of a local bakery feels that too many bagels are thrown out every night, so he decides to estimate the demand for bagels. After a month's observation, he collected 30 days' sales and ascertained that the average sales were 120 and the standard deviation of daily sales was 10. Assume that the daily bagel sales follow a normal distribution. Construct a 90 percent confidence interval for the demand for bagels.
66. Suppose the owner in question 65 observed the sales for 60 days and found the average sales to be 115 with a standard deviation of 12. Obtain the 90 percent confidence interval for the demand for bagels. Compare your answer with the answer you got in question 65. Can you explain why the interval is smaller?
67. The manager in the local shoe factory wants to estimate the productivity of the midnight shift. He draws a random sample of 10 nights and records the productivity as follows:
- | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 124 | 124 | 145 | 132 | 123 | 124 | 122 | 141 | 133 | 122 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
- Estimate the average productivity.
 - Assuming that the data follow a normal distribution, derive a 95 percent confidence interval.
68. A local dairy farm has just installed a new machine that pumps milk into 16-ounce bottles. The manager of the farm wants to make sure that the amount of milk put in the bottles is 16 ounces, so he randomly selects 12 bottles of milk each hour and weighs the milk. The results obtained in the last hour were
- | | | | | | |
|-------|-------|-------|-------|-------|-------|
| 16.01 | 16.03 | 15.89 | 15.99 | 16.02 | 16.03 |
| 16.04 | 16.01 | 15.99 | 16.03 | 16.04 | 16.05 |
- Obtain the average weight of the milk.
 - Obtain a 95 percent confidence interval for the average amount of milk in the bottles.
69. The personnel office found that in the last 5 years the average cost of recruiting management trainees has been \$500. The cost varies but follows a normal distribution. The standard deviation is estimated to be 25. Assume that the cost of recruitment will remain the same next year and that the company will hire 50 new employees. How much money should the company allocate for recruitment? Construct a 90 percent confidence interval to estimate the recruitment expenses.
70. A survey wherein 90 employees were randomly drawn shows that the average number of sick days taken by employees each year is 5.4 days. The number of sick days follows a normal distribution with a standard deviation of 1.5. Obtain a 90 percent confidence interval for the average number of sick days.
71. A recent poll shows that 53 percent of the voters interviewed strongly support the incumbent and are willing to vote for her in the coming election. The poll was taken by asking 1,000 voters. Estimate the proportion of support for the incumbent with a 95 percent confidence interval.
72. A consumer rights organization tests a new car to estimate the car's average gasoline mileage. Because its budget is limited, the organization can test only 25 cars. The standard deviation of the cars tested is 2. What is the range of the 90 percent confidence interval?
73. A poll is conducted to predict whether new municipal bonds should be issued. Assume that 230 out of 500 interviewees voted for issuance of the new bonds. How precise is this prediction? Construct a 95 percent confidence interval for the proportion of yes votes.
74. In question 73, assume that 45 percent of the entire population of voters support issuance of the new bonds. Under this condition, if the pollsters want to stay within 2 percent error (plus and minus 1 percent), how many voters should they interview?
75. A multinational company wants to find out how society perceives it. The company sends a questionnaire to 2,000 people and learns that 893 have favorable opinions, others either have an unfavorable opinion or no opinion.
- What percent of the people surveyed have favorable opinions of the company? Construct a 90 percent confidence interval.

- b. What is the percentage of people who have favorable opinions of the company? Construct a 95 percent confidence interval.
76. When we construct a 90 percent confidence interval for, say, a mean, we build a range that has an upper bound and a lower bound, and we write the confidence interval as
- $$P(\text{lower bound} < \text{mean} < \text{upper bound}) = 90\%$$
- Comment on the following statement: Would you say the probability that the mean occurs between the upper and lower bounds is 90 percent?
77. A new machine was designed to cut a metal part at a length of .24 inches. Although the machine is well designed, for some uncontrolled reasons the machine cuts the metal with a standard deviation of .01 inch. For quality control purposes, the company wants to draw a sample from each hour's production and measure the average length of the sample metal parts. If the company wants to control the 99 percent confidence interval in a range of .01, how many parts should the company sample every hour?
78. The trains scheduled to arrive at the New Brunswick train station at 7:35 A.M. every weekday do not always arrive at 7:35. A commuter carefully recorded the arrival time for the last 200 working days and found that late arrivals follow a normal distribution with a mean delay of 0 minutes and a standard deviation of 1 minute.
- Estimate the average arrival time for the train.
 - Estimate the average arrival time using a 90 percent confidence interval.
 - If you plan to arrive at the train station at 7:34 regularly for the next 200 working days, how many trains should you expect to miss?
79. A marketing consulting company wants to estimate the percentage of students holding credit cards by sending questionnaires to students. The sponsor of this research wants to establish a 95 percent confidence interval and a ± 1 percent error margin. To achieve this precision, how many questionnaires should the company send out if every student responds?

80. In a survey of 2,000 voters, 36 percent were found to support increasing taxes to build a new school system. Obtain the 95 percent confidence interval for the proportion supporting the tax increase.

81. The manager in the local supermarket wanted to know whether it is worth the trouble to keep the store open 24 hours a day. He randomly sampled and recorded 20 nights' sales and got

245	145	123	178	125	175	182	130
214	192	120	187	163	148	198	192
129	134	139	271				

Use MINITAB to answer the following questions.

- Estimate the average sales per night.
 - Construct the 90 percent confidence level for the average sales.
82. A large mail-order company wants to find the effect of sending catalogs to potential customers. Of the 600 potential customers who have just received the new catalogs, 123 responded with an order within a month. Estimate the proportion of responses and establish a 90 percent confidence interval.
83. The personnel department wants to estimate the cost of hiring a new secretary. The following data are collected on 8 new secretaries.

\$2,100	\$2,135	\$2,545	\$2,433
\$2,344	\$2,564	\$2,457	\$2,556

Estimate the average cost of hiring. Construct a 90 percent confidence interval.

84. The dean of student activities wants to estimate the average spending on beer per week by a student. From a previous study, the standard deviation of spending was estimated to be \$39. If the dean wants to control the 90 percent confidence interval within $\pm \$5$, how many students should he survey?
85. The dean of student activities wants to know students' reaction to the new student center. Of the 500 students queried, 350 report that they like the new building. Estimate the proportion of the students who like the building. Construct a 90 percent confidence interval.

86. In question 85, if the dean wants to narrow the 90 percent confidence interval to ± 1 percent, how many students should he ask?
87. A soft drink producer installs a new assembly line to fill 12-ounce soda cans. After a week of operation, the plant manager randomly samples 120 cans of soda and weighs the soda. He finds that the soda cans contained an average of 12.05 ounces of soda. The standard deviation of the weight is .02 ounce. Construct a 95 percent confidence interval for the average amount of soda pumped into the cans.
88. In question 87, what is the 95 percent confidence interval for the variance of the soda pumped into the cans.

Use the following information to answer questions 89 to 91. In an airline company, a committee was formed to study the seriousness of late arrivals of freight. The following report was compiled about the arrival record.

Total number of freight shipments	625
Total number of late arrivals	159
Average late time	34 minutes
Standard deviation of late time	25 minutes

89. Construct a 90 percent confidence interval to estimate the average late time.
90. Construct a 90 percent confidence interval to estimate the percentage of late arrivals.
91. Construct a 90 percent confidence interval to estimate the standard deviation of late time.
92. A potential candidate in the third borough conducted a poll to decide whether he should challenge the incumbent. From a previous poll, he knows that the current incumbent has the support of 45 percent of the people. He wants to construct a 90 percent confidence interval with a ± 3 percent error margin. How many voters should he survey?

Use the following information to answer questions 93 to 96. An automobile manufacturer wants to study the repair record of its own cars. The performance of 1,000 cars and their maintenance records were monitored after they were sold to consumers. In a span of 3 years, 3,560 repairs occurred among the 1,000 cars monitored. The standard deviation of the number of repairs for 1 car is 2.5. A total of \$303,000 was spent to repair

the cars. The standard deviation of repair costs for 1 car is \$60. There are 205 cars that did not have any repairs in the 3 years.

93. Compute the average cost of 1 repair. Construct an 80 percent confidence interval.
94. Compute the average number of repairs for each car. Construct an 80 percent confidence interval.
95. Construct a 90 percent confidence interval for the standard deviation of costs.
96. Construct a 90 percent confidence interval for the proportion of trouble-free cars. What is the error margin?
97. Define the following:
- Convenience lot
 - Single-sampling plan
 - Double-sampling plan
 - upper control limit
 - lower control limit
 - acceptance sampling
98. Discuss the similarities and differences among \bar{X} -charts, \bar{R} -charts, S -charts, and P -charts.
99. Thirty samples of 100 items each were inspected, and 68 were found to be defective. Compute control limits for a P -chart.
100. The following table gives the fraction defective for an automotive piston for 20 samples. Three hundred units are inspected each day. Construct a P -chart and interpret the results.

Sample	Fraction Defective	Sample	Fraction Defective
1	.11	11	.16
2	.16	12	.25
3	.12	13	.15
4	.10	14	.12
5	.09	15	.11
6	.12	16	.11
7	.12	17	.14
8	.15	18	.18
9	.09	19	.10
10	.13	20	.13