

## Chapter 2

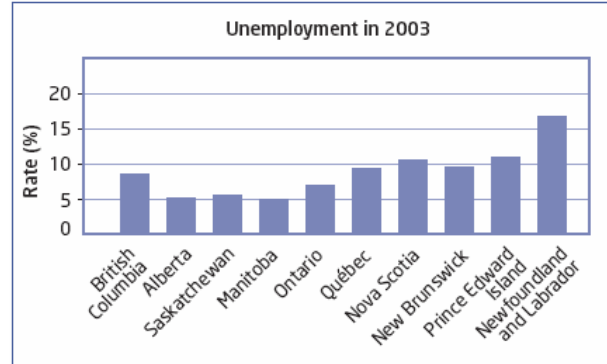
## Relations

### Chapter 2 Get Ready

#### Chapter 2 Get Ready

#### Question 1 Page 40

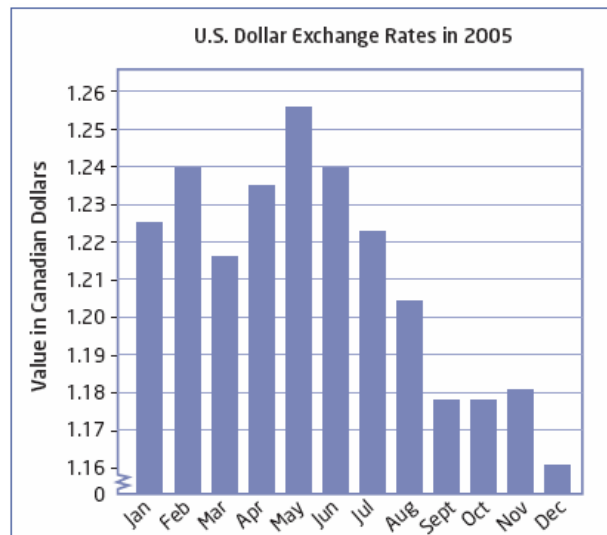
- a) The heights of the bars represent the unemployment rate, in percent, for each province in 2003.
- b) Newfoundland and Labrador has the greatest unemployment rate.
- c) The prairie provinces had the lowest unemployment rate. People had the best chance of finding work in 2003 in the prairie provinces.



#### Chapter 2 Get Ready

#### Question 2 Page 40

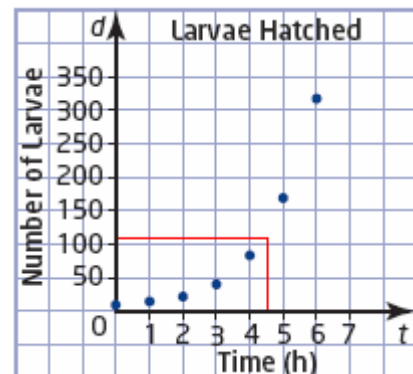
- a) The lowest value of the U.S. dollar shown on the graph is \$1.16 CDN, in December of 2005.
- b) The value of the U.S. dollar compared to the Canadian dollar was the greatest in May of 2005.
- c) The graph shows an overall downward trend in the value of the U.S. dollar compared to the Canadian dollar.



#### Chapter 2 Get Ready

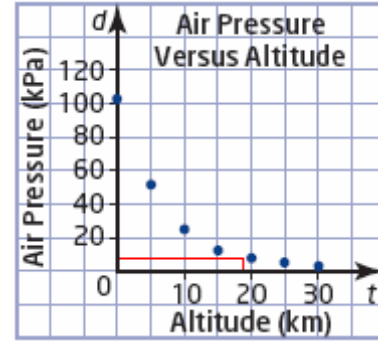
#### Question 3 Page 41

- a) The scatter plot is shown.
- b) After 4.5 h, about 110 larvae have hatched.



**Chapter 2 Get Ready      Question 4   Page 41**

- a) The scatter plot is shown.
- b) The air pressure at an altitude of 18 km is about 7.5 kPa.



**Chapter 2 Get Ready      Question 5   Page 41**

- a) The unit rate is  $\frac{42 \text{ pages}}{6 \text{ min}} = 7 \frac{\text{pages}}{\text{min}}$ .
- b) The unit rate is  $\frac{\$15}{5 \text{ kg}} = \$3/\text{kg}$ .
- c) The unit rate is  $\frac{880 \text{ km}}{11 \text{ h}} = 80 \text{ km/h}$ .

**Chapter 2 Get Ready      Question 6   Page 41**

- a) The unit rate is  $\frac{\$4.19}{750 \text{ g}} \doteq \$0.0056/\text{g}$ .
- b) The unit rate is  $\frac{500 \text{ mL}}{24 \text{ muffin}} \doteq 20.8 \frac{\text{mL}}{\text{muffin}}$ .
- c) The unit rate is  $\frac{5000 \text{ m}}{38.6 \text{ min}} \doteq 130 \text{ m/min}$ .

## Chapter 2 Section 1: Hypotheses and Sources of Data

### Chapter 2 Section 1                      Question 1    Page 45

- a) Most people's favourite number is not 7.
- b) Adults do not spend more time listening to classical music than rap. (Alternative: Adults spend either less time or as much time listening to classical music as they spend listening to rap.)
- c) In Ontario, the number of teenagers who join hockey teams is greater than or equal to the number who join soccer teams.
- d) Chocolate is the most popular flavour of ice cream.

### Chapter 2 Section 1                      Question 2    Page 45

Answers will vary. Sample answers are shown.

a) Hypothesis: Time spent doing homework increases as a student's age increases.

Opposite: Time spent doing homework does not increase as a student's age increases.

b) Hypothesis: Children tend to grow to the same height as their mothers.

Opposite: Children do not tend to grow to the same height as their mothers.

c) Hypothesis: As temperature increases, the crime rate also increases.

Opposite: As temperature increases, the crime rate decreases or remains constant.

d) Hypothesis: As the cost of gasoline increases, the number of people using public transit increases.

Opposite: As the cost of gasoline increases, the number of people using public transit decreases or stays the same.

### Chapter 2 Section 1                      Question 3    Page 45

- a) The data are primary; the office manager gathers the data.
- b) The data are secondary; the student uses data gathered by Statistics Canada.
- c) The data are primary; the researcher gathers the data.
- d) The data are secondary; the researcher uses data gathered by the transit authority.

**Chapter 2 Section 1****Question 4 Page 45**

Answers about advantages will vary. Sample answers are shown.

- a) The data are primary. Advantage: the data are up-to-date.
- b) The data are secondary. Advantage: Internet search is fast and easy.
- c) The data are primary. Advantage: the survey is getting opinions directly from customers.
- d) The data are primary. Advantage: the data are up-to-date.

**Chapter 2 Section 1****Question 5 Page 45**

Answers will vary. Sample answers are shown.

- a) Most students in the class prefer dogs as pets.
- b) Survey the class. Primary data are best since the population is small and secondary data may not be available.

**Chapter 2 Section 1****Question 6 Page 46**

- a) The data are primary. Steve gathered the data himself.
- b) Answers will vary. Sample answers are shown.

Brown-eyed students are shorter.

Blue is the least common eye colour.

- c) The hypotheses can be tested by surveying a larger sample of students.

Name	Eye Colour	Height (cm)
Josanth	brown	167
Fred	green	181
Graham	green	185
Cho	brown	171
Seth	blue	154
Jamal	green	183
Juan	brown	160
Cameron	blue	173

**Chapter 2 Section 1****Question 7 Page 46**

Answers will vary. Sample answers are shown.

- a) Hypothesis: Females make more phone calls than males.
- b) You can survey 50 females and 50 males to test your hypothesis with primary data.
- c) You can look for data on the Internet or in publications to test your hypothesis with secondary data.
- d) Secondary sources that survey larger samples are more likely to be accurate.

**Chapter 2 Section 1****Question 8 Page 46**

Answers will vary. Sample answers are shown.

- a) Hypothesis: Taller people perform better at the high jump.
- b) Heights of the athletes and how high the athletes can jump are the data needed to test the hypothesis. Primary data for the school team would be easy to collect. Secondary sources could survey a larger sample and yield more accurate results.

**Chapter 2 Section 1****Question 9 Page 46**

Answers will vary. Sample answers are shown.

- a) Hypothesis: The faster the computer, the more it will cost.
- b) Most popular computer vendors have Web sites. A search shows that faster computers do cost more.
- c) This is primary data if you collect prices from Web sites for individual suppliers. This is secondary data if you find price surveys with data gathered by someone else.
- d) You can also visit a computer store to research speeds and prices.

**Chapter 2 Section 1****Question 10 Page 46**

Answers will vary. Sample answers are shown.

- a) A cow produces 20-25 L of milk in a day.
- b) A cow eats 12-15 kg of hay in a day.
- c) If the information comes from visiting a dairy farm, it is primary data. If the data comes from a book or the Internet, it is secondary data.

**Chapter 2 Section 1****Question 11 Page 47**

Solutions for Achievement Checks are shown in the Teacher's Resource.

**Chapter 2 Section 1****Question 12 Page 47**

Answers will vary. Sample answers are shown.

- a) Hypothesis: The greater the latitude of a city, the lower the mean of its daily maximum temperatures in January.
- b) Available data shows that the hypothesis is generally true, if other factors such as ocean currents are not relevant.

**Chapter 2 Section 1****Question 13 Page 47**

Answers will vary.

**Chapter 2 Section 1****Question 14 Page 47**

If the mean is 6, then the sum of the numbers is  $6n$ . If 17 is added, the mean becomes 7, with  $n + 1$  numbers in the list. You are looking for a number  $n$  such that

$$\frac{6n + 17}{n + 1} = 7$$

Use the "guess and check" method to determine that  $n$  must equal 10.

**Chapter 2 Section 2 Sampling Principles**

**Chapter 2 Section 2 Question 1 Page 52**

- a) The population is all children.
- b) The population is all those who wrote the test.
- c) The population is all cars.
- d) The population is all food stores.

**Chapter 2 Section 2 Question 2 Page 52**

- a) The data required are the ages when girls and boys learn to walk. Use a sample, the population is very large.
- b) The data required are the test marks. Use a census, the population is small.
- c) The data required are the salaries of Canadian employees. Use a sample, the population is very large.
- d) The data required are people's heights and ages. Use a sample, the population is very large.
- e) The data required are the makes of the cars in the school parking lot. Use a census, the population is small.
- f) The data required are colours of cars driving by the school. Use a sample, the population is very large.

**Chapter 2 Section 2 Question 3 Page 52**

Answers will vary. Sample answers are shown.

- a) Survey every fourth customer who comes into the cafe.
- b) Randomly select 1% of the teenagers in every high school across Ontario.
- c) Use a random number generator to select telephone numbers within Canada, and then survey the people who identify themselves as bilingual.
- d) Select households to survey by any random method, and then ask the people surveyed where they were born.

**Chapter 2 Section 2**

**Question 4 Page 53**

- a) This is a non-random sample. It could be biased since University of Waterloo students may not be representative of all university graduates.
- b) This is a simple random sample. It could be biased, since the sample excludes anyone who does not have a telephone listing.
- c) This is a non-random sample. It is biased because it includes only people who have chosen to spend some of their free time going to a movie.
- d) This is a systematic random sampling.

**Chapter 2 Section 2**

**Question 5 Page 53**

Answers may vary. Sample answers are shown.

You can group the students by age, by grade level, or by gender.

**Chapter 2 Section 2**

**Question 6 Page 53**

- a) The population is all farmers in Ontario.
- b) Answers will vary. A sample answer is shown.

Use a random number generator to randomly select 10% of the farmers in each county.

**Chapter 2 Section 2**

**Question 7 Page 53**

- a) The population is all employees of the company.
- b) Answers may vary. A sample answer is shown.

Use a random number generator to randomly select a starting point on an alphabetical list of the employees. Then, select every sixth person until you have a total of 50.

**Chapter 2 Section 2**

**Question 8 Page 53**

- a) The population includes all members of the school teams.
- b) Answers will vary. A sample answer is shown.

Write each team member's name on a slip of paper. Then, randomly draw 15% of the slips out of a box.



**Chapter 2 Section 2**

**Question 9 Page 53**

The population of the school is 1216 students.

$$\begin{aligned} \text{Number of Grade 9 Students} &= \frac{330}{1216} \times 150 \\ &\doteq 41 \end{aligned}$$

$$\begin{aligned} \text{Number of Grade 10 Students} &= \frac{308}{1216} \times 150 \\ &\doteq 38 \end{aligned}$$

$$\begin{aligned} \text{Number of Grade 11 Students} &= \frac{295}{1216} \times 150 \\ &\doteq 36 \end{aligned}$$

$$\begin{aligned} \text{Number of Grade 12 Students} &= \frac{283}{1216} \times 150 \\ &\doteq 35 \end{aligned}$$

Grade	Number of Students
9	330
10	308
11	295
12	283

**Chapter 2 Section 2**

**Question 10 Page 54**

a) Use the command `randInt(12,36,25)`. The first number is the lower limit, the second number is the upper limit, and the third number is the number of random integers desired.

b) Enter `randInt(1,500,40)`. If any numbers are repeated, change the command to generate more random numbers and use the first 40 that are not duplicates.

c) Enter `randInt(100,1000,75)`. Increase 75 to 100 or more if some numbers are repeated.

```
MATH NUM CPX 1235
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
```

```
randInt(1,10,20)
(10 10 2 6 5 8 ...
```

**Chapter 2 Section 2**

**Question 11 Page 54**

a) The sample is not completely random. Students at small schools have a greater chance of being selected than students at large schools.

b) The results are biased. The sample is likely to have a greater proportion of students from small schools than the population does.

**Chapter 2 Section 2****Question 12 Page 54**

Answers for sampling methods will vary. Sample answers are shown.

- a) The population is all students in the school. Obtain a list of students. Use a random number generator to select a starting point. Select every 10th student.
- b) The population is all people in the community. Obtain a list of residents. Use a random number generator to select a starting point. Select every 50th resident.
- c) The population is all people aged 18 to 30. Use a random number generator to generate telephone numbers across the country. Survey those who identify themselves as between the ages of 18 and 30.
- d) The population is all senior citizens in Ontario. Use a random number generator to generate telephone numbers across Ontario. Survey those who identify themselves as senior citizens.
- e) The population is all computer printers for sale in Canada. Search retailers on the Internet to assemble a list of all printers sold in Canada. Purchase one of each kind for testing.
- f) The population is gasoline prices at all vendors in the community. Use a telephone book to find addresses for all gasoline retailers in the community. Call or visit each one to generate a list of prices.

**Chapter 2 Section 2****Question 13 Page 54**

The sample is representative only of people who browse the site and are willing to fill out the form. The sample excludes anyone who does not have Internet access or the inclination to complete the survey.

**Chapter 2 Section 2****Question 14 Page 54**

a) In the 1920s, many people did not have telephones. Since these people were not included in the surveys, the samples were not representative of the whole population.

b) Answers will vary. Sample answers are shown.

People with more than one telephone number have a greater chance of being selected.

People refusing to answer telephone surveys may make the sample unrepresentative of certain groups.

Deaf people will be left out of the sample.

**Chapter 2 Section 2                      Question 15   Page 55**

Answers will vary.

**Chapter 2 Section 2                      Question 16   Page 55**

Answers will vary.

**Chapter 2 Section 2                      Question 17   Page 55**

Answers will vary. Sample answers are shown.

Poorly designed questions can influence the answers that respondents will give.

People may give false answers to questions they feel uncomfortable with.

**Chapter 2 Section 2                      Question 18   Page 55**

Answers will vary. Sample answers are shown.

- a) Assign each tree a number and use a random number generator to choose 10% of the trees.
- b) Divide the park into sections with similar numbers of trees, and randomly select 10% from each section.
- c) Assign each tree a number. Randomly select a starting point, and then select every tenth number before and after the starting number.
- d) Sample the 10% of the trees closest to roads.

Any of the random samples will test trees throughout the park. However, the forester could choose a non-random sample with a larger proportion of the hardwood trees that the beetle attacks most often.

**Chapter 2 Section 2                      Question 19   Page 55**

a) Answers will vary. Sample answers are shown.

You can interview sports fans at a sports venue such as an arena or ball park.

You can interview classmates.

b) Convenience samples are not truly random because every member of the population does not have an equal chance of being selected. Interviewing sports fans at a sports venue excludes members of the population who are not interested in sports or do not attend live events. Interviewing classmates excludes members of the population who are not in the class.

Since the required number is odd, the last digit must be a 1, 3, 5, or 7. For each of the 4 choices of last digit, there are 6 choices for the middle digit and 5 choices for the first digit. The number of odd three-digit numbers possible is  $4 \times 6 \times 5 = 120$ .

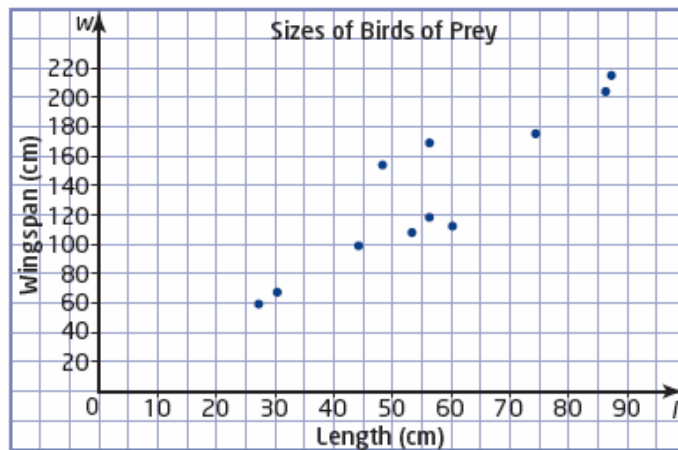
### Chapter 2 Section 3 Use Scatter Plots to Analyse Data

#### Chapter 2 Section 3 Question 1 Page 64

- a) independent variable: physical fitness  
dependent variable: blood pressure
- b) independent variable: level of education  
dependent variable: income
- c) independent variable: load in an airplane  
dependent variable: length of runway needed for take off

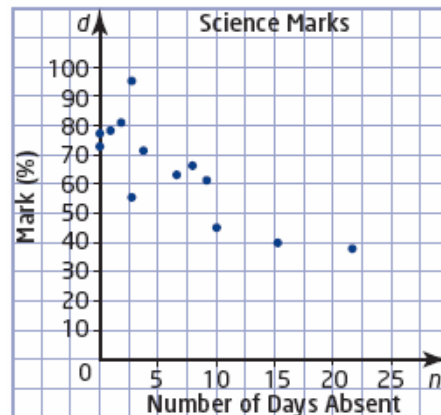
#### Chapter 2 Section 3 Question 2 Page 64

- a) To show wingspan as the independent variable, move it to the horizontal axis.
- b) As the length increases, the wingspan increases.



#### Chapter 2 Section 3 Question 3 Page 64

- a) independent variable: number of days absent  
dependent variable: science mark.
- Marks depend on attendance, rather than attendance depending on marks.
- b) The scatter plot is shown.
- c) As the number of days absent increases, the marks generally decrease.
- d) The point (3, 95) lies somewhat apart from the rest of the data. It can be considered as an outlier.



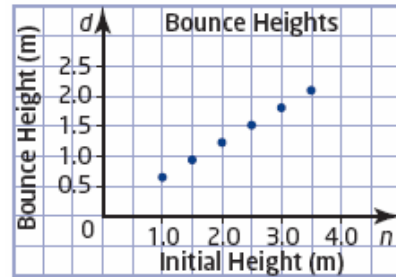
**Chapter 2 Section 3**

**Question 4 Page 65**

- a) independent variable: initial height  
 dependent variable: bounce height

The bounce height depends on the initial height, rather than the initial height depending on the bounce height.

- b) The scatter plot is shown.



- c) As the initial height increases, so does the bounce height.

- d) The point (4.00, 1.62) is an outlier. It should be discarded only for a valid reason, such as a measurement error. Repeat the measurement several times to determine whether this is a measurement error.

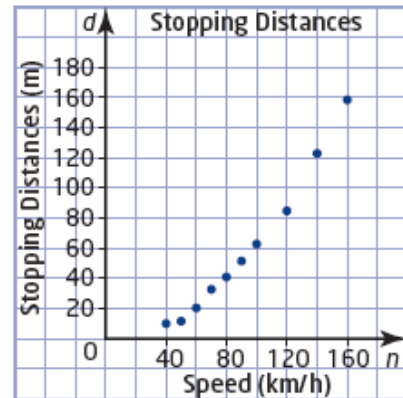
**Chapter 2 Section 3**

**Question 5 Page 65**

- a) The scatter plot is shown.

- b) As the speed of a car increases, the stopping distance increases. The pattern is non-linear.

- c) A car travelling at 85 km/h needs 46 m to stop. The point is not an outlier since it follows the pattern of the other data



**Chapter 2 Section 3**

**Question 6 Page 65**

Answers will vary. Sample answers are shown.

- a) Hypothesis: As a person's height increases, so does the shoulder width.  
 b) Select a sample of persons of varying heights. Measure height and shoulder width.  
 c) Display your results in a scatter plot, and draw your conclusion.  
 d) To improve the accuracy of measurements; use a larger sample.

**Chapter 2 Section 3**

**Question 7 Page 66**

Answers will vary. Sample answers are shown.

a) Select a sample of athletes. Measure each athlete's height and the maximum height he or she can jump.

b) The independent variable is the height.

The dependent variable is the jump height.

c) If the hypothesis is true, then the points on the scatter plot will follow a line or curve that rises to the right.

**Chapter 2 Section 3**

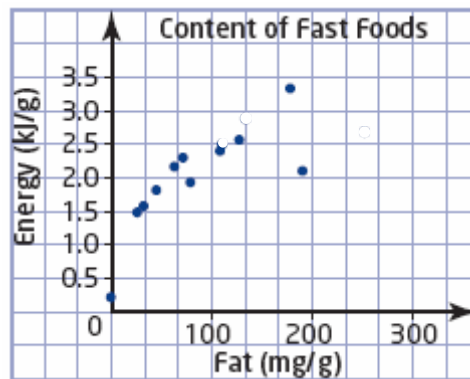
**Question 8 Page 66**

a) Divide the amount of fat in milligrams by the serving size in grams to obtain the amount of fat per gram.

Divide the energy in kJ by the serving size in grams to obtain the energy per gram.

Item	Fat (mg/g)	Energy (kJ/g)
Harvey's Original Hamburger	127	2.6
Harvey's Veggie Burger	63	2.2
Mr. Submarine Small Assorted Sub	34	1.6
Mr. Submarine Small Vegetarian Sub	26	1.5
Pizza Pizza Pepperoni Slice (walk-in)	69	2.3
Pizza Pizza Vegetarian Slice (walk-in)	43	1.8
KFC Chicken Breast	118	2.4
KFC Popcorn Chicken	184	3.3
Swiss Chalet Quarter Chicken Breast	75	1.9
Swiss Chalet Garden Salad, undressed	0	0.2
Swiss Chalet Caesar Salad	188	2.1

b) The scatter plot is shown.



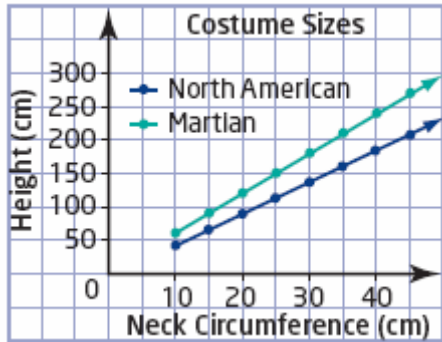
c) The point for Caesar Salad is an outlier due to its high fat content. Nonetheless, this point represents valid data that should not be discarded.

d) Answers will vary. A sample answer is shown.

The scatter plot shows that some fast foods can have a high energy content without a high fat content.

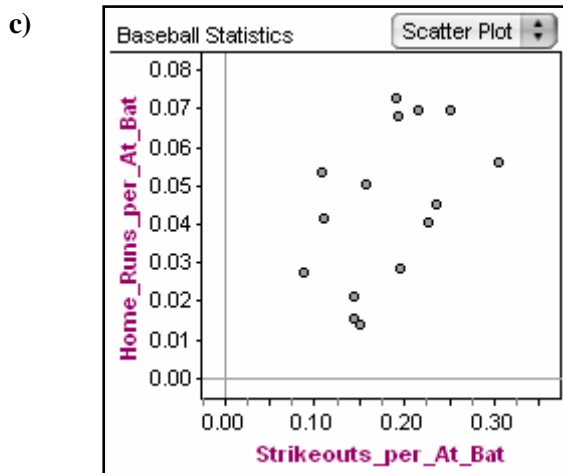
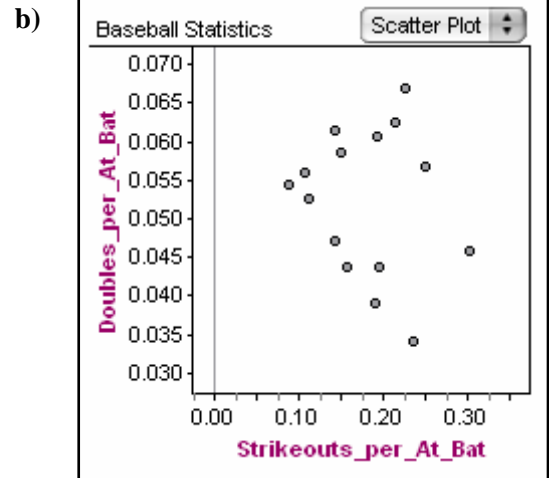
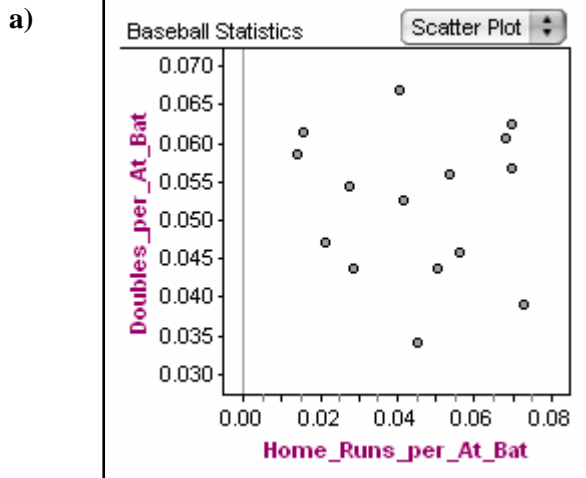
**Chapter 2 Section 3**

**Question 9 Page 67**





Divide each statistic by the number of times at bat to obtain the rates. Click [here](#) to load the Fathom® file.



d) Home runs per at bat seem to increase somewhat as the number of strikeouts per at bat increases. The other two scatter plots do not show any relationship between the variables.

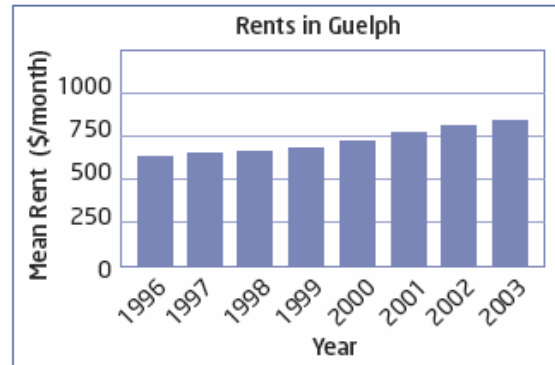
To keep the value of the expression as small as possible, use the smallest numbers for the numerators, and the largest numbers for the denominators. Use "guess and check" to determine which arrangement yields the smallest value for the expression.

$$\begin{aligned}\frac{1}{4} + \frac{2}{5} + \frac{3}{6} &= \frac{15}{60} + \frac{24}{60} + \frac{30}{60} \\ &= \frac{69}{60} \\ &= 1\frac{3}{20}\end{aligned}$$

## Chapter 2 Section 4 Trends, Interpolation, and Extrapolation

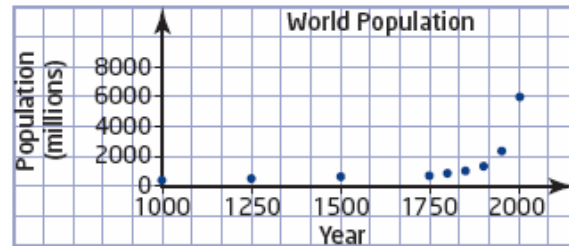
### Chapter 2 Section 4 Question 1 Page 73

- a) The bar graph is shown.
- b) The bar graph shows a rising trend in rents.
- c) Over 7 years, the mean rent increased by \$165. A reasonable estimate for the mean rent in another 7 years is  $823 + 165 = \$988$ .



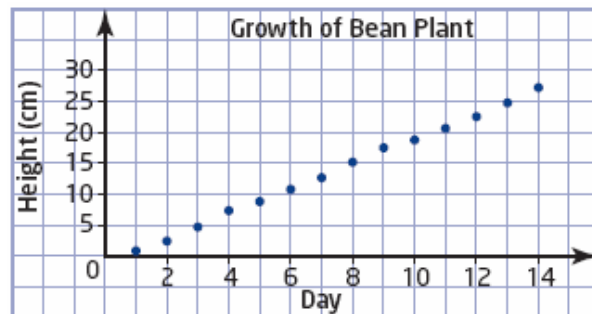
### Chapter 2 Section 4 Question 2 Page 73

- a) The scatter plot is shown.
- b) The world population is growing much more quickly now than in the past.
- c) The graph shows an increasing rate of growth. It does not predict that the world population will stabilize at about 10 billion people around the year 2200.



### Chapter 2 Section 4 Question 3 Page 73

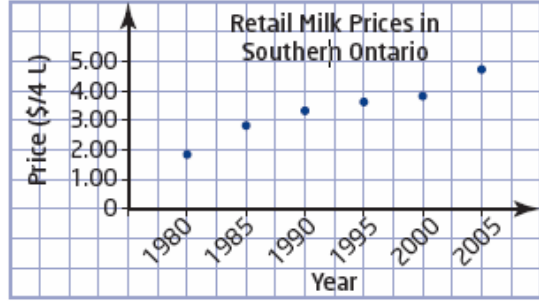
- a) The scatter plot is shown.
- b) The height is increasing at a nearly constant rate.
- c) In future weeks, the height will increase at a slower rate as the plant matures, and reach a maximum height.



Chapter 2 Section 4

Question 4 Page 73

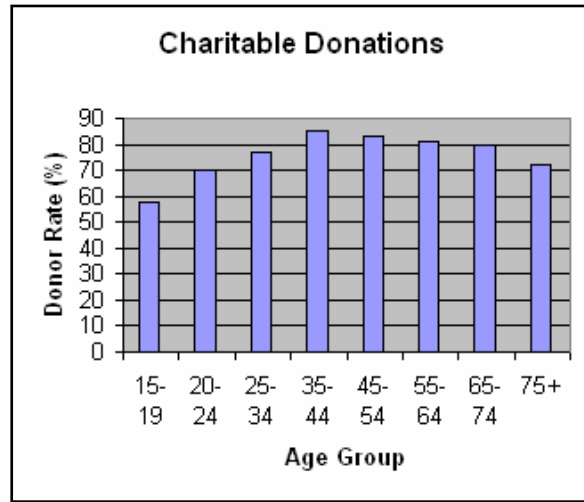
- a) The scatter plot is shown.
- b) Milk prices increased over each 5-year period, but not at a constant rate.
- c) The price in 1995 was about \$3.60, and the price in 2000 was about \$3.80. A reasonable estimate for the price in 1998 is about \$3.69.
- d) From 1980 to 2000, the price of milk went from about \$2.00 to about \$4.00. A reasonable estimate for a price of \$6.00 is another 20 years, or about 2020, assuming prices increase at the same overall rate.



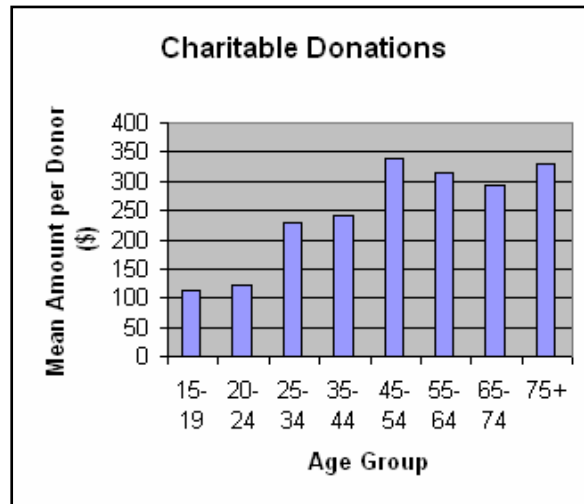
Chapter 2 Section 4

Question 5 Page 74

- a) The bar graph is shown. The donation rate increases up to the 35 – 44 age group, and then decreases.



- b) The bar graph is shown. Donation amounts increase with age up to the 45 – 54 interval, then decrease, and then increase again for the 75+ interval. Donation amounts are greater for people over 44 than for younger people.
- c) Both graphs rise to a maximum for middle-aged people, then decrease somewhat. However, the donation amount rises again in the 75+ interval while the donor rate continues to decrease.

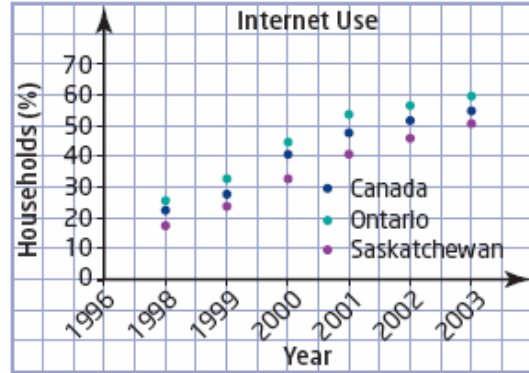


Chapter 2 Section 4

Question 6 Page 74

a) The graph is shown. Internet use increased each year, with the national rate being about halfway between the rate in Ontario and the rate in Saskatchewan.

b) From 1998 to 2003, Internet use in Canada increased from about 23% to 55%, or about 6% per year. A reasonable estimate for the usage in 2005 is  $55\% + 12\%$ , or 67%, assuming that the same rate of growth continues.



Chapter 2 Section 4

Question 7 Page 75

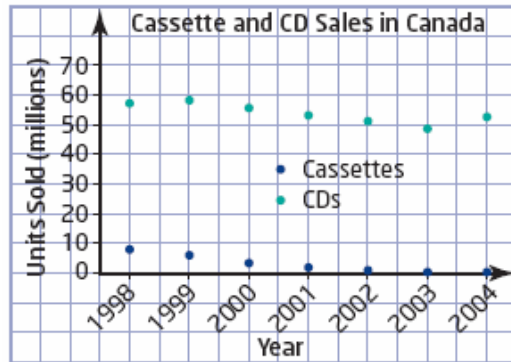
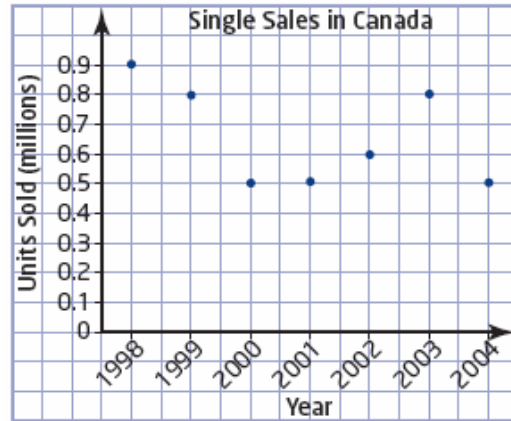
a) The graphs are shown. Overall, sales of singles show a downward trend. Sales of cassettes show a clear downward trend, while sales of CDs show a moderate downward trend.

b) Answers will vary. Sample answers are shown.

Singles will sell 0.5 million in 2005.

Cassettes will sell 0.05 million in 2005.

CDs will sell 55 million in 2005.



**Chapter 2 Section 4**

**Question 8 Page 75**

Solutions for Achievement Checks are shown in the Teacher's Resource.

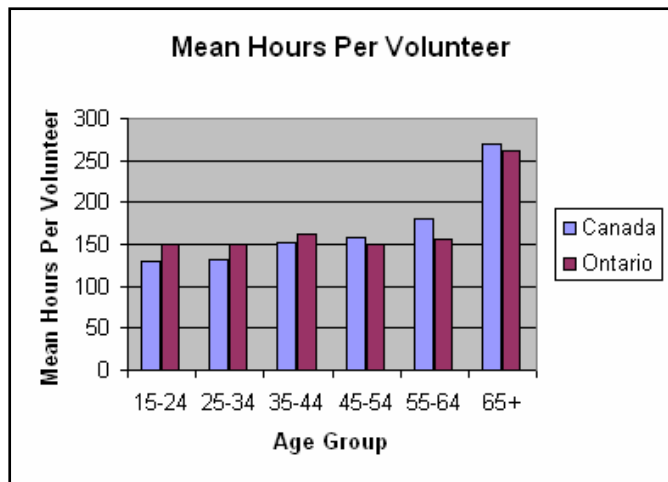
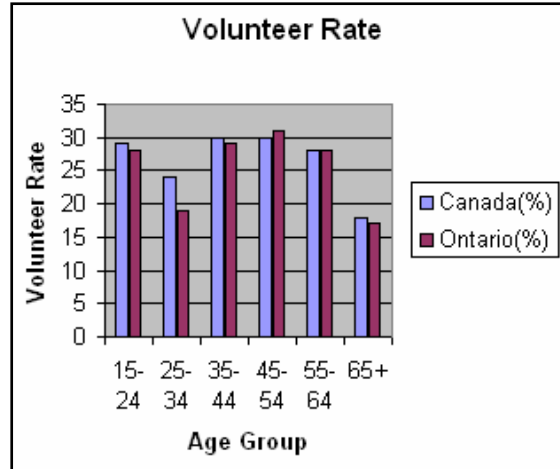
**Chapter 2 Section 4**

**Question 9 Page 76**

a) Graphs are shown. The volunteer rate in Ontario is about the same as for all Canadians except in the age group 25-34, when 5% fewer Ontarians volunteer.

b) The age group 45-54 has the greatest volunteer rate. People in this age range may have more free time.

c) As age increases, the hours per volunteer across Canada also increase, especially beyond the age of 65. Most people over 65 are retired and could have more time to volunteer.



**Chapter 2 Section 4**

**Question 10 Page 76**

Answers will vary.

**Chapter 2 Section 4**

**Question 11 Page 76**

Try each answer. Answer B works.

At noon there are 40 girls in the room. If 15 leave, there are 25 left. Therefore, there are 50 boys in the room. If 45 boys leave, there are 5 boys left. The ratio of girls to boys is 25:5 or 5:1, as required.

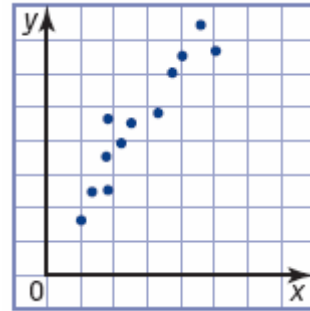
Let the first day be a Saturday. Saturdays will occur on the following days:

1, 8, 15, 22, 29, 36, 43, 50, 57, 64, 71, 78, 85, 92, and 99. There are 15 Saturdays.

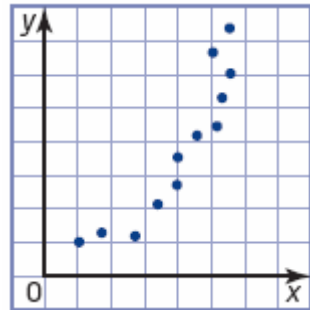
**Chapter 2 Section 5 Linear and Non-Linear Relations**

**Chapter 2 Section 5 Question 1 Page 83**

a) This graph appears to be linear. The points lie along a straight line.

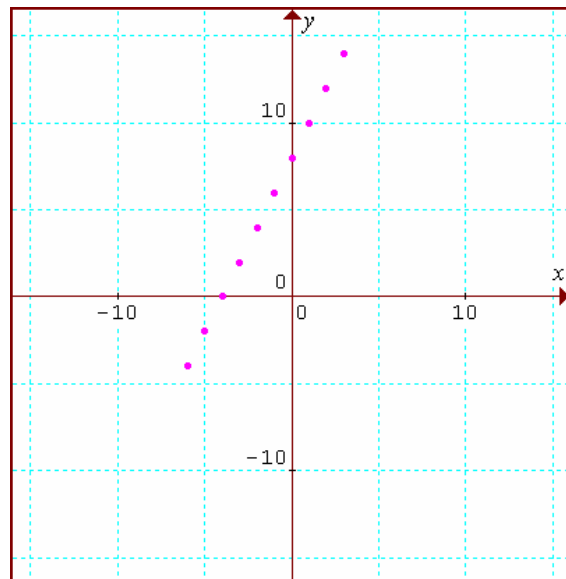


b) This graph does not appear to be linear. The points curve upwards.



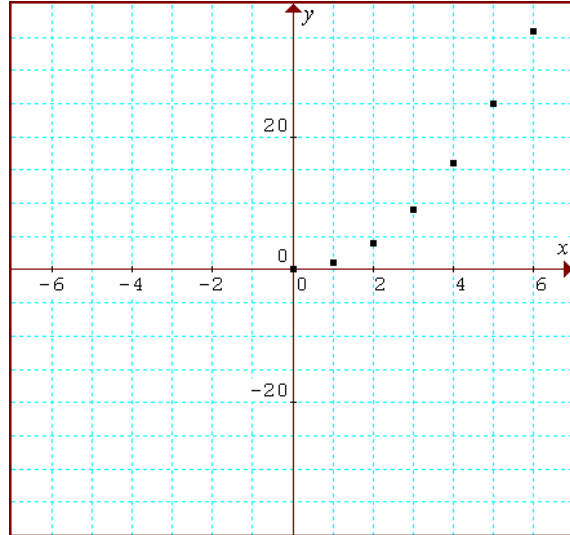
**Chapter 2 Section 5 Question 2 Page 83**

a) The relationship is linear. The points lie along a straight line.





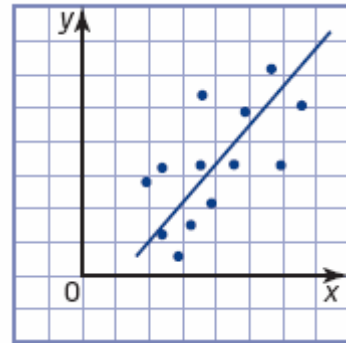
b) The relationship is non-linear. The points do not lie along a straight line.



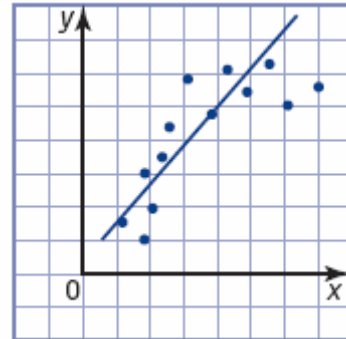
Chapter 2 Section 5

Question 3 Page 84

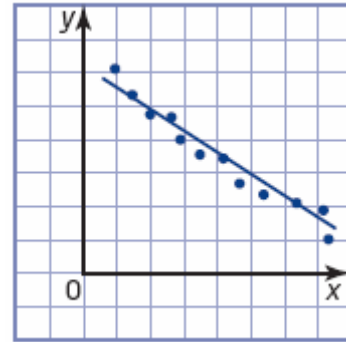
a) The line of best fit is a good model for the data. The points lie reasonably close to a straight line.



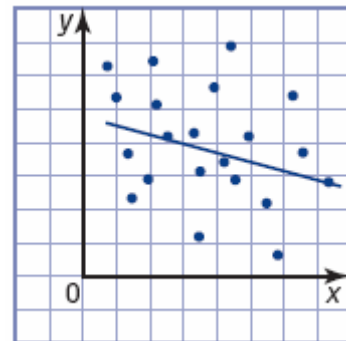
b) The line of best fit is not a good model for the data. The points seem to follow a curve to the right.



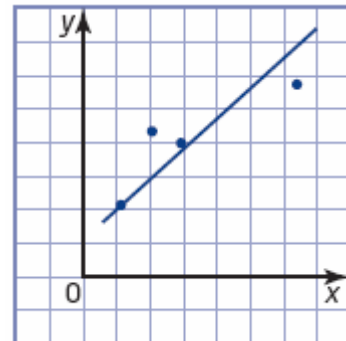
c) The line of best fit is a good model for the data. The points lie close to a straight line.



d) The line of best fit is not a good model for the data. The points do not seem to follow a pattern at all.



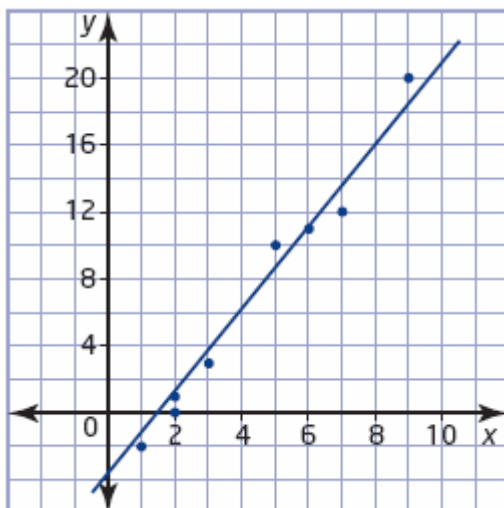
e) The line of best fit is not a good model for the data. There are too few points to determine a definite pattern.



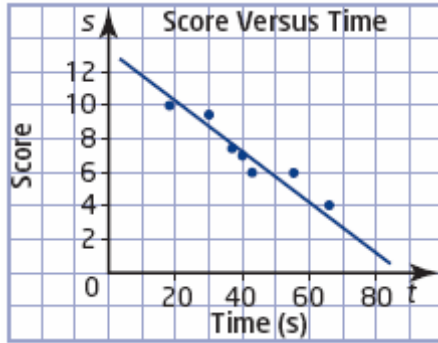
Chapter 2 Section 5

Question 4 Page 84

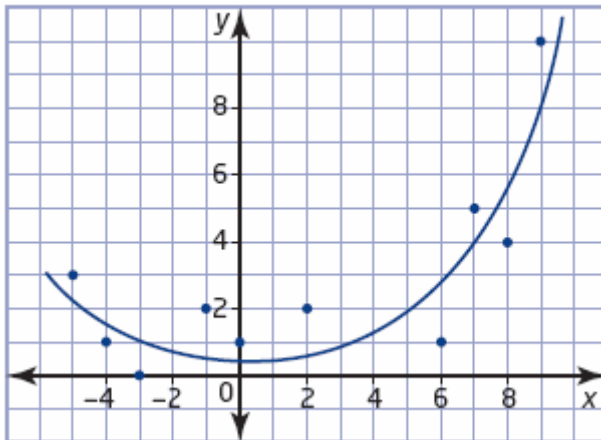
a)



b)



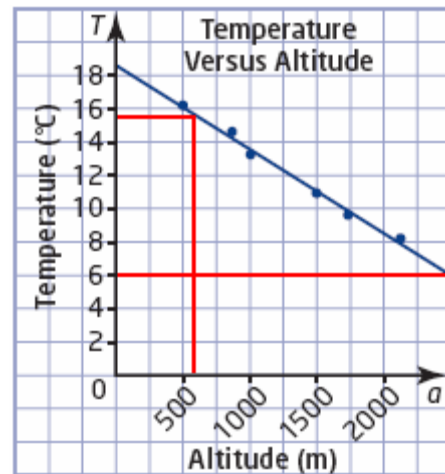
c)



Chapter 2 Section 5

Question 5 Page 85

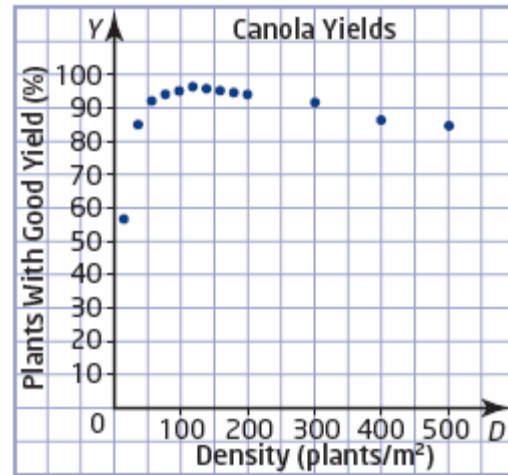
- a) The scatter plot is shown.
- b) The relation is linear. The line of best fit is shown.
- c) The temperature at an altitude of 600 m is about  $15.5^{\circ}\text{C}$ .
- d) The temperature at an altitude of 2500 m is about  $6.0^{\circ}\text{C}$ .



Chapter 2 Section 5

Question 6 Page 85

- a) The scatter plot is shown.
- b) The yield rises steeply at first, levels off to a maximum around 120 plants/m<sup>2</sup>, and then decreases slowly. The relation is non-linear.
- c) A line of best fit is not a good model for the data. The points do not lie along a straight line. They follow a curve.
- d) Answers will vary. Sample answers are shown.



As plant density increases, weeds are crowded out.

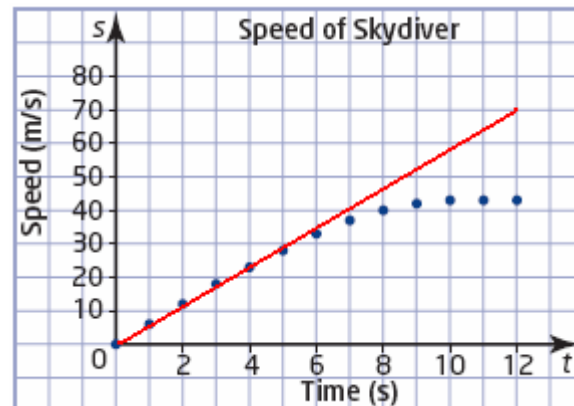
If plant density increases too much, water and nutrients in the soil are shared by too many plants.

As plant density increases, cross-pollination becomes more likely.

Chapter 2 Section 5

Question 7 Page 85

- a) The graph is shown.
- b) The extrapolation is shown. If the trend continues, the speed after 12 s of free fall is about 70 m/s.
- c) See the graph in part a).
- d) Air resistance increases with speed. The speed increases only until the air resistance offsets the acceleration due to gravity.
- e) Extrapolations can be inaccurate because the relationship between the variables may change beyond the range of the data.



**Chapter 2 Section 5****Question 8 Page 86**

Answers will vary. Sample answers are shown.

- a) The purpose could be to investigate how a person's heart rate changes immediately after exercise.
- b) It is reasonable to expect that a person's heart rate will decrease steadily in the time immediately after vigorous exercise.
- c) Answers will vary.
- d) Answers will vary.
- e) Answers will vary.
- f) Answers will vary.

**Chapter 2 Section 5****Question 9 Page 86**

Answers will vary. Use a cylinder not much wider than a penny to maximize the effect of dropping the penny into the water. You may have to use multiple numbers of pennies on each drop in order to see a reasonable change in the height. The relationship should be linear.

**Chapter 2 Section 5****Question 10 Page 86**

Solutions for the Achievement Checks are shown in the Teacher's Resource.

**Chapter 2 Section 5****Question 11 Page 87**

- a) Note that the  $t$  values increase at a constant rate. Check the corresponding  $d$  values. They also increase at a constant rate of 5. The relation is linear.
- b) Note that the  $t$  values increase at a constant rate. Check the corresponding  $h$  values. They do not change at a constant rate. The relation is non-linear.

**Chapter 2 Section 5****Question 12 Page 87**

There is a non-linear relation between the gauge reading and the volume of fuel in the tank. The eighths at the low end of the gauge correspond to less fuel than the eighths at the "full" end of the gauge. The gauge measures the "depth" of the fuel in the tank. Since most fuel tanks curve at the bottom, there is less fuel at the bottom of the tank than at the top.

**Chapter 2 Section 5****Question 13 Page 87**

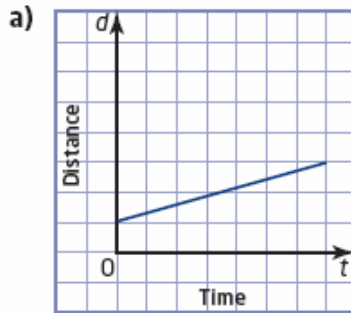
Inspect expression D. The denominator is always one larger than the numerator. The value of the fraction will always be less than 1, regardless of the value of  $n$ .

Since the required number is even, the last digit must be a 2, 4, or 6. For each of the 3 choices of last digit, there are 5 choices for the middle digit and 4 choices for the first digit. The number of even three-digit numbers possible is  $3 \times 5 \times 4 = 60$ .

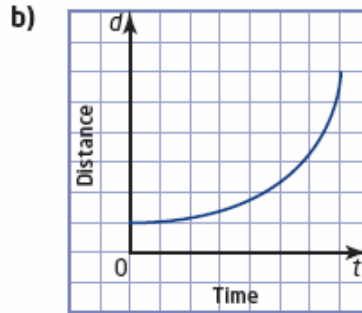
Chapter 2 Section 6 Distance-Time Graphs

Chapter 2 Section 6 Question 1 Page 91

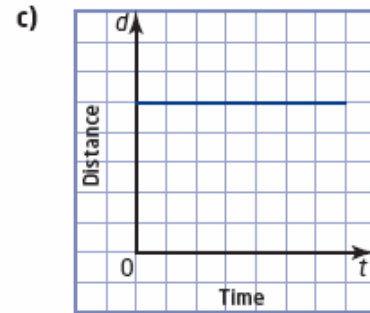
Answers may vary. Sample answers are shown.



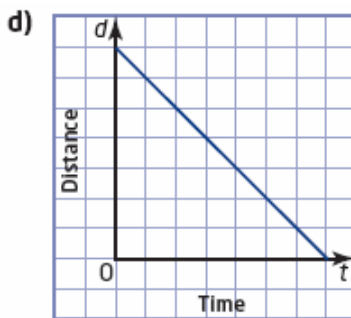
A car is moving away at a constant speed.



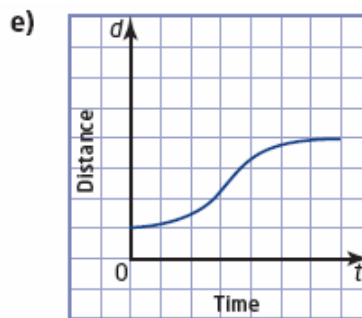
A car is moving away at increasing speed.



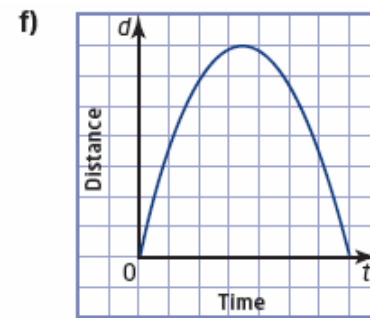
A car is parked, not moving.



A car is moving closer at a constant speed.



A car is moving away at increasing speed, then slowing down and stopping.



A car is moving away at decreasing speed, stopping for a moment, then coming back with increasing speed.

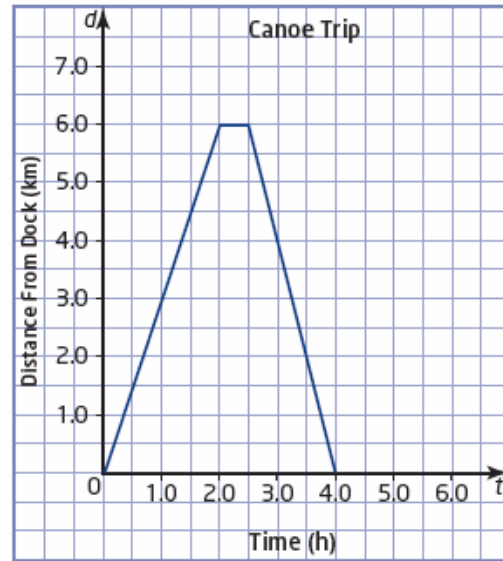
Chapter 2 Section 6 Question 2 Page 91

Graphs a), c), and d) from question 1 show linear relations. The graphs are straight lines.

Chapter 2 Section 6

Question 3 Page 92

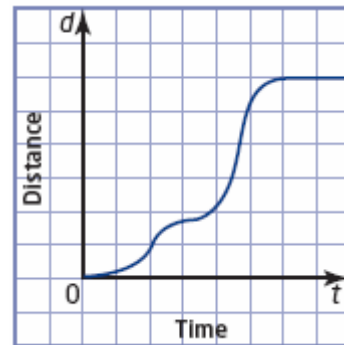
- a) The trip took 4.0 h.
- b) The distance to the end of the lake is 6.0 km.
- c) The flat portion of the graph represents time that the canoeist rested at the end of the lake.
- d) It took 2.0 h to reach the end of the lake, but only 1.5 h to come back. The canoeist was travelling faster on the way back.



Chapter 2 Section 6

Question 4 Page 92

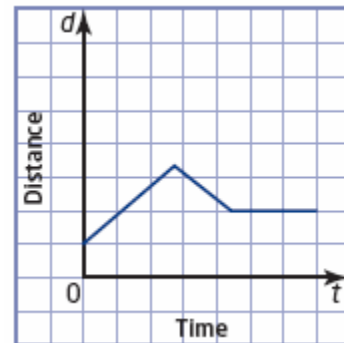
After starting out, the cyclist increases her speed, then slows down. Then she travels a bit faster than before, then slows down and stops.



Chapter 2 Section 6

Question 5 Page 92

- a) Move away from the wall at a constant speed, then reverse direction and walk back toward the wall at the same speed, but stop before you reach your starting position.
- b) If you walked fast, the sloped line segments would be steeper.
- c) If you walked slower, the sloped line segments would be less steep.
- d) If you stopped sooner, the middle segment would be shorter and the horizontal segment would be higher.





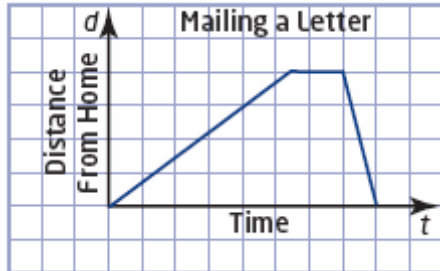
Chapter 2 Section 6

Question 6 Page 93

Answers will vary.

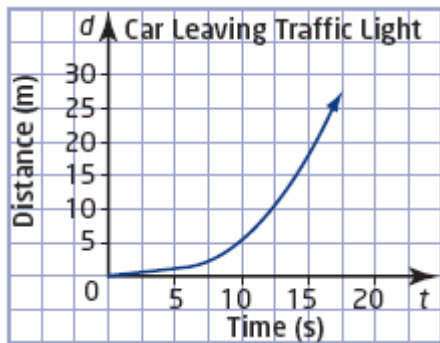
Chapter 2 Section 6

Question 7 Page 93



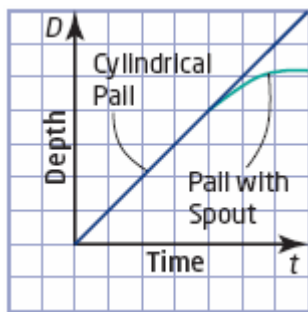
Chapter 2 Section 6

Question 8 Page 93



Chapter 2 Section 6

Question 9 Page 93



Chapter 2 Section 6

Question 10 Page 93

Answers will vary.

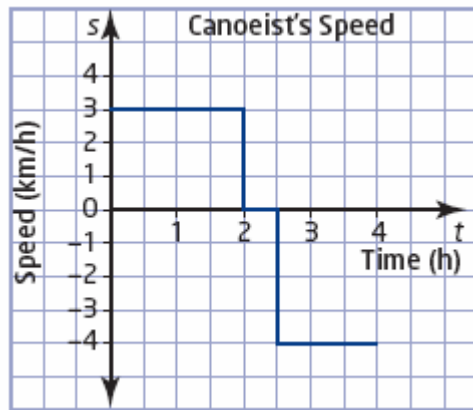
a)

$$\begin{aligned}\text{First segment } v &= \frac{6.0 \text{ km}}{2.0 \text{ h}} \\ &= 3 \text{ km/h}\end{aligned}$$

$$\begin{aligned}\text{Second segment } v &= \frac{0.0 \text{ km}}{2.0 \text{ h}} \\ &= 0 \text{ km/h}\end{aligned}$$

$$\begin{aligned}\text{Third segment } v &= \frac{6.0 \text{ km}}{1.5 \text{ h}} \\ &= 4 \text{ km/h}\end{aligned}$$

b)



c) The steeper the graph, the faster the canoeist is paddling.

d) Negative speed indicates the rate at which the canoeist is returning to the dock.

d) The horizontal axis represents time. The vertical axis represents the distance from the CBR™ to the ball.

e) The relation between distance and time is not linear. The points do not lie on a straight line.

l) The relation between time and bounce height is linear. The points lie along a straight line.

**Chapter 2 Section 6****Question 13 Page 94**

Answers will vary.

**Chapter 2 Section 6****Question 14 Page 94**

Use a table to help you with the "guess and check" method. A calculator or spreadsheet can also be used. Click [here](#) to load the spreadsheet file.

Shaheen was born in 1979, and was 26 on her birthday in 2005.

Year	Age	Sum of Digits
2005	0	7
2004	1	6
2003	2	5
2002	3	4
2001	4	3
2000	5	2
1999	6	28
1998	7	27
1997	8	26
1996	9	25
1995	10	24
1994	11	23
1993	12	22
1992	13	21
1991	14	20
1990	15	19
1989	16	27
1988	17	26
1987	18	25
1986	19	24
1985	20	23
1984	21	22
1983	22	21
1982	23	20
1981	24	19
1980	25	18
1979	26	26
1978	27	25
1977	28	24
1976	29	23
1975	30	22
1974	31	21

## Chapter 2 Review

### Chapter 2 Review

### Question 1 Page 95

Answers will vary. Sample answers are shown.

a) Hypothesis: As the temperature in a town during the summer increases, so does the volume of water used by the town's residents.

Opposite: As the temperature in a town during the summer increases, the volume of water used by the town's residents does not increase.

b) Hypothesis: Taller people have higher marks in mathematics.

Opposite: Taller people do not have higher marks in mathematics.

### Chapter 2 Review

### Question 2 Page 95

a) This is primary data. This is a good choice, since a survey of students at the school could give more accurate results than secondary data would.

b) This is secondary data. This is a good choice, since primary data could take a lot of time to collect, and would not likely be significantly more accurate.

c) This is secondary data. This may not be a good choice, since the encyclopedia might not give information on bears in a specific province.

d) This is secondary data. This is not a good choice. The source of data is convenient, but may not reflect the tastes of students at the school.

### Chapter 2 Review

### Question 3 Page 95

a) The population is all students at the school.

b) Answers will vary. A sample answer is shown.

Use a random number generator to randomly select 25% of the students from the class lists for each grade.

### Chapter 2 Review

### Question 4 Page 95

a) The population is all passengers that fly on the airline.

b) Answers will vary. A sample answer is shown.

Obtain a list of all passengers who have flown on the airline. Randomly select one name on the list of the airline's passengers, and then select every hundredth person before and after that name.

**Chapter 2 Review**

**Question 5 Page 95**

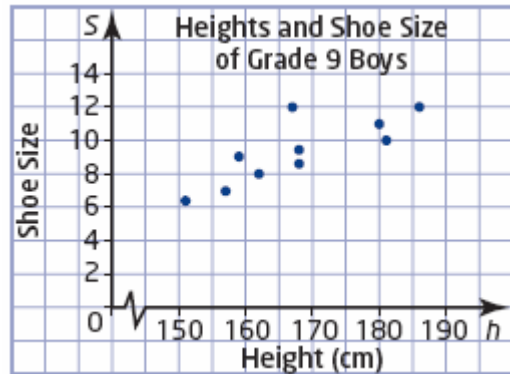
Answers for sampling techniques will vary. Sample answers are shown.

- a) The population is all customers of the department store. The store can pick a customer at random, and then every 10th customer entering the store, to survey.
- b) The population is all campers at provincial parks. Park rangers at each park can survey every 10th camper who registers.
- c) The population is all students at the school. The librarian can use a random number generator to generate 50 random numbers between 1 and the population of the school. Then, he can use the numbers to select students from a school listing to survey.

**Chapter 2 Review**

**Question 6 Page 95**

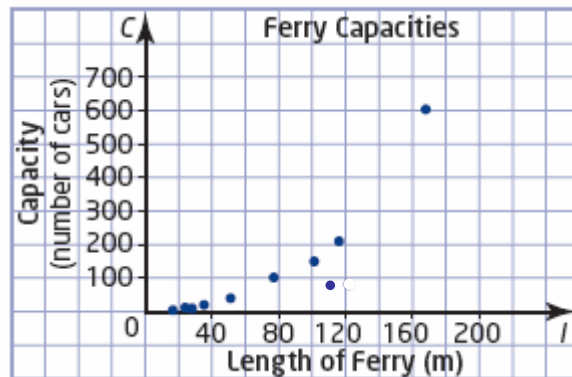
- a) The scatter plot is shown.
- b) As the students' heights increase, so do their shoe sizes.
- c) (167, 12) is an outlier, but should not be discarded since it is a valid measurement, unless there is some reason to believe that the measurement was made in error.



**Chapter 2 Review**

**Question 7 Page 96**

- a) The scatter plot is shown.
- b) As the length of the ferry increases, the capacity also increases. The points follow a curve, so the relationship is non-linear.
- c) The point (110.8, 80) is an outlier.



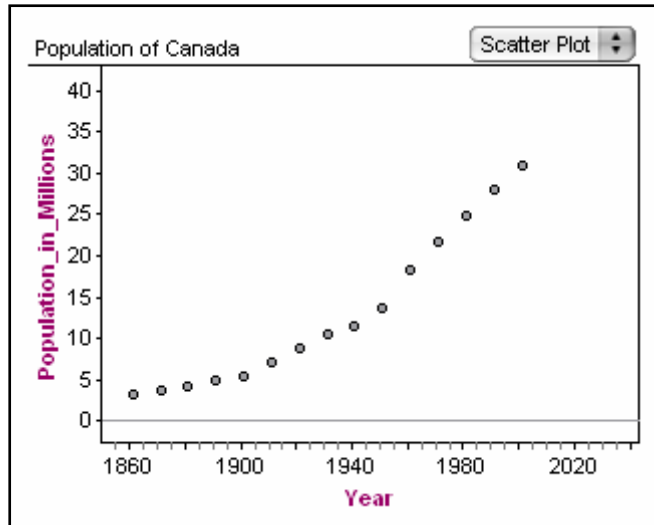
Answers about causes may vary. Sample answers are shown.

The ferry might carry cargo as well as cars.  
The ferry might carry fewer cars so that it can travel faster.  
Some ferries derive most of their business from passengers, and may have few spaces for cars.

**Chapter 2 Review**

**Question 8 Page 96**

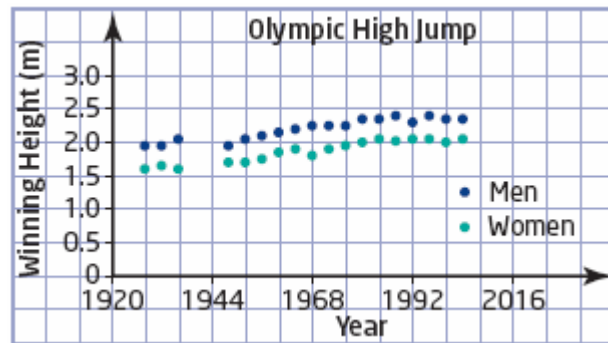
- a) The scatter plot is shown.
- b) The population of Canada has grown at an increasing rate since 1861.
- c) The population in 1967 was about 20 million.
- d) The population in 2021 will be about 34 million.



**Chapter 2 Review**

**Question 9 Page 96**

- a)
- b) Both the men's and women's winning heights are increasing, but the rate of increase has been slower since about 1980.
- c) There are no apparent outliers.
- d) Answers will vary. Sample answers are shown.

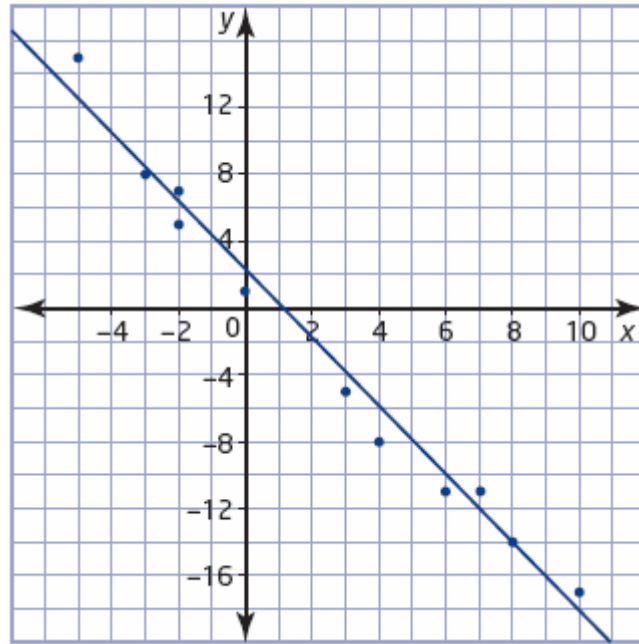


Men's winning height in 2012 will be about 2.48 m. Women's winning height will be about 2.15 m

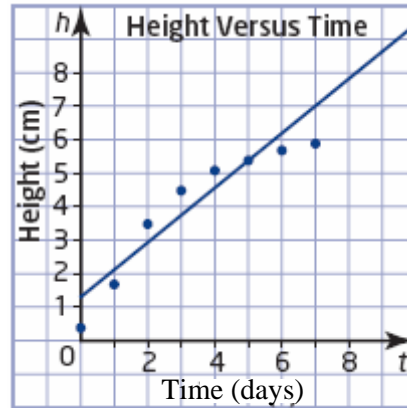
Chapter 2 Review

Question 10 Page 97

a) The scatter plot and line of best fit are shown. The line is a good fit. All of the points are close to the line.



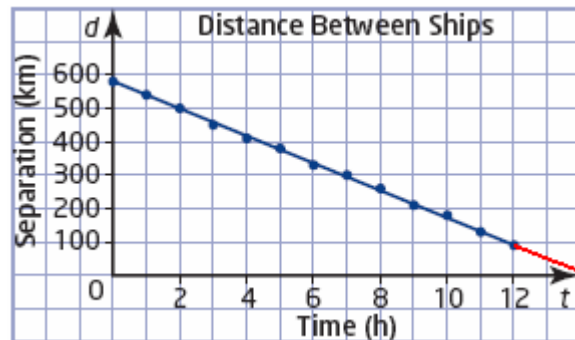
b) The scatter plot and line of best fit are shown. The line is not a good fit. The points appear to follow a curve.



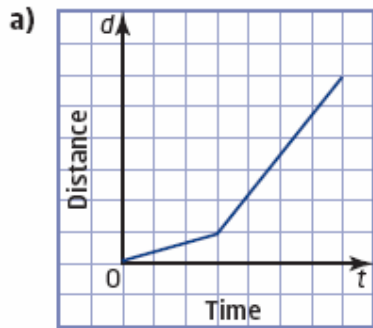
Chapter 2 Review

Question 11 Page 97

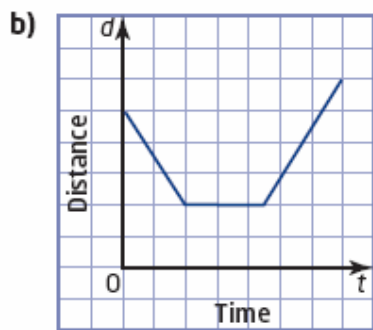
- a) The scatter plot is shown.
- b) As time increases, the distance between the two ships decreases. The relationship is linear.
- c) There are no apparent outliers.
- d) The ships will be closest to each other after 14.3 h.



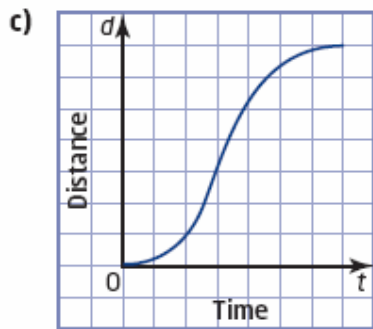
Answers may vary. Sample answers are shown.



Marni walks away from her home for 2 min at a constant speed, and then runs in the same direction at a constant speed for 2 min.



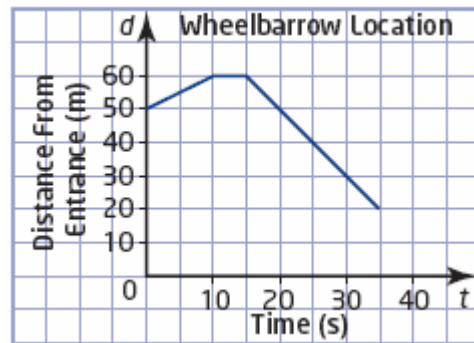
John bikes from school to a store, buys something, and then bikes back past the school to home.



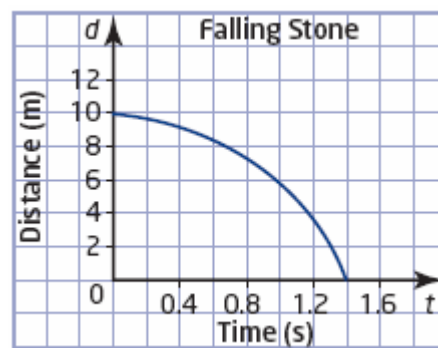
A car speeds up as it leaves a traffic light, and then slows down and stops at another light.



a) The distance-time graph is shown.



b) The distance-time graph is shown.



**Chapter 2 Chapter Test**

**Chapter 2 Chapter Test      Question 1    Page 98**

Answer B is a primary source of data, since you are collecting it yourself. All of the others are secondary sources.

**Chapter 2 Chapter Test      Question 2    Page 98**

Answer C is not a random sample. You are only surveying people on a particular street corner.

**Chapter 2 Chapter Test      Question 3    Page 98**

Estimating value beyond the known data for a relation is extrapolation. Answer A.

**Chapter 2 Chapter Test      Question 4    Page 98**

The final step in an experiment is the evaluation. Answer C.

**Chapter 2 Chapter Test      Question 5    Page 98**

- a) Caffeine cannot affect your sleep.
- b) If you study more, your results on tests either improve or stay the same.
- c) At least half of the students in your school do not have a part-time job.
- d) Cell phone use has not more than doubled in the past 2 years.

**Chapter 2 Chapter Test      Question 6    Page 98**

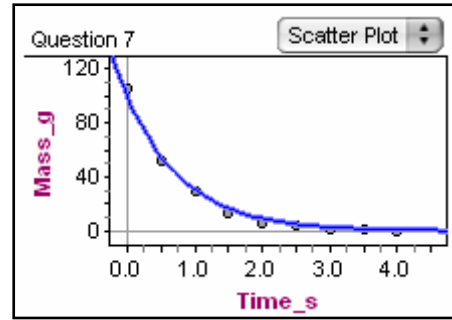
- a) The population is all teachers working for the school board.

Answers will vary. Sample answers are shown.

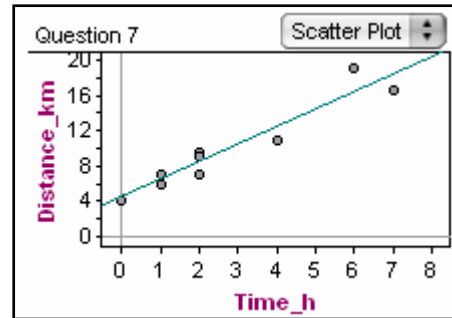
- b) Randomly select 20% of the teachers in each school.
- c) Select a name at random from a list of all of the teachers, and then select every fifth name before and after the first name selected.
- d) Survey all the teachers in the nearest school.
- e) Teachers at the same school have the same students and working conditions. These teachers may not have the same concerns and opinions as teachers at other schools

**Chapter 2 Chapter Test Question 7 Page 98**

a) The scatter plot and curve of best fit are shown. The relation is non-linear.



b) The scatter plot and line of best fit are shown. The relation appears to be linear.



**Chapter 2 Chapter Test Question 8 Page 99**

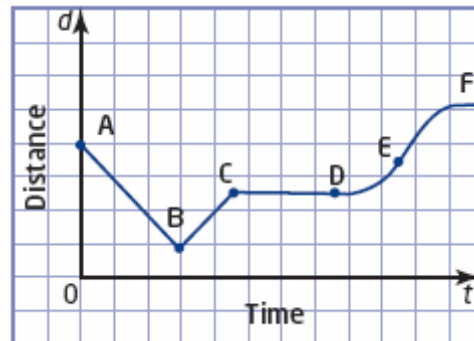
AB: The distance is decreasing at a steady rate.

BC: The distance is increasing at a steady rate.

CD: There is no motion.

DE: The distance is increasing at an increasing rate.

EF: The distance is increasing at a decreasing rate.



**Chapter 2 Chapter Test Question 9 Page 99**

Answers will vary.

Chapter 2 Chapter Test      Question 10    Page 99

- a) The scatter plot is shown.
- b) The relation is non-linear. As time increases, the height first increases, then decreases.
- c) The point (2.5, 21.4) is an outlier. Possible causes could be an inaccurate reading, or a data transmission error.
- d) See the graph in part a) for the curve of best fit.
- e) The extrapolation is shown on the graph. The height after 5 s is about 4.7 m.

