

Statistical Inference

- 1) A candy company fills a 20-ounce package of Halloween candy with individually wrapped pieces of candy. The number of pieces of candy per package varies because the package is sold by weight. The company wants to estimate the number of pieces per package. Inspectors randomly sample 120 packages of this candy and count the number of pieces in each package. They find that the sample mean number of pieces is 18.72. Assuming a population standard deviation of .8735, what is the point estimate of the number of pieces per package? Construct a 99% confidence interval to estimate the mean number of pieces per package for the population.
- 2) A small lawnmower company produced 1500 lawnmowers in 2008. In an effort to determine how maintenance-free these units were, the company decided to conduct a multiyear study of the 2008 lawnmowers. A sample of 200 owners of these lawnmowers was drawn randomly from company records and contacted. The owners were given an 800 number and asked to call the company when the first major repair was required for the lawnmowers. Owners who no longer used the lawnmower to cut their grass were disqualified. After many years, 187 of the owners had reported. The other 13 disqualified themselves. The average number of years until the first major repair was 5.3 for the 187 owners reporting. It is believed that the population standard deviation was 1.28 years. If the company wants to advertise an average number of years of repair-free lawn mowing for this lawnmower, what is the point estimate? Construct a 95% confidence interval for the average number of years until the first major repair.
- 3) The average total purchase at a convenience store is less than that at a supermarket. Despite smaller-ticket purchases, convenience stores can still be profitable because of the size of operation, the volume of business, and the markup. A business analyst is interested in estimating the average purchase amount for convenience stores. To do so, she randomly sampled 24 purchases from several convenience stores and tabulated the amounts billed. Use the following data to construct a 90% confidence interval for the population average amount of purchases. Assume that the population standard deviation is 32.3 and the population is normally distributed.

20	110	80	70	90	30
50	40	20	10	100	80
140	70	60	30	70	20
40	10	30	60	80	40

- 4) A community health association is interested in estimating the average number of maternity days women stay in the local hospital. A random sample is taken of 36 women who had babies in the hospital during the past year. The following numbers of maternity days each woman was in the hospital are rounded to the nearest day.

3	3	4	3	2	5
3	1	4	3	4	2
3	5	3	2	4	3
2	4	1	6	3	4
3	3	5	2	3	2
3	5	4	3	5	4

Use these data and a population standard deviation of 1.17 to construct a 98% confidence interval to estimate the average maternity stay in the hospital for all women who have babies in this hospital.

- 5) A meat-processing company in the US produces and markets a package of eight small sausage sandwiches. The product is nationally distributed, and the company is interested in knowing the average retail price charged for this item in stores across the country. The company cannot justify a national census to generate this information. Based on the company information system's list of all retailers who carry the product, a business analyst for the company contacts 36 of these retailers and ascertains the selling prices for the product. Use the following price data and a population standard deviation of 0.113 to determine a point estimate for the national retail price of the product. Construct a 90% confidence interval to estimate this price.

2.23	2.11	2.12	2.20	2.17	2.10
2.16	2.31	1.98	2.17	2.14	1.82
2.12	2.07	2.17	2.30	2.29	2.19
2.01	2.24	2.18	2.18	2.32	2.02
1.99	1.87	2.09	2.22	2.15	2.19
2.23	2.10	2.08	2.05	2.16	2.26

- 6) According to the Census Bureau, the average travel time to work in Mumbai is 31.5 minutes. Suppose a business analyst wants to estimate the average travel time to work in Bangalore using a 95% level of confidence. A random sample of 45 Bangalore commuters is taken and the travel time to work is obtained from each. The data follow. Assuming a population standard deviation of 5.124, compute a 95% confidence interval on the data. What is the point estimate and what is the error of the interval? Explain what these results means in terms of Mumbai commuters.

27	20	16	26	25	32	29	14	19
27	28	23	21	28	28	27	24	22
27	27	27	20	23	21	29	14	27
25	34	15	20	28	18	29	27	30
29	28	25	16	29	21	28	33	18

- 7) According to Rustom International, the average hotel room rentals paid for a domestic trip by business travellers in the financial industry is Rs.1,250. Suppose another travel industry research company takes a random sample of 51 business travellers in the financial industry and determines that the sample average hotel room rentals paid is Rs.1,192, with a sample standard deviation of Rs.279. Construct a 98% confidence interval for the population mean from these sample data. Assume that the data are normally distributed in the population. Now go back and examine the Rs. 1,250 figure published by Rustom International. Does it fall into the confidence interval computed from the sample data? What does this tell you?
- 8) A valve manufacturer produces a butterfly valve composed of two semi-circular plates on a common spindle that is used to permit flow in one direction only. The semi-circular plates are supplied by a vendor with specifications that the plates be 2.37 mm thick and have a tensile strength of five pounds per mm. A random sample of 20 such plates is taken. Electronic callipers are used to measure the thickness of each plate; the measurements are given here. Assuming that the thicknesses of such plates are normally distributed, use the data to construct a 95% level of confidence for the population mean thickness of these plates. What is the point estimate? How much is the error of the interval?

2.4066	2.4579	2.6724	2.1228	2.3238	2.1328	2.0665	2.2738	2.2055	2.5267
2.5937	2.1994	2.5392	2.4359	2.2146	2.1933	2.4575	2.7956	2.3353	2.2699

- 9) Some fast-food chains offer a lower-priced combination meal in an effort to attract budget-conscious customers. One chain test-marketed a burger, fries, and drink combination for Rs. 171. The weekly sales volume for these meals was impressive. Suppose the chain wants to estimate the average amount its customers spent on a meal at their restaurant while this combination offer was in effect. An analyst gathers data from 28 randomly selected customers. The following data represent the sample meal totals.

321	540	350	439	560	865	502
420	125	764	328	557	326	380
546	987	467	586	373	408	547
449	519	582	762	483	842	910

Use these data to construct a 90% confidence interval to estimate the population mean value. Assume the amounts spent are normally distributed.

- 10) The marketing director of a large department store wants to estimate the average number of customers who enter the store every 5 minutes. She randomly selects 5-minute intervals and counts the number of arrivals at the store. She obtains the figures 58, 32, 41, 47, 56, 80, 45, 29, 32, and 78. The analyst assumes the number of arrivals is normally distributed. Using these data, the analyst computes a 95% confidence

interval to estimate the mean value for all 5-minute intervals. What interval values does she get?

- 11) Suppose a company from the United States does considerable business in the city of Mumbai, and wishes to establish a per diem rate for employee travel in the city. The company researcher is assigned this task, and in an effort to determine this figure, she obtains a random sample of 14 business travellers staying in Mumbai. The result is the data presented below. Use these data to construct a 98% confidence interval to estimate the average per diem expense for businesspeople traveling in Mumbai. What is the point estimate? Assume per diem rates for any locale are approximately normally distributed.

418.42	229.06	396.48	326.21	435.57	363.38	426.57
607.69	372.80	583.10	253.67	332.25	350.81	362.37

- 12) How much experience do supply-chain transportation managers have in their field? Suppose in an effort to estimate this, 41 supply-chain transportation managers are surveyed and asked how many years of managerial experience they have in transportation. Survey results (in years) are shown below. Use these data to construct a 99% confidence interval to estimate the mean number of years of experience in transportation. Assume that years of experience in transportation is normally distributed in the population.

5	8	10	21	20	25	14	6	19	3
1	9	11	2	3	13	2	4	9	4
5	4	21	7	6	3	28	17	32	2
25	8	13	17	27	7	3	15	4	16
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- 13) The Interstate Conference of Employment Security Agencies says the average workweek is down to only 35 hours, largely because of a rise in part-time workers. Suppose this figure was obtained from a random sample of 20 workers and that the standard deviation of the sample was 4.3 hours. Assume hours worked per week are normally distributed in the population. Use this sample information to develop a 98% confidence interval for the population variance of the number of hours worked per week for a worker. What is the point estimate?
- 14) A manufacturing plant produces steel rods. During one production run of 20,000 such rods, the specifications called for rods that were 46 cm in length and 3.8 cm in width. Fifteen of these rods comprising a random sample were measured for length; the resulting measurements are shown here. Use these data to estimate the population variance of length for the rods. Assume rod length is normally distributed in the population. Construct a 99% confidence interval. Discuss the ramifications of the results.

44 cm	47 cm	43 cm	46 cm	46 cm
45 cm	43 cm	44 cm	47 cm	46 cm
48 cm	48 cm	43 cm	44 cm	45 cm

- 15) Suppose a random sample of 14 people 30–39 years of age produced the household incomes shown here. Use these data to determine a point estimate for the population variance of household incomes for people 30–39 years of age and construct a 95% confidence interval. Assume household income is normally distributed.

37,500	44,800
33,500	36,900
42,300	32,400
28,000	41,200
46,600	38,500
40,200	32,000
35,500	36,800

- 16) 8.44. A group of investors wants to develop a chain of fast-food restaurants. In determining potential costs for each facility, they must consider, among other expenses, the average monthly electric bill. They decide to sample some fast-food restaurants currently operating to estimate the monthly cost of electricity. They want to be 90% confident of their results and want the error of the interval estimate to be no more than \$100. They estimate that such bills range from \$600 to \$2,500. How large a sample should they take?
- 17) Suppose a production facility purchases a particular component part in large lots from a supplier. The production manager wants to estimate the proportion of defective parts received from this supplier. She believes the proportion defective is no more than .20 and wants to be within .02 of the true proportion of defective parts with a 90% level of confidence. How large a sample should she take?
- 18) What proportion of secretaries of Fortune 500 companies has a personal computer at his or her workstation? You want to answer this question by conducting a random survey. How large a sample should you take if you want to be 95% confident of the results and you want the error of the confidence interval to be no more than .05? Assume no one has any idea of what the proportion actually is.
- 19) What proportion of shoppers at a large appliance store actually makes a large-ticket purchase? To estimate this proportion within 10% and be 95% confident of the results, how large a sample should you take? Assume you have no idea what proportion of all shoppers actually make a large-ticket purchase.