Homework 3
15. Loans. Based on past experience, a bank believes that 7% of the people who receive loans will not make payments on time. The bank has recently approved 200 loans.
   a) What are the mean and standard deviation of the proportion of clients in this group who may not make timely payments?
   b) What assumptions underlie your model? Are the conditions met? Explain.
   c) What's the probability that over 10% of these clients will not make timely payments?

16. Contacts. Assume that 30% of students at a university wear contact lenses.
   a) We randomly pick 100 students. Let \( \hat{p} \) represent the proportion of students in this sample who wear contacts. What's the appropriate model for the distribution of \( \hat{p} \)? Specify the name of the distribution, the mean, and the standard deviation. Be sure to verify that the conditions are met.
   b) What's the approximate probability that more than one third of this sample wear contacts?

17. Back to school? Best known for its testing program, ACT, Inc., also compiles data on a variety of issues in education. In 2004 the company reported that the national college freshman-to-sophomore retention rate held steady at 74% over the previous four years. Consider colleges with freshman classes of 400 students. Use the 68-95-99.7 Rule to describe the sampling distribution model for the percentage of those students we expect to return to that school for their sophomore years. Do you think the appropriate conditions are met?

18. Binge drinking. As we learned in Chapter 15, a national study found that 44% of college students engage in binge drinking (5 drinks at a sitting for men, 4 for women). Use the 68-95-99.7 Rule to describe the sampling distribution model for the proportion of students in a randomly selected group of 200 college students who engage in binge drinking. Do you think the appropriate conditions are met?

19. Back to school, again. Based on the 74% national retention rate described in Exercise 17, does a college where 522 of the 603 freshman returned the next year as sophomores have a right to brag that it has an unusually high retention rate? Explain.

20. Binge sample. After hearing of the national result that 44% of students engage in binge drinking (5 drinks at a sitting for men, 4 for women), a professor surveyed a random sample of 244 students at his college and found that 96 of them admitted to binge drinking in the past week. Should he be surprised at this result? Explain.

21. Polling. Just before a referendum on a school budget, a local newspaper polls 400 voters in an attempt to predict whether the budget will pass. Suppose that the budget actually has the support of 52% of the voters. What's the probability the newspaper's sample will lead them to predict defeat? Be sure to verify that the assumptions and conditions necessary for your analysis are met.

22. Seeds. Information on a packet of seeds claims that the germination rate is 92%. What's the probability that more than 95% of the 160 seeds in the packet will germinate? Be sure to discuss your assumptions and check the conditions that support your model.

23. Apples. When a truckload of apples arrives at a packing plant, a random sample of 150 is selected and examined for bruises, discoloration, and other defects. The whole truckload will be rejected if more than 5% of the sample is unsatisfactory. Suppose that in fact 8% of the apples on the truck do not meet the desired standard. What's the probability that the shipment will be accepted anyway?

24. Genetic defect. It's believed that 4% of children have a gene that may be linked to juvenile diabetes. Researchers hoping to track 20 of these children for several years test 732 newborns for the presence of this gene. What's the probability that they find enough subjects for their study?

25. Nonsmokers. While some nonsmokers do not mind being seated in a smoking section of a restaurant, about 60% of the customers demand a smoke-free area. A new restaurant with 120 seats is being planned. How many seats should be in the nonsmoking area in order to be sure of having enough seating there? Comment on the assumptions and conditions that support your model, and explain what "very sure" means to you.

26. Meals. A restauranteur anticipates serving about 180 people on a Friday evening, and believes that about 20% of the patrons will order the chef's steak special. How many of those meals should he plan on serving in order to be pretty sure of having enough steaks on hand to meet customer demand? Justify your answer, including an explanation of what "pretty sure" means to you.

27. Sampling. A sample is chosen randomly from a population that can be described by a Normal model.
   a) What's the sampling distribution model for the sample mean? Describe shape, center, and spread.
   b) If we choose a larger sample, what's the effect on this sampling distribution model?

28. Sampling, part II. A sample is chosen randomly from a population that was strongly skewed to the left.
   a) Describe the sampling distribution model for the sample mean if the sample size is small.
   b) If we make the sample larger, what happens to the sampling distribution model's shape, center, and spread?
   c) As we make the sample larger, what happens to the expected distribution of the data in the sample?

29. Waist size. A study measured the Waist Size of 250 men, finding a mean of 36.33 inches and a standard deviation of 4.02 inches. Here is a histogram of these measurements.
32. CEOs revisited. In Exercise 30 you looked at the annual compensation for 800 CEOs, for which the true mean and standard deviation were (in thousands of dollars) 10,307.51 and 17,964.62, respectively. A simulation drew samples of sizes 30, 50, 100, and 200 (with replacement) from the total annual compensations of the Fortune 800 CEOs. The summary statistics for these simulations were as follows:

<table>
<thead>
<tr>
<th>n</th>
<th>mean</th>
<th>st. dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>10,251.73</td>
<td>3359.64</td>
</tr>
<tr>
<td>50</td>
<td>10,343.93</td>
<td>2483.84</td>
</tr>
<tr>
<td>100</td>
<td>10,329.94</td>
<td>1779.18</td>
</tr>
<tr>
<td>200</td>
<td>10,340.37</td>
<td>1230.79</td>
</tr>
</tbody>
</table>

a) According to the Central Limit Theorem, what should the theoretical mean and standard deviation be for each of these sample sizes?
b) How close are the theoretical values to what was observed in the simulation?
c) Looking at the histograms in Exercise 30, at what sample size would you be comfortable using the Normal model as an approximation for the sampling distribution?
d) What about the shape of the distribution of Total Compensation explains your answer in part c?

33. GPAs. A college's data about the incoming freshmen indicates that the mean of their high school GPAs was 3.4, with a standard deviation of 0.35; the distribution was roughly mound-shaped and only slightly skewed. The students are randomly assigned to freshman writing seminars in groups of 25. What might the mean GPA of one of these seminar groups be? Describe the appropriate sampling distribution model—shape, center, and spread—with attention to assumptions and conditions. Make a sketch using the 68–95–99.7 Rule.

34. Home values. Assessment records indicate that the value of homes in a small city is skewed right, with a mean of $140,000 and standard deviation of $60,000. To check the accuracy of the assessment data, officials plan to conduct a detailed appraisal of 100 homes selected at random. Using the 68–95–99.7 Rule, draw and label an appropriate sampling model for the mean value of the homes selected.

35. The trial of the pyx. In 1150, it was recognized in England that coins should have a standard weight of precious metal as the basis for their value. A guinea, for example, was supposed to contain 128 grains of gold. (There are 360 grains in an ounce.) In the "trial of the pyx," coins minted under contract to the crown were weighed and compared to standard coins (which were kept in a wooden box called the pyx). Coins were allowed to deviate by no more than 0.28 grains—roughly equivalent to specifying that the standard deviation should be no greater than 0.09 grains (although they didn't know what a standard deviation was in 1150). In fact, the trial was performed by weighing 100 coins at a time and requiring the sum to deviate by no more than 100 × 0.28 = 28 or 28 grains—equivalent to the sum having a standard deviation of about 9 grains.

a) In effect, the trial of the pyx required that the mean weight of the sample of 100 coins have a standard deviation of 0.09 grains. Explain what was wrong with performing the trial in this manner.
b) What should the limit have been on the standard deviation of the mean?

Note: Because of this error, the crown was exposed to being cheated by private mints that could mint coins with greater variation and then, after their coins passed the trial, select out the heaviest ones and recast them at the proper weight, retaining the excess gold for themselves. The error persisted for over 600 years, until sampling distributions became better understood.

36. Safe cities. Allstate Insurance Company identified the 10 safest and 10 least-safe U.S. cities from among the 200 largest cities in the United States, based on the mean number of years drivers went between automobile accidents. The cities on both lists were all smaller than the 10 largest cities. Using facts about the sampling distribution model of the mean, explain why this is not surprising.

Exercises 37–54 require the use of Normal tables or technology.

37. Pregnancy. Assume that the duration of human pregnancies can be described by a Normal model with mean 266 days and standard deviation 16 days.

a) What percentage of pregnancies should last between 270 and 280 days?
b) At least how many days should the longest 25% of all pregnancies last?
c) Suppose a certain obstetrician is currently providing prenatal care to 60 pregnant women. Let \( \bar{y} \) represent the mean length of their pregnancies. According to the Central Limit Theorem, what's the distribution of this sample mean, \( \bar{y} \)? Specify the model, mean, and standard deviation.
d) What's the probability that the mean duration of these patients' pregnancies will be less than 260 days?

38. Rainfall. Statistics from Cornell's Northeast Regional Climate Center indicate that Ithaca, NY, gets an average of 35.4" of rain each year, with a standard deviation of 4.2". Assume that a Normal model applies.

a) During what percentage of years does Ithaca get more than 40" of rain?
b) Less than how much rain falls in the driest 20% of all years?
c) A Cornell University student is in Ithaca for 4 years. Let \( \bar{y} \) represent the mean amount of rain for those 4 years. Describe the sampling distribution model of this sample mean, \( \bar{y} \).
d) What's the probability that those 4 years average less than 30" of rain?

39. Pregnant again. The duration of human pregnancies may not actually follow a Normal model, as described in Exercise 37.

a) Explain why it may be somewhat skewed to the left.
b) If the correct model is in fact skewed, does that change your answers to parts a, b, and c of Exercise 37? Explain why or why not for each.
40. At work. Some business analysts estimate that the length of time people work at a job has a mean of 6.2 years and a standard deviation of 4.5 years.
   a) Explain why you suspect this distribution may be skewed to the right.
   b) Explain why you could estimate the probability that 100 people selected at random had worked for their employers an average of 10 years or more, but you could not estimate the probability that an individual had done so.

41. Dice and dollars. You roll a die, winning nothing if the number of spots is odd, $1 for a 2 or a 4, and $10 for a 6.
   a) Find the expected value and standard deviation of your prospective winnings.
   b) You play twice. Find the mean and standard deviation of your total winnings.
   c) You play 40 times. What’s the probability that you win at least $100?

42. New game. You pay $10 and roll a die. If you get a 6, you win $50. If not, you get to roll again. If you get a 6 this time, you get your $10 back.
   a) Create a probability model for this game.
   b) Find the expected value and standard deviation of your prospective winnings.
   c) You play this game five times. Find the expected value and standard deviation of your average winnings.
   d) 100 people play this game. What’s the probability the person running the game makes a profit?

43. AP Stats 2006. The College Board reported the score distribution shown in the table for all students who took the 2006 AP Statistics exam.

<table>
<thead>
<tr>
<th>Score</th>
<th>Percent of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>12.6</td>
</tr>
<tr>
<td>4</td>
<td>22.2</td>
</tr>
<tr>
<td>3</td>
<td>25.3</td>
</tr>
<tr>
<td>2</td>
<td>18.3</td>
</tr>
<tr>
<td>1</td>
<td>21.6</td>
</tr>
</tbody>
</table>

   a) Find the mean and standard deviation of the scores.
   b) If we select a random sample of 40 AP Statistics students, would you expect their scores to follow a Normal model? Explain.
   c) Consider the mean scores of random samples of 40 AP Statistics students. Describe the sampling model for these means (shape, center, and spread).

44. Museum membership. A museum offers several levels of membership, as shown in the table.

<table>
<thead>
<tr>
<th>Member Category</th>
<th>Amount of Donation ($)</th>
<th>Percent of Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>50</td>
<td>41</td>
</tr>
<tr>
<td>Family</td>
<td>100</td>
<td>37</td>
</tr>
<tr>
<td>Sponsor</td>
<td>250</td>
<td>14</td>
</tr>
<tr>
<td>Patron</td>
<td>500</td>
<td>7</td>
</tr>
<tr>
<td>Benefactor</td>
<td>1000</td>
<td>1</td>
</tr>
</tbody>
</table>

   a) Find the mean and standard deviation of the donations.
   b) During their annual membership drive, they hope to sign up 50 new members each day. Would you expect the distribution of the donations for a day to follow a Normal model? Explain.
   c) Consider the mean donation of the 50 new members each day. Describe the sampling model for these means (shape, center, and spread).

45. AP Stats 2006, again. An AP Statistics teacher had 63 students preparing to take the AP exam discussed in Exercise 43. Though they were obviously not a random sample, he considered his students to be “typical” of all the national students. What’s the probability that his students will achieve an average score of at least 3?

46. Joining the museum. One of the museum’s phone volunteers sets a personal goal of getting an average donation of at least $100 from the new members she enrolls during the membership drive. If she gets 80 new members and they can be considered a random sample of all the museum’s members, what is the probability that she can achieve her goal?

47. Pollution. Carbon monoxide (CO) emissions for a certain kind of car vary with mean 2.9 g/mi and standard deviation 0.4 g/mi. A company has 80 of these cars in its fleet. Let $\bar{y}$ represent the mean CO level for the company’s fleet.
   a) What’s the approximate model for the distribution of $\bar{y}$? Explain.
   b) Estimate the probability that $\bar{y}$ is between 3.0 and 3.1 g/mi.
   c) There is only a 5% chance that the fleet’s mean CO level is greater than what value?

48. Potato chips. The weight of potato chips in a medium-size bag is stated to be 10 ounces. The amount that the packaging machine puts in these bags is believed to have a Normal model with mean 10.2 ounces and standard deviation 0.12 ounces.
   a) What fraction of all bags sold are underweight?
   b) Some of the chips are sold in “bargain packs” of 3 bags. What’s the probability that none of the 3 is underweight?
   c) What’s the probability that the mean weight of the 3 bags is below the stated amount?
   d) What’s the probability that the mean weight of a 24-bag case of potato chips is below 10 ounces?

49. Tips. A waiter believes the distribution of his tips has a model that is slightly skewed to the right, with a mean of $9.60 and a standard deviation of $5.40.
   a) Explain why you cannot determine the probability that a given party will tip him at least $20.
   b) Can you estimate the probability that the next 4 parties will tip an average of at least $15? Explain.
   c) Is it likely that his 10 parties today will tip an average of at least $15? Explain.

50. Groceries. Grocery store receipts show that customer purchases have a skewed distribution with a mean of $32 and a standard deviation of $20.
   a) Explain why you cannot determine the probability that the next customer will spend at least $40.
22. Drinking. A national health organization warns that 30% of middle school students nationwide have been drunk. Concerned, a local health agency randomly and anonymously surveys 110 of the 1212 middle school students in its city. Only 21 of them report having been drunk.

(a) What proportion of the sample reported having been drunk?
(b) Does this mean that this city’s youth are not drinking as much as the national data would indicate? Explain.
(c) Create a 95% confidence interval for the proportion of the city’s middle school students who have been drunk.
(d) Is there any reason to believe that the national level of 30% is not true of the middle school students in this city?

23. Death penalty poll, part III. In the chapter’s example and again in Exercise 21 we looked at a Gallup Poll investigating the public’s attitude toward the death penalty. In response to one question, 60% thought it was fair, but when the question was phrased differently, the proportion in favor dropped to 54%.

(a) What kind of bias may be present here?
(b) Each group consisted of 510 respondents. If we combine them, considering the overall group to be one larger random sample, what is a 95% confidence interval for the proportion of the general public that thinks the death penalty is being fairly applied?
(c) How does the margin of error based on this pooled sample compare with the margins of error from the separate groups? Why?

24. Gambling. A city ballot includes a local initiative that would legalize gambling. The issue is hotly contested, and two groups decide to conduct polls to predict the outcome. The local newspaper finds that 53% of 1200 randomly selected voters plan to vote “yes,” while a college Statistics class finds 54% of 450 randomly selected voters in support. Both groups will create 95% confidence intervals.

(a) Without finding the confidence intervals, explain which one will have the larger margin of error.
(b) Find both confidence intervals.
(c) Which group concludes that the outcome is too close to call? Why?

25. Rickets. Vitamin D, whether ingested as a dietary supplement or produced naturally when sunlight falls on the skin, is essential for strong, healthy bones. The bone disease rickets was largely eliminated in England during the 1950s, but now there is concern that a generation of children more likely to watch TV or play computer games than spend time outdoors is at increased risk. A recent study of 2700 children randomly selected from all parts of England found 20% of them deficient in vitamin D.

(a) Find a 98% confidence interval.
(b) Explain carefully what your interval means.
(c) Explain what “98% confidence” means.

26. Pregnancy. In 1998 a San Diego reproductive clinic reported 49 live births to 207 women under the age of 40 who had previously been unable to conceive.

(a) Find a 90% confidence interval for the success rate at this clinic.
(b) Interpret your interval in this context.
(c) Explain what “90% confidence” means.
(d) Do these data refute the clinic’s claim of a 25% success rate? Explain.

27. Only child. In a random survey of 226 college students 20 reported being “only” children (with no siblings). Estimate the proportion of students nationwide who are only children.

(a) Check the conditions (to the extent you can) for constructing a confidence interval.
(b) Construct a 95% confidence interval.
(c) Interpret your interval.
(d) Explain what “95% confidence” means in this context.

28. Back to campus. In 2004 ACT, Inc., reported that 74% of 1644 randomly selected college freshmen returned to college the next year. Estimate the national freshman-to-sophomore retention rate.

(a) Verify that the conditions are met.
(b) Construct a 98% confidence interval.
(c) Interpret your interval.
(d) Explain what “98% confidence” means in this context.

29. Credit scores. In a May 2007 Experian/Gallup Personal Credit Index poll of 1008 U.S. adults aged 18 and over, 8% of respondents said they were very uncomfortable with their ability to make their monthly payments on their current debt during the next three months. Find a 95% confidence interval for the proportion of the adult population that feels this way. Be sure to check the appropriate conditions and interpret your interval correctly.

30. Back to campus again. The ACT, Inc., study described in Exercise 28 was actually stratified by type of college—public or private. The retention rates were 71.9% among 505 students enrolled in public colleges and 74.9% among 1139 students enrolled in private colleges.

(a) Will the 95% confidence interval for the true national retention rate in private colleges be wider or narrower than the 95% confidence interval for the retention rate in public colleges? Explain.
(b) Find the 95% confidence interval for the public college retention rate.
(c) Should a public college whose retention rate is 75% proclaim that they do a better job than other public colleges of keeping freshmen in school? Explain.

31. Another payment. Exercise 29 described an Experian/Gallup poll of 1008 adults which found that 8% of them were worried about their ability to make their monthly payments. A more detailed poll surveyed 1288 adults, reporting similar overall results and also noting difference among four age groups: 18-29, 30-49, 50-64, and 65+.

(a) Do you expect the 95% confidence interval for the true proportion of all 16- to 29-year-olds who are worried to be wider or narrower than the 95% confidence interval for the true proportion of all U.S. consumers? Explain.
(b) Do you expect this second poll’s overall margin of error to be larger or smaller than the Experian/Gallup poll’s? Explain.

32. Legal Music. A random sample of 168 students were asked how many songs were in their digital music
and what fraction of them were legally purchased. Overall, they reported having a total of 117,079 songs, of which 23.1% were legal. The music industry would like a good estimate of the fraction of songs in students’ digital music libraries that are legal.

a) Think carefully. What is the parameter being estimated? What is the population? What is the sample size?

b) Check the conditions for making a confidence interval.

c) Construct a 95% confidence interval for the fraction of legal digital music.

d) Explain what this interval means. Do you believe that you can be this confident about your result? Why or why not?

33. Deer ticks. Wildlife biologists inspect 153 deer taken by hunters and find 32 of them carrying ticks that test positive for Lyme disease.

a) Create a 90% confidence interval for the percentage of deer that may carry such ticks.

b) If the scientists want to cut the margin of error in half, how many deer must they inspect?

c) What concerns do you have about this sample?

34. Pregnancy, II. The San Diego reproductive clinic in Exercise 26 wants to publish updated information on its success rate.

a) The clinic wants to cut the stated margin of error in half. How many patients’ results must be used?

b) Do you have any concerns about this sample? Explain.

35. Graduation. It’s believed that as many as 25% of adults over 50 never graduated from high school. We wish to see if this percentage is the same among the 25 to 30 age group.

a) How many of this younger age group must we survey in order to estimate the proportion of non-grads to within 6% with 90% confidence?

b) Suppose we want to cut the margin of error to 4%. What’s the necessary sample size?

c) What sample size would produce a margin of error of 3%?

36. Hiring. In preparing a report on the economy, we need to estimate the percentage of businesses that plan to hire additional employees in the next 60 days.

a) How many randomly selected employers must we contact in order to create an estimate in which we are 98% confident with a margin of error of 5%?

b) Suppose we want to reduce the margin of error to 3%. What sample size will suffice?

c) Why might it not be worth the effort to try to get an interval with a margin of error of only 1%?

37. Graduation, again. As in Exercise 35, we hope to estimate the percentage of adults aged 25 to 30 who never graduated from high school. What sample size would allow us to increase our confidence level to 95% while reducing the margin of error to only 2%?

38. Better hiring info. Editors of the business report in Exercise 36 are willing to accept a margin of error of 4% but want 99% confidence. How many randomly selected employers will they need to contact?

39. Pilot study. A state’s environmental agency worries that many cars may be violating clean air emissions stan-
dards. The agency hopes to check a sample of vehicles in order to estimate that percentage with a margin of error of 3% and 90% confidence. To gauge the size of the problem, the agency first picks 60 cars and finds 9 with faulty emissions systems. How many should be sampled for a full investigation?

40. Another pilot study. During routine screening, a doctor notices that 22% of her adult patients show higher than normal levels of glucose in their blood—a possible warning sign for diabetes. Hearing this, some medical researchers decide to conduct a large-scale study, hoping to estimate the proportion to within 4% with 98% confidence. How many randomly selected adults must they test?

41. Approval rating. A newspaper reports that the governor’s approval rating stands at 65%. The article adds that the poll was based on a random sample of 972 adults and has a margin of error of 2.5%. What level of confidence did the pollsters use?

42. Amendment. A TV news reporter says that a proposed constitutional amendment is likely to win approval in the upcoming election because a poll of 1505 likely voters indicated that 52% would vote in favor. The reporter goes on to say that the margin of error for this poll was 3%.

a) Explain why the poll is actually inconclusive.

b) What confidence level did the pollsters use?

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**JUST CHECKING**

**Answers**

1. No. We know that in the sample 17% said "yes"; there's no need for a margin of error.

2. No, we are 95% confident that the percentage falls in some interval, not exactly on a particular value.

3. Yes. That's what the confidence interval means.

4. No. We don't know for sure that's true; we are only 95% confident.

5. No. That's our level of confidence, not the proportion of voters. The sample suggests the proportion is much lower.

6. Wider.

7. Lower.

8. Smaller.
A computer program found that the resulting 95% confidence interval for the mean amount spent in March 2005 is (−$2836.84, $90691.49). Explain why the analysts didn’t find the confidence interval useful, and explain what went wrong.

13. Normal temperature. The researcher described in Exercise 9 also measured the body temperatures of that randomly selected group of adults. The data he collected are summarized below. We wish to estimate the average (or “normal”) temperature among the adult population.

<table>
<thead>
<tr>
<th>Summary</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>52</td>
</tr>
<tr>
<td>Mean</td>
<td>98.285</td>
</tr>
<tr>
<td>Median</td>
<td>98.200</td>
</tr>
<tr>
<td>MidRange</td>
<td>98.600</td>
</tr>
<tr>
<td>StdDev</td>
<td>0.6824</td>
</tr>
<tr>
<td>Range</td>
<td>2.800</td>
</tr>
<tr>
<td>IntQRRange</td>
<td>1.050</td>
</tr>
</tbody>
</table>

Through parking fees. During a two-month period (44 weekdays), daily fees collected averaged $126, with a standard deviation of $15.

a) What assumptions must you make in order to use these statistics for inference?

b) Write a 90% confidence interval for the mean daily income this parking garage will generate.

c) Explain in context what this confidence interval means.

d) Explain what “90% confidence” means in this context.

e) The consultant who advised the city on this project predicted that parking revenues would average $130 per day. Based on your confidence interval, do you think the consultant was correct? Why?

15. Normal temperatures, part II. Consider again the statistics about human body temperature in Exercise 13.

a) Would a 90% confidence interval be wider or narrower than the 98% confidence interval you calculated before? Explain. (You should not need to compute the new interval.)

b) What are the advantages and disadvantages of the 98% confidence interval?

c) If we conduct further research, this time using a sample of 500 adults, how would you expect the 98% confidence interval to change? Explain.

d) How large a sample would you need to estimate the mean body temperature to within 0.1 degrees with 98% confidence?

16. Parking II. Suppose that, for budget planning purposes, the city in Exercise 14 needs a better estimate of the mean daily income from parking fees.

a) Someone suggests that the city use its data to create a 95% confidence interval instead of the 90% interval first created. How would this interval be better for the city? (You need not actually create the new interval.)

b) How would the 95% interval be worse for the planners?

c) How could they achieve an interval estimate that would better serve their planning needs?

d) How many days’ worth of data must they collect to have 95% confidence of estimating the true mean to within $3? |

17. Hot dogs. A nutrition laboratory tests 40 “reduced sodium” hot dogs, finding that the mean sodium content is 310 mg, with a standard deviation of 36 mg.

a) Find a 95% confidence interval for the mean sodium content of this brand of hot dog.

b) What assumptions have you made in this inference? Are the appropriate conditions satisfied?

c) Explain clearly what your interval means.

18. Speed of light. In 1882 Michelson measured the speed of light (usually denoted c as in Einstein’s famous equation $E = mc^2$). His values are in km/sec and have 299,000 subtracted from them. He reported the results of 23 trials with a mean of 7.5622 and a standard deviation of 0.12.

a) Find a 95% confidence interval for the true speed of light from these statistics.

b) State in words what this interval means. Keep in mind that the speed of light is a physical constant that, as