

## Chapter 4 Answers

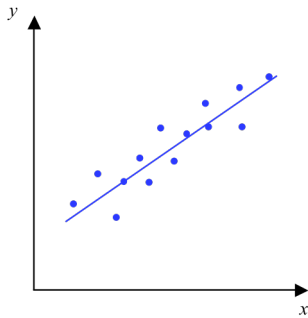
### Get Set, pages 59–60

- a) \$1.25/song      b) 0.35 km/min      c) \$1.54/kg
- a) \$29.15      b) biodiesel: 15.6 L; diesel: 23.4 L
- a) 88.89%      b) 80.77%      c) 77.27%      d) 68.57%
- a) 661.5 mL      b) 1228.5 mL
- \$88.92 per share
- mean: 80.00; median: 76.66; no mode
- 8117.5 mL
- mean: 0.03; median: 0.02; mode: 0.01
- a) Secondary data, since the data were gathered by a source other than Melissa.  
b) The line graph makes it easier to see the trend in energy use over time.  
c) 105.6%
- a) No. The correlation is weak.  
b) No. Too little data.  
c) Yes. There is sufficient data, the correlation is strong, and there are no outliers or influential points to consider.

### 4.1 Statistical Measures, pages 61–63

#### Warm-Up

- a) 2      b) 29
- a)  $6x$       b)  $3s + 11t$       c)  $-10a + 9b - 9$
- zero roots
- a) 17.2 units      b) 17.3 units
- mean: 12.3; median: 12; mode: 11
- $8(s + x) = 48$ , where  $s$  represents the side length of the octagon
- C
- Sketches may vary. For example:



#### Practise

- a) 0.007      b) \$22.34      c) 46.8      d) 0.052
- a)  $-16.67\%$       b)  $3.00\%$       c)  $-47.06\%$       d)  $233.33\%$       e)  $2.78\%$
- a) i) 56th percentile      ii) 81st percentile  
b) i) 19.54 min      ii) 18.78 min
- Tamara: 92%; Max: 80%; Dominique: 84%; Maria: 83%; Jordan: 92%
- a) 2005: 87.5%; 2006:  $-60\%$ ; 2007: 116.7%; 2008:  $-38.5\%$   
b) 2005: 165%; 2006:  $-67.9\%$ ; 2007: 129.4%; 2008:  $-56.4\%$
- a) \$1.43      b) \$0.87      c) \$114.40; \$69.60

### 4.2 Statistical Indices, pages 64–67

### Warm-Up

- 12.4, 10.5, 6.12, 4.02, -1.9, -1.91
- a)  $-2xy - 5x + 5y$       b)  $7a + 10b + 7$       c)  $-x - 8y$
- a) (0, 10)      b)  $\frac{2}{3}$       c)  $-\frac{3}{2}$
- 299 units<sup>2</sup>
- 11 values
- 36, 49
- a) equilateral triangle  
b) scalene triangle
- 27.25%

### Practise

- a) The CPI would decrease.      b) The CPI would increase.
- a) 3.77%      b) 1.82%      c) 5.66%
- a) 0.68      b) 1.08      c) -30.53%      d) -10.23%
- a) \$1323.29      b) 2.6%/year      d) He is ahead of inflation.
- a) -33.33%      b) 15.69%      c) 0.81      e) 1.40
- a) 4570 ft  
b) Yes. The pilot needs 4700 ft to land safely.

### 4.3 Interpret Statistics in the Media, pages 68-70

#### Warm-Up

- a) 2.5      b) 9.2      c) 16.8
- a)  $-4x^2 + 2x + 9$       b)  $8x^2 - 3x + 3$       c)  $5x - 3y$
- (6, 20)
- a) 175.9 cm<sup>2</sup>      b) 650.8 m<sup>2</sup>
- a)  $\frac{1}{4}$       b)  $\frac{1}{26}$
- $A = \pi \left[ \frac{x-2}{2} \right]^2$
- A
- The CPI would increase.

#### Practise

- Answers may vary. For example:  
a) How many teachers were surveyed? What grades do they teach? For how long did the teachers use each type of board?  
b) How many students were surveyed? Were students who use the cafeteria at varying levels of frequency surveyed? Over what time span was the survey conducted?  
c) How much non-junk e-mail does the spam filter destroy? Over what time span was the survey conducted? Were different types of e-mail service providers tested?  
d) What was the age range of readers surveyed? Which social networking sites were considered? What was the government level of the politicians mentioned in the question?
- a) The article might be implying that the United States is the richest country in the world.  
b) Other indicators such as total population, average income, and national GDP would help to clarify the situation.

3. a) If the poll were conducted 20 times, the results would fall between a 57.9% and a 64.1% support for a ban on fighting in professional hockey 19 times.  
 b) If the poll were conducted 20 times, the results would fall between a set of values varying by at most 5.2% for Canadians who see no problem sharing downloaded music and movies 19 times.
4. a) Take 75% off the regular price. With this deal, you pay 25% of the original price. With the other deal, you pay 30% of the original price.  
 b) Use the coupon. With the coupon, you pay \$26.49. With the additional discount, you pay \$27.99.  
 c) Save \$300 now. With this deal, you pay \$999 for the sofa. With the other deal, you pay \$1299. It is unlikely that you could invest the \$1299 for three months and earn more than \$300 in interest.
5. a) 10% chance of snow  
 b) Answers may vary. For example: An 80% chance of snow in the North Bay area and a 12.5% chance of snow in Simcoe County. A 40% chance of snow in the North Bay area and a 25% chance of snow in Simcoe County.
6. a) CookieChum. Four out of five children is 80% for Mr. Yummy cookies, which is less than 90% for CookieChum.  
 b) SleepWell. 42.5% of the nation is satisfied with their mattresses compared to 40% for Dreamer.  
 c) News Now magazine. It is preferred by almost 78% of people and Days News is preferred by as few as 71% of people.
7. a) China: 59.26%; Mexico: 44.54%; Italy: 38.04%. Answers may vary.  
 b) Spain: 12.65%; Germany: 12.80%; United Kingdom: 25.60%. Answers may vary.  
 c) Bar graph. The data is in categories.

#### 4.4 Statistical Bias, pages 71-73

##### Warm-Up

1. a) -5.25                      b) 0.5
2. a) 1                              b)  $\frac{9}{14}$                               c) 2
3. vertical transition up 5 units
4. 17 420 mL
5. a)  $\frac{1}{2}$                               b)  $\frac{3}{4}$
6.  $4x = (30 - x) + 15$ , where  $x$  represents Sylvia's age.
7. D
8. Answers may vary. For example: Where was the survey conducted?

##### Practise

1. Statistical bias refers to the external influences that may affect the accuracy of statistics, resulting in errors that cannot be corrected by repeating an experiment many times.
2. Answers may vary. For example:  
 a) An Internet survey invited any interested users to complete their survey. This is a volunteer survey that uses a non-random sampling method.  
 b) Two scales were used to weigh each student in a class, but one scale was not calibrated properly. The measurements will not match.  
 c) A telephone survey failed to contact all names on the calling list due to people not being home. People not at home are excluded from the survey.

**d)** A survey question asked respondents: “Tractor trailer truck drivers have to deal with increasing fuel prices and longer hours on the road. Do you think tractor trailer truck drivers deserve a raise?” The question influences respondents' answers.

**3. a)** Sampling bias. The sample size is too small.

**b)** Measurement bias. The times are recorded using two different methods.

**c)** Response bias. The respondents at the market will agree with the survey question.

**d)** Response bias or measurement bias. Respondents are led to select Gum A, or may find it difficult to assess which lasts longer.

**e)** Sampling bias. The selection of people to call is not random.

**f)** Non-response bias. Not enough people have responded to the survey.

**g)** Response bias. People are unlikely to answer the question or to answer honestly.

**4.** Answers may vary. For example:

**a)** How do you feel about the basketball team’s performance this season?

**b)** Do you feel that the current student council should be re-elected?

**c)** Have your shopping habits in the downtown core changed recently?

**d)** Should helmets be mandatory for all skiers and snowboarders?

**5.** A

**6.** Answers may vary. For example:

**a)** Students in the higher grades have already completed grade 9 and the proposed changes will not affect them. The survey could be completed during class time in a homeroom class to improve response rate among all grades.

**b)** The synopsis is too long and takes too much time for respondents to read and analyze. The synopsis should be reduced to a few key point form details to make it easier for respondents to read.

**c)** Shoppers are too busy to fill in the form. Set up the sample tasting in a mall or a place where people have more time to stop and respond to the survey.

**7.** Answers may vary. For example:

**a)** The number of vehicles passing through the intersection should be counted as various hours of the day, and repeated on more than one day.

**b)** The experimenters should agree on a standard method of measuring the length of the forearm before taking any measurements.

**c)** The worker should test a sample of the flashlights made throughout the week.

**8. a)** The sample is not selected randomly and the sample is not representative of the population. Students of all hair colours should be surveyed.

**b)** The sample size is too small. More players should be surveyed.

**c)** The sample is not representative of the population. The hotel should survey a sample of guests from every floor.

#### 4.5 Critical Analysis, pages 74-76

##### Warm-Up

**1. a)** 168

**b)** 3

**2. a)**  $-\frac{8}{3}$

**b)**  $-\frac{9}{4}$

**c)** 10

**3.** minimum.  $-8$

**4.** 5.5 m

**5. a)**  $\frac{7}{10}$

**b)**  $\frac{1}{2}$

**6.**  $96 = 2l + 2(l - 14)$ , where  $l$  represents the length of the rectangle in centimetres

**7.** D

**8.** sampling bias

### Practise

1.
  - a) Inferential statistics. It is implied that the results of the study are true for all Canadian grade 12 students.
  - b) Descriptive statistics. It is summarizing results for the 2000 homes in the study.
  - c) Inferential statistics. It is implied that the results of the study are true for all Ontarians.
  - d) Descriptive statistics. It is summarizing results for the 190 water samples in the study.
2.
  - a) Current students. The college recruiting office would not highlight the negative aspects of residence life.
  - b) Both are biased. The Canadian Medical Association would claim the pay rate of physicians should be raised while the provincial government would claim their pay rate is high enough.
  - c) Professional polling firm. The car manufacturer would be biased towards their own brand of car.
  - d) Canadian government. The travel agency is trying to encourage people to travel.
  - e) The county health unit. The makers of the medicine sell the medicine for a profit so they would be biased when they recommend it.
  - f) The hockey scouts. The agent is trying to find a team for the player and obtain the best contract.
3. Answers may vary. For example:
  - a) What is the definition of “Canadian youth”? Was the sample of Canadian youth large enough and diverse enough to use the data for inferential statistics? Who conducted the study?
  - b) Was the study conducted by an independent group? Does the article cite references? Is the Web site current?
  - c) How recent is the data? What were the stock prices last year? What is the source of this statistic?
  - d) When was the study done? Who collected the data? What are the prices and household incomes used in the article??
4.
  - a) It is misleading because the horizontal axis does not start from zero. I would improve the graph by starting the horizontal axis at zero.
  - b) Data before April 2008 is not shown that would support the alternate headline.
  - c) Descriptive statistics. It is reporting the price of the Canadian dollar.
5.
  - a) The sample is all Canadians who voted in the 2006 elections. Yes, the sample is large and diverse enough to use as inferential statistics.
  - b) The author is Elections Canada, a very reliable source of election data. The summary is done by a student who might not be as reliable.
  - c) secondary data
  - d) Answers may vary. For example: The data is from January 2006, which is over three years ago. However, elections do not happen very often, so the data is probably still relevant.
  - e) Answers may vary. For example: The data is from a reliable source and is based on a large sample, so it is not biased. Nolan analysed the data by using regression and assessed the strength of the correlation. But he did not consider that the data for people 75+ might be an influential point. Without the data point, the linear regression is  $y = 7.2486x + 37.647$  and  $R^2 = 0.9599$ .
  - f) No. A more accurate conclusion would be that older Canadians are more likely to vote.

### Chapter 4 Review, pages xx-xx

1.
  - a) The average for each person.
  - b) The total assets or wealth minus the total liabilities or debt.
  - c) A number between 1 and 99 indicating the percent of the population with a score less than or equal to a specific value.
2.
  - a) 5th percentile
  - b) 86th percentile
  - c) 95th percentile
3. 0.000 34

4. Mohammed: 82%; Siobhan: 82%
5. a) -25%                      b) 0.43                      c) 1.74
6. a) 6090 ft  
b) No. The pilot needs 8290 ft to land safely.
7. a) The graph implies that the unemployment rate increased for all provinces from January 2009 to February 2009. It also implies that Alberta has the greatest increase in unemployment and the Nova Scotia has the least increase.  
b) Provincial unemployment rates could be more accurately compared using the actual change in the unemployment rate instead of the percent increase in the unemployment rate.  
c) Answers may vary. For example: Misleading headline: Unemployment rates soar on the West Coast. Accurate headline: Unemployment rates increase in all provinces.  
d) The provincial unemployment rates from January 2009.
8. a) Deal 1  
b) Answers may vary. For example: Advertising a discount when the buyer has pay the full price and mail in a coupon to get a refund. Using large print to make the sale price seem more attractive.
9. a) Bias that occurs when the sample does not reflect the population being studied.  
b) Bias that occurs when survey participants purposely give false or misleading responses or are led to respond in a particular way.  
c) Bias that occurs when the measurement technique has errors, causing unreliable results.  
d) Bias that occurs when certain groups of respondents are under-represented in a sample compared to the overall population being studied.
10. a) Response bias. Instead of asking the question, include it on an anonymous written survey.  
b) Response bias. Change the question to "Do you feel the current formal committee should remain in office for another year?"  
c) Sampling bias. The sample size is too small. More teens should be interviewed.  
d) Measurement bias. The scientist should measure the sticks with a ruler.  
e) Non-response bias. The company should conduct the survey at perfume or cosmetics counters in stores.  
f) Response bias. Separate the contest from the survey for more accurate results.
11. a) Descriptive statistics. It is summarizing results for the respondents.  
b) Inferential statistics. The results of a study are projected to all Canadian families.  
c) Descriptive statistics. It is summarizing results for the fifty people interviewed.
12. Answers may vary. For example:  
a) How is Internet use measured? When was the study done?  
b) How many teenagers were surveyed? How was the monthly dollar amount determined?  
c) How was the carbon emissions data gathered? When was the study done?
13. Answers may vary. For example:  
a) There is no indication of how the sampling was done. It appears that a very large sample was used from across Canada, so there should be little or no sampling bias.  
b) The original data was collected by Statistics Canada but the data shown was calculated by Tomas and Maria. Without the original data from Statistics Canada, it cannot be confirmed that the calculated data is without error. A professional statistician could have analysed the original data in greater detail.  
c) The data is from a secondary source and the source has been properly documented. However, how the data was manipulated was not shown.  
d) The study was done in 2008 using 2007 data, so the data is current and still relevant.  
e) Linear regression was performed on the data. The trend in the data justified the use of regression, where  $r^2 = 0.52$  or  $r = 0.721$ , which indicates a strong linear correlation. However, Tomas and Maria did not consider the influential point (17. 85.2) and how it might influence

correlation. Judging from the shape of the graph, a quadratic regression analysis might have been more appropriate.

Tomas and Maria are using the data as inferential statistics. Since the data was taken from Statistics Canada, the sample would be large enough that it would appropriately represent the population as a whole.

Overall, Tomas and Maria followed appropriate steps in accessing, documenting, and analysing the data. Their conclusion that older people are more likely to be employed is accurate but they should have considered the effect of the influential point. Without it, the linear correlation would probably be stronger. Alternatively, a different type of regression analysis should have been considered.