Chapter 11

11.1 Factors Affecting Data Collection, pages 419–421

4. Example: **a)** The responses would be biased. The soccer team would have no interest in uniforms for the volleyball team. **b)** The responses would be biased. Truck drivers would probably respond that they prefer to drive trucks. **c)** The cost of the survey would be high and may outweigh the benefits of the study. **d)** The influencing factor is use of language. The positive descriptions of "most sturdy" and "expertly designed" could prompt them to choose Invincible Bikes.

5. Example: **a)** No bias. **b)** The bias is asking only owners of boarding horses and using the negative word "annoying". Rewrite: "Where should the stable be located?" **c)** The bias is asking only riders and including "on the site of the stable." Rewrite: "Where should a public park be built?"

6. Example: **a)** The influencing factor is the use of language. The respondent may not prefer either of the two choices. Rewrite: "What soda do you prefer?" **b)** The influencing factor is asking the opposition party member. Rewrite: "Who do you think is the best prime minister in Canadian history?" **c)** The person responding may be confused by the question. Rewrite: "Do your appliances and tools need any maintenance? If yes, do you know about the Hands-On-Repair Company?" **d)** This is private information. Students may not know their parents' income. No suggestion for a rewrite.

7. Example: **a)** "Which riding trails would you support closing?" **b)** "Who is your favourite male movie star?" **c)** "What is the cheapest way to travel a long distance?"

8. Example: **a)** "What sport do you like to watch?" **b)** "What is your favourite flavour of ice cream?" **c)** "Do you use the Internet to watch TV? If yes, what shows do you watch most often online?"

9. Example: **a)** "What juice flavour is your favourite?" or "Which of the following is your favourite juice flavour? a) apple, b) orange, c) pineapple, d) grapefruit, e) other"

b) "What is your favourite shirt colour?" or "Which of the following is your favourite shirt colour? a) yellow, b) black, c) white, d) red, e) other"

c) "What kind of diet do you support?" or "Which type of diet do you support? a) natural food, b) high protein, c) low carbohydrates, d) low fat, e) other"

10. Example: **a)** Ask people ages 13 to 19; "What sport do you like best?" **b)** Ask cell-phone owners; "What is most important consideration when buying a cell phone?" **c)** Ask people who use a media source; "What media source do you trust the most?"

11. Example: **a)** "Have you tried Crystal Juice? If yes, would you consider buying it as your regular juice?" **b)** "Do you use cough medicines? If yes, which brands do you use?" **c)** "If you were hiking in the bush and came across a moose, what would you do?" **d)** "Do you have Internet access? If yes, how satisfied are you with the level of service you receive?"

12. Example: **a)** The use of "expensive store" in the question makes the question biased. Rewrite: "Where have you purchased clothing items within the past year?" **b)** Asking members of the golf club makes the question biased. Rewrite: "Are you in favour of the proposed highway?"

13. Example: **a)** Biased question: "Do you prefer mindless computer games or mind stimulating board games like chess?" Rewrite: "What kind of games do you prefer to play?"
14. Example: **a)** Question 1: "Would you consider going on an Arctic adventure tour? If yes, what activities would appeal to you?" Question 2: "If you were going on an Arctic adventure tour, which of the following activities would interest you? a) dogsledding, b) white-water rafting, c) mountain climbing, d) big game hunting" Question 3: "Have you ever gone on a trip to the Arctic? If yes, what activities did you participate in?"
c) The use of language is the influencing factor that creates the bias. The words "mindless" and "mind stimulating" could sway a participant's answer to the survey question.
15. Example: If the source of the poll is a political party, the survey question may contain influencing factors that would affect the outcome.

11.2 Collecting Data, pages 427–429

4. Example: **a)** The population would be people who listen to rock bands. Since this population size could be quite large, a sample would be the most time- and cost-effective. **b)** The population would be this year's grade 9 students. A sample or population could be used, depending on the number of grade 9 students.
c) The population would be customers of the store who buy soccer shirts. A sample or population could be used, depending on the number of customers.
d) The population would be people who use shampoo. Since most people use shampoo, the population would be too large. A sample would be more appropriate.
5. Example: **a)** The population would be people who use the Internet at home. Since the population would be very large, a sample would be less time-consuming and more cost-effective. **b)** The population would be people associated with the school. A sample would be less time-consuming. **c)** The population would be customers of an electronics store who use the repairs and service department. A sample or population could be used, depending on the number of customers.
d) The population would be people with special needs. A sample would be appropriate. It would be difficult to find and ask all people with special needs.
6. Example: **a)** Voluntary response; place an ad in the newspaper asking people to respond. **b)** Stratified; count the number of people in different categories of people associated with the school: students, parents, and staff. Ask a proportional number of people from each group. **c)** Systematic; ask every 10th repair/service customer. **d)** Voluntary response; place an ad in the newspaper asking people with special needs to respond.
7. Example: **a)** Ask people listening to the show to volunteer to phone-in their opinions. This is a voluntary response sample. **b)** Take a random sample by assigning each school a number, and have a random number generator select 25 numbers.
c) Take a convenience sample by asking the first 50 teenagers who enter the mall on a Saturday. **d)** Take a convenience sample by asking the first 50 people who enter a coffee shop downtown.
8. Example: **a)** Population; there are not that many hospitals. **b)** Sample; it would be too costly and time-consuming to ask all grade 9 students. **c)** Population; all parachutes should be tested because their use involves life or death. **d)** Sample; it would be too costly and time-consuming to test all bike tires.
9. Adults represent 50% of the population, teens represent 20% of the population, and children represent 30% of the population. Kristi could stratify by asking 5 adults, 2 teens, and 3 children.
10. a) The population is the students of the school.
b) The sample is students who use the cafeteria.
c) For the first question, yes, students who use the cafeteria would have an opinion about paint colours for the walls. For the second question, no, students who do not use the cafeteria should also be included in the survey regarding the use of the cafeteria for graduation.
d) No, he should not use the same sample for each question. Even though both questions refer to the cafeteria, the two questions are unrelated. Students who use the cafeteria would have an opinion about paint colours for the walls. But students who do not use the cafeteria should be included in the survey regarding the use of the cafeteria for graduation.
11. a) Yes, there is a bias in Enzo's sample. The bias is surveying people at a baseball game regarding spending the budget on baseball equipment.
b) A random sample of ten students from each class would reflect the overall opinion of the students.
12. There could be 20 different responses from either method. The sample is too small to yield a conclusive result. If Anita uses a stratified sample that is larger, then her method would be better due to more people being involved. Also, the stratified sample would ensure that all departments are represented.
13. Example: She must have enough friends to make a large sample. Her friends' families must represent the population of Canadian households.
14. Example: **a)** Yes; $\frac{12}{50}$ is 24%, so 24% of the people in the survey are allergic to dogs. No; The fact that none of the 50 people surveyed are allergic to hedgehogs does not mean that no people are allergic to hedgehogs.
b) "Are you allergic to any animals? If yes, what animal are you allergic to?" There may be other animals that are not on the list that people are allergic to. Some people may not have allergies to any animals.

16. Example: **a)** The survey assumes everyone surveyed is aware of what the fire department is doing. Rewrite: "Have you had the fire department perform a service for you? If yes, how would you rate the service?" **b)** Influencing factors: Who was asked? When were they asked? How were they asked? It could have been a convenience sample that asked people who lived around the fire station. It may have been a voluntary response sample, where people were asked to mail in a response to a survey question that was placed in their mailbox. A random, stratified, or systematic survey would reflect opinions more accurately.

11.3 Probability in Society, pages 435–439

4. He assumed that the random sample was large enough to represent the entire population of light bulbs.
5. If the sample is accurate, 4080 toothpicks would be damaged. Assumption: The sample was random and large enough to represent the population of toothpicks.
6. a) Yes, only vegetarians were sampled. Assuming that there are non-vegetarians in the school population, the supervisor made a false prediction.
b) Example: Ask a larger sample of students, stratifying vegetarian and non-vegetarian students.
7. a) The prediction may be correct, but a larger sample would be more accurate. **b)** Use a larger sample.
8. a) 10 people **b)** The theoretical probability is $33\frac{1}{3}\%$. This assumes each of the three candidates has the same chance of winning. **c)** The experimental probability of 53% is greater than the theoretical probability of $33\frac{1}{3}\%$. **d)** If the winner receives the greatest number of votes and the poll represents the population of voters, Candidate A will win.
9. a) 20% **b)** Assumption: Each movie type has the same chance of being selected. **c)** 20% **d)** The probabilities are the same. **e)** 600 movies
10. a) 6.5 **b)** 7 **c)** 6 **d)** The samples are close indicators because they were off by 0.5 from the mean of all ten judges.
11. a) The sample is too small, so it may not represent the population of grade 9 students who work part-time. It could be biased. **b)** No, since the sample could be biased.
12. The experimental probability of having a boy is 48.7%. Since this is slightly less than the theoretical probability of 50%, the results confirm the article's claim.
14. a) John used theoretical probability assuming that each vehicle has an equal chance of passing the bus stop. Cathy used an experimental probability method based on her past experience. **b)** John's prediction was 20%. Cathy's was 40%. The experimental probability was about 13%. John was closer. **c)** 105 trucks.
15. a) The theoretical probability of giving birth to a girl is $\frac{1}{2}$. So, the theoretical probability of having three girls is $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$. **b)** 0% **c)** The theoretical probability is 12.5% or $\frac{1}{8}$ and the experimental probability is 0%. **d)** No, both the theoretical and experimental probabilities are very low. **e)** Assumption: The probability that a newly-born child is a boy is 50%.
16. a) Example: Yes, the sample was random and sufficiently large. **b)** 25% **c)** 1509 students **d)** Assumption: The proportion in the general population is the same as the proportion in the sample.

Chapter 11 Review, pages 444–445

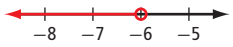
1. H
2. C
3. E
4. A
5. G
6. D
7. B
8. I
9. F
10. Example: **a)** The wording is an influencing factor. The use of the word "increased" will tend to make people respond negatively. **b)** The wording is confusing, "What is store-bought bread?" **c)** The sample is biased. Only juice drinkers are asked the survey question.
11. Example: **a)** The influencing factor is the use of language. The question assumes that respondents like cheesecake. Rewrite: "Do you like cheesecake? If yes, what is your favourite flavour?" **b)** The influencing factor is a bias by stating that "everyone loves the Rockets." Rewrite: "Do you like rock music? If yes, who is your favourite rock group?" **c)** The influencing factor is ethics, assuming respondents download music from the Internet. Rewrite: "Do you download music from the Internet? If yes, what music did you download in the past month?"
12. Example: **a)** The population is teens in Canada. Take a stratified sample by categorizing teens by where they live: rural, city, small town. **b)** The population is students in your school. Take a random sample by systematically choosing every 10th student from an alphabetical list. **c)** The population is the gas station retailers in the community. Take a random sample by placing the name of each retailer in a box, and drawing ten names.

13. a) This is a convenience sample. This sample may not typify the average mall shopper. **b)** This is a type of stratified sample. But unless the population of each province or territory is the same, selecting 20 youths from each group is not a proportional selection. **c)** This is a convenience sample. Selecting employees from one store location may not typify the average employee of a fast-food chain.
14. Example: **a)** A stratified sample of the doctors, nurses, and hospital administrators would be representative of the hospital's needs. **b)** A systematic sample of every 10th customer who buys a sundae would give a representative random sample.
15. a) convenience **b)** stratified **c)** systematic
16. a) Approximately 304 trout **b)** Assumptions: All fish are equally easy to catch. None of the fish died and none were born. The stream is a closed system and the fish cannot "escape" into a lake or ocean.
c) Example: Wait less time, but long enough to ensure a thorough mixing of the fish. Perhaps four or five days would give more accurate results.
17. Example: **a)** No. Her sample is biased since all the sample members were also members of her class.
b) She could take a systematic sample by obtaining an alphabetical list of all the grade 9 students and asking every 10th student on the list.
18. Assumption: The sample represents the population of grade 9 students.
Group 1: I agree with this statement because only 12.5% indicated they spent the most money on clothes.
Group 2: I disagree with this statement because only 27% chose cell phones. Cell phones are more expensive than many other forms of entertainment. This may lead students to spend more money on them, but they could attend movies or buy music more often.
Group 3: I agree with this statement because 27% of 500 is 135.
Group 4: I disagree with this statement because less than half of the sample spent money on these items.

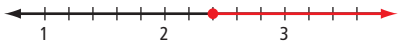
Chapters 8–11 Review, pages 450–452

1. a) $x < 1$, since 8 times x is less than 8. $x = \frac{1}{20}$
b) $x > 1$, since x divided by 9 is close to 1, x must be close to 9. $x = 7.5$ **c)** $x > 1$, since 7 divided by x is less than 1, x must be greater than 7. $x = 28$
d) $x < 1$, since for x to fit into 1 almost 3 times, x must be less than 1. $x = \frac{2}{5}$

2. 3.4 m
3. \$3.49
4. 2.5 h
5. 21
6. a) $x \leq 17$ **b)** $-6.6 \leq x < -5$
7. a) $x < -6$

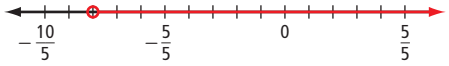


b) $2.4 < x$

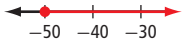


8. a) $8 \leq x$ **b)** 1.3 million $< x$ **c)** $x \leq 3.7\%$ **d)** $x \leq 10\%$
9. a) $x < 8.8$

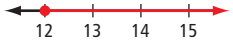
b) $x > -\frac{8}{5}$



c) $-50 \leq x$



d) $12 \leq x$



10. a) $4.5 \leq x$ **b)** $20 < x$ **c)** $13 > x$ **d)** $-9 \leq x$
11. More than approximately 9.29 t
12. a) $145t \leq 800$ **b)** 5.5 or fewer hours
13. after 40 h
14. $\angle DEB = 47°$, $\angle DCB = 94°$
15. CE = 5.4 cm
16. EF = 48 mm
17. 138 cm
18. Example: **a)** The wording leads the respondents to choose cards. Rewrite: "Do you play cards?"
b) People surveyed may not drink milk. Rewrite: "Do you drink milk? If yes, what type do you prefer to drink?"
19. Example: **a)** The population is students.
b) A convenience sample could be used, in which you ask your friends. A systematic sample could be used, in which you obtain an alphabetical list of students in your school, and ask every 10th student on the list.

20. Example: **a)** The population is the audience of the talk show. A voluntary sample of people watching the show could be used. **b)** The population is the people in the book store. The author could use a random sample by asking the first 50 people who enter the store.
c) The population is the students of the school. The sample could be a systematic sample of every 20th student on the school roster.
21. Example: **a)** The population is department managers and sales associates. **b)** The sampling method is random. **c)** Yes; there is a random sample of 20 stores, a random sample of 40 departments, and a random sample of department managers and sales associates.
22. Example: **a)** Since the grade 9 students were the only ones sampled, they assumed they knew what the elementary students would want to eat for the barbecue. **b)** A stratified sample would work best. Group the school by grades, and take a proportional sample of each grade.
23. a) 50% **b)** The assumption is that there is an equal chance of each answer being either correct or incorrect.
c) Example: Flipping a coin could be used to model this experiment. **e)** An experiment of only ten trials may not be enough to accurately predict the outcome.