Practice and Exercise Book Answers

Chapter 1 Trigonometry

Get Set, page 1

1. **a)** $x = \pm 4$ **b)** $x = \pm 6$ **c)** $x = \pm 15$ **d)** $x = \pm 18$
2. **a)** 6.4 m **b)** 11.3 m
3. **a)** 1:2 **b)** 5:9 **c)** 4:7 **d)** 28:9
4. **a)** $x = 2$ **b)** $x = 25$ **c)** $x = 28$ **d)** $x = 18$; $y = 30$
5. **a)** 54° **b)** 69°, 69°

1.1 Revisit the Primary Trigonometric Ratios, pages 2–4

Warm-Up

1. A, D
2. **a)** $x = 260$ **b)** $y = 28$ **c)** $z = 3$
3. $x = 4$
4. **a)** obtuse **b)** acute
c) acute **d)** obtuse
5. **a)** 11 cm **b)** 8 cm
6. **a)** 25, 32, 40 **b)** 53, 41, 29 **c)** 100, 144, 196
7. **a)** $h^2 = a^2 + b^2$ **b)** Pythagorean relation
8. 66 cm

Practise

1. **a)** 0.8660 **b)** 0.7071 **c)** 0.5774
2. **a)** 28.3° **b)** 43.2° **c)** 72.7°
3. $\angle B = 70°$, $a = 11$ m, $c = 33$ m
4. $\angle A = 58°$, $\angle B = 32°$, $c = 35.5$ cm
5. **a)** $\angle B = 63°$, BC = 45.4 m, AC = 89.1 m
b) $\angle A = 16.1°$, $\angle B = 73.9°$, AT = 34.6 cm
6. AD = 32.4 cm
7. $x = 8.1$ m, $y = 6.3$ m

1.2 Solve Problems Using Trigonometric Ratios, pages 5–7

Warm-Up

1. **a)** $\frac{5}{7}$ **b)** $\frac{3}{2}$ **c)** $\frac{7}{9}$ **d)** $\frac{1}{14}$
2. **a)** $\frac{1}{5}$ **b)** $\frac{1}{3}$ **c)** $\frac{3}{4}$ **d)** $\frac{9}{50}$
3. Answers may vary. (0, 14), (1, 11), (2, 8)
4. Answers may vary.
a) 40°, 60°, 80° **b)** 45°, 45°, 90°
5. **a)** 10 **b)** 60°
6. $x = 3$
7. TANGENT
8. $\sin T = \frac{t}{v}$, $\cos T = \frac{u}{v}$, $\tan T = \frac{t}{u}$
$\sin U = \frac{u}{v}$, $\cos U = \frac{t}{v}$, $\tan U = \frac{u}{t}$

Practise

1. 2065 m
2. 2.6°
3. 35°
4. 576 m
5. 28 m
6. 44 m
7. 11.3 km
8. 17.8 m

1.3 The Sine Law, pages 8–10

Warm-Up

1. **a)** D **b)** B **c)** A **d)** C
2. **a)** $x = 24$ **b)** $y = 60$ **c)** $z = 30$
3. (10, 35)
4. scalene, obtuse
5. $\frac{1}{3}$
6. $\frac{1}{3}$
7. B
8. 65.6°

Practise

1. **a)** 25.9 cm **b)** 28.9 m **c)** 24.7 cm
2. **a)** $\angle Y = 76°$, $\angle Z = 59°$, $z = 10$ cm
b) $\angle C = 35°$, $b = 10$ mm, $c = 6$ mm
3. 8 ft
4. 18 ft and 29 ft
5. **a)** 13.1 m **b)** 14.4 m
6. 83 in.

1.4 The Cosine Law, pages 11–13

Warm-Up

1. **a)** 574.5 **b)** 23.1 **c)** 1.0 **d)** 161.0
2. $a = 12.3$
3. $t = 20$ or -20
4. JK, KL, JL
5. **a)** $\frac{1}{3}$ **b)** 0
6. 204 mm
7. C
8. $x = 47°$, $y = 17$ ft

Practise

1. **a)** 62° **b)** 68°
2. **a)** 43.1 ft **b)** 14.9 m
3. $\angle A = 56°$, $\angle B = 38°$, $\angle C = 86°$
4. $\angle Y = 59°$, $\angle Z = 67°$, $x = 46.0$ m
5. 162 km
6. 11.4 m
7. 8.6 cm
8. 5.8 m

1.5 Make Decisions Using Trigonometry, pages 14–16

Warm-Up

1. Answers may vary.
a) 60° **b)** 62° **c)** 70° **d)** 60°
2. $0 = b^2 + b - 375$
3. Answers may vary.
a) $y = -\frac{1}{2}x - 3$ **b)** $(0, -3)$
4. isosceles
5. **a)** scalene **b)** equilateral
6. x = the length of KL; $\sin J = \frac{x}{x + 2}$

7. SOH: sine of an angle = $\frac{\text{opposite}}{\text{hypotenuse}}$,
CAH: cosine of an angle = $\frac{\text{adjacent}}{\text{hypotenuse}}$,
TOA: tangent of an angle = $\frac{\text{opposite}}{\text{adjacent}}$

8. $\angle M = 51.1°$, $\angle O = 57.7°$, $\angle N = 71.2°$

Practise

1. a) cosine law; $\angle P = 50°$, $\angle Q = 86°$, $\angle R = 44°$
b) primary trigonometric ratios; $\angle B = 33°$, $\angle A = 57°$, BC = 29 cm
c) sine law; $\angle X = 80°$, $x = 36$ cm, $z = 24$ cm

2. Yes, the golf ball is actually 37 ft high when it passes the tree.

3. No, it is not safe to climb, since the angle between the base of the ladder and the ground is only 63°.

4. 48°, 63°, and 69°

5. 63 m

6. The hotel which forms a 48° with the dock is 448 m from the dock; the other hotel is 389 m from the dock.

Chapter 1 Review, pages 17–18

1. $a = 18.9$ cm, $c = 32.1$ cm, $\angle B = 54°$

2. $a = 17.6$ cm, $c = 27.4$ cm, $\angle B = 50°$

3. 53°

4. 5.3 km

5. a) 21 m **b)** 50°

6. 225 cm

7. 49°, 61°, and 70°

8. 63.1 cm

Chapter 2 Probability

Get Set, page 19

1. a) $\frac{83}{100}$ **b)** $\frac{13}{20}$ **c)** $\frac{37}{250}$ **d)** $\frac{2}{3}$

2. a) $\frac{21}{50}$ **b)** $\frac{39}{100}$ **c)** $\frac{123}{500}$ **d)** $\frac{1}{3}$

3. a) $\frac{2}{3}$ **b)** $-\frac{1}{4}$ **c)** 2 **d)** $\frac{3}{10}$

4. a) \$58 750 **b)** $\frac{3}{20}$ **c)** 5%

2.1 Probability Experiments, pages 20–22

Warm-Up

1. a) −30 **b)** 8

2. a) $x + 2$ **b)** $x - 4y$ **c)** $-x^2 + 4x + 1$

3. A

4. a) $x = 61°$ **b)** $x = 45°$

5. a) mean: 168.5, median: 167, mode: 162 **b)** mean

6. 18 h

7. C

8. a) 0.6 **b)** 0.6667 **c)** 0.0066

Practise

1. a) 30 students **b)** $\frac{1}{5}$, 0.2, 20%
c) 0. Answers may vary. Sample answer: No, I thought there would be at least one student born in each month.

2. a) 18
b) 30. Answers may vary. Sample answer: The number of successful trials was 18, and the total number of trials was 48, so the number of unsuccessful trials was 48 − 18 = 30. The experimental probability of unsuccessful trials was $1 - \frac{3}{8} = \frac{5}{8}$, so the number of unsuccessful trials was $\frac{5}{8} \times 48 = 30$.
c) It is possible. Explanations may vary. Sample answer: $\frac{3}{8}$ is close to $\frac{1}{2}$, so a successful trial and an unsuccessful trial might be equally likely.

3. $\frac{17}{20}$, 85%, 0.85

4. a) $\frac{1}{4}$ **b)** $\frac{3}{50}$ **c)** 1 **d)** $\frac{13}{25}$

5. a) 0 **b)** increase the number of trials

6. a) 2 polar bears. The theoretical probability is $\frac{190}{950}$ or 0.2; $0.2 \times 10 = 2$.
b) Yes; $\frac{8}{40} = 0.2$, which is the theoretical probability.

2.2 Theoretical Probability, pages 23–25

Warm-Up

1. a) 8 **b)** −30

2. a) $x = 2$ **b)** $x = -0.5$ **c)** $x = -4$

3. a) $-\frac{3}{2}$ **b)** $\frac{5}{4}$

4. \$13.26

5. 100

6. \$13 111.80

7. sector of a circle

8. $\frac{9}{10}$, 0.9, 90%

Practise

1. a) $\frac{1}{27}$ **b)** $\frac{25}{27}$ **c)** $\frac{8}{27}$ **d)** $\frac{13}{18}$ **e)** $\frac{1}{9}$

2. a) $\frac{15}{46}$ **b)** $\frac{31}{46}$

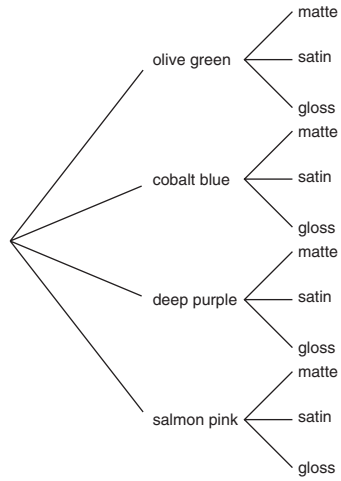
3. a) $\frac{1}{4}$ **b)** $\frac{1}{3}$ **c)** $\frac{5}{12}$ **d)** 0

4. a) $\frac{2}{7}$ **b)** $\frac{1}{2}$ **c)** $\frac{3}{14}$ **d)** $\frac{5}{6}$

5. $\frac{1}{8}$

6. $\frac{7}{30}$

7. a)



b) i) $\frac{1}{12}$ **ii)** $\frac{1}{3}$ **iii)** $\frac{2}{3}$ **iv)** 0

8. $\frac{1}{2}$

2.3 Compare Experimental and Theoretical Probabilities, pages 26–29

Warm-up

1. Answers may vary.
a) 1146 **b)** 3645 **c)** 3.73

2. **a)** $3x + 5$ **b)** $2x^3 + 4x$ **c)** $2a^2 - 3a + 4$

3. C

4. **a)** 83.2 cm^3 **b)** 4084.07 cm^3

5. Answers may vary. Sample answers:
a) tossing a coin and having either a head or a tail
b) rolling a 7 with one six-sided die

6. 3 packs of 10 and 6 packs of 20

7. B

8. $\frac{1}{3}$

Practise

1. **a)** $\frac{3}{4}$ **b)** $\frac{7}{20}$
c) An event's probability and its complement's probability only add to equal 1 when they are both theoretical probabilities,
d) A number less than or equal to 0.25 can represent two heads, a number between 0.25 and 0.50 can represent two tails, and a number greater than 0.50 can represent one head and one tail.
e) Use the command **randInt(1,4,1)**. 1 can represent two heads, 2 can represent two tails, and 3 or 4 can represent one head and one tail.

2. **a)** 1 **b)** $\frac{1}{2}$ **c)** decrease and get closer to $\frac{1}{2}$

3. **a)** $\frac{1}{6}$
b) No. Yes. The theoretical probability is most likely close in value to $\frac{1}{6}$.

4. **a)** 38 trials **b)** red: $\frac{2}{19}$; green: $\frac{11}{19}$; white: $\frac{6}{19}$
c) 60 hats

5. **a)** The game favours player B. The theoretical probability of rolling a sum less than or equal to 6 (not including doubles) is $\frac{2}{5}$.
b) No. There are 6 doubles: half have a sum less than or equal to 6 and half have a sum greater than 6.

6. **a)** $\frac{14}{15}$ **b)** $\frac{1}{12}$
c) The sums are complements so the probabilities add to 1. The theoretical probability of rolling a sum greater than 4 is $1 - \frac{1}{12} = \frac{11}{12}$.

7. Answers may vary. Sample answer:
a)

Trial Number	Number of Heads
1	1
2	3
3	2
4	0
5	1
6	1
7	1
8	3
9	2
10	2
11	1
12	0
13	1
14	2
15	3

b) $\frac{2}{5}$
c) $\frac{3}{8}$; 1 tail means there are 2 heads, so the probabilities of 1 tail and 2 heads are the same. 1 head is the reverse of 1 tail, so the probabilities of 1 head and 1 tail are also the same.
d) Use the command **randInt(1,8,1)**. 1 can represent 0 heads, 2, 3, or 4 can represent 1 heads, 5, 6, or 7 can represent 2 heads, and 8 can represent 3 heads.

2.4 Interpret Information Involving Probability, pages 30–32

Warm-up

1. **a)** 21 **b)** 15.75 **c)** $\frac{1}{6}$

2. **a)** $(x - 10)(x + 7)$ **b)** $(x + 10)(x - 4)$ **c)** $(x + 5)^2$

3. (3, 4)

4. **a)** 336 cm^2 **b)** 988 cm^2

5. **a)** $\frac{1}{2}$ **b)** $\frac{3}{26}$ **c)** $\frac{1}{13}$

6. 15 games

7. quadrant

8. D

Practise

1. **a)** $\frac{1}{2}$ **b)** $\frac{2}{5}$
c) Theoretical probability; it is more precise.

2. **a)** 165 people; 90 people
b) the number of people surveyed

3. **a)** 144 points **b)** 1260 points
c) Her scoring record might change in later games.

4. **a)** 0.900 **b)** 200 goals

5. **a)** 8 Canadians **b)** 200 Canadians

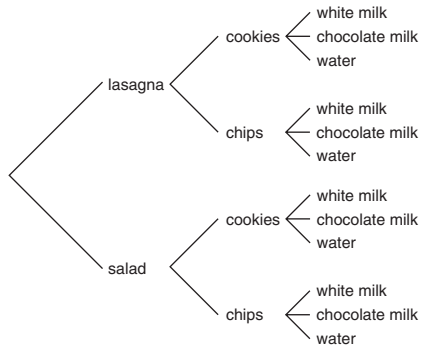
Chapter 2 Review, pages 33–34

1. a) $\frac{11}{25}$ **b)** 44% **c)** 0.44

2. $\frac{3}{5}$

3. a) $\frac{1}{9}$ **b)** $\frac{1}{18}$ **c)** $\frac{1}{6}$
d) $\frac{1}{4}$ **e)** $\frac{11}{18}$ **f)** $\frac{8}{9}$

4. a)



b) i) $\frac{1}{2}$ **ii)** $\frac{1}{6}$ **iii)** $\frac{1}{6}$ **iv)** $\frac{1}{2}$

5. a) Use the command **randInt(2,10,1)**. Each integer can represent the number of the card drawn.
b) A number less than or equal to 0.111… can represent drawing a 2, a number between 0.111… and 0.222… can represent drawing a 3, and so on.
c) Divide the spinner into sections of 40° each, each section can represent a number from 2 to 10.

6. a) $\frac{11}{45}$ **b)** 6 black face cards; $\frac{1}{15}$
c) $\frac{3}{26}$; it is almost double the experimental probability.

7. a) 200 students **b)** 31%

Chapter 3 One Variable Statistics

Get Set, page 35

1. a) 31, 28, 22, 19, 17, 13, 11, 10, 7, 6, 4
b) 61, 58, 42, 17, 12, 4, 0, –2, –19, –44
c) $\frac{7}{8}, \frac{1}{2}, \frac{2}{5}, \frac{1}{3}, \frac{3}{11}$

2. a) 13.86 **b)** 6.71 **c)** 7.35 **d)** 5.39

3. a) bar graph **b)** tomatoes **c)** 37 plants

3.1 Sampling Techniques, pages 36–38

Warm-Up

1. a) 6 **b)** $\frac{1}{2}$

2. a) $7x + 11y$ **b)** $3s + 5t$ **c)** $4a + 7b - 3$

3. a) (0, 7) **b)** $\frac{3}{4}$ **c)** $-\frac{4}{3}$

4. a) $x = 10$ **b)** $x = 8$

5. a) $\frac{1}{3}$ **b)** $\frac{1}{36}$

6. $4a + 2x = 20$, where a is side length of the square.

7. pentagon; scalene triangle

8. 1.71, 1.31, 1.22, 1.15, 1.12, 1.09

Practise

1. convenience sampling

2. Answers may vary. Sample answers:
a) simple random sampling; sample will represent all voters
b) voluntary-response sampling; students being surveyed can to respond by e-mail
c) convenience sampling; Eric can survey people on game night
d) voluntary response sampling; people in grocery stores can choose to respond

3. a) systematic sample of every 10th patient; all patients of the family doctors
b) voluntary response sample of customers who fill out the survey; population: all customers of this restaurant
c) cluster sample of English students; all of Emma's fellow students
d) random sample of chosen batteries; all batteries produced by the factory

4. systematic sampling

5. a) simple random sampling
b) No. There are a different number of students in each grade but the sample size from each grade is the same. The sample size should be in proportion to the number of students in each grade.

6. a) Choose names randomly from a list of all employees.
b) Choose one city and survey all employees in that city.
c) Choose a random sample of employees that is in proportion to the number of employees in each city.
d) Answers may vary. Sample answer: for all offices, leave surveys in the cafeterias or hand them out at the end of meetings

3.2 Collect and Analyse Data, pages 39–41

Warm-Up

1. a) 8 **b)** 5

2. a) $xy - 4x + 5y$ **b)** $a + 3b + 7$ **c)** $x - 1$

3. 0

4. 1064.37 mL

5. a) $\frac{1}{2}$ **b)** $\frac{1}{4}$

6. 36, 49

7. C

8. voluntary response sampling

Practise

1. a) Answers may vary. Sample answer: This statement might lead people to exaggerate their levels of physical activity rather than admitting they are not very fit.
b) Simply ask people about their amount of physical activity without making statements about its benefits.

2. a) secondary source **b)** primary sources
c) primary source **d)** secondary source

3. The survey asks for best musical group, which implies any style, but only rock bands are listed. People might simply choose one of the bands listed rather than stating their opinion.

4. Answers may vary. Sample answers:
a) Most people visit a Web-site because they like it, so the responses will be skewed. Ask visitors to list their favourite sites.
b) Customers will favour the brand of car they bought from the dealer. Survey people at an auto convention.
c) People who can afford season tickets are unlikely to think that regular game tickets cost too much. Survey people in the regular seats or people at high school games.
d) Not enough surveys were returned for the university to reach a conclusion. They should choose a different survey method that gets a larger response.

5. a) Olivia: systematic random sampling; Max: cluster sampling

b)

Olivia's Survey Technique	
Strength	Weakness
surveys everyone who might use the café	time-consuming

Max's Survey Technique	
Strength	Weakness
convenient	only surveys half the people who might use the café

3.3 Display Data, pages 42–45

Warm-Up

1. a) 0.8 **b)** 1.7 **c)** 101.0
2. a) $7x^2 + 7x + 13$ **b)** $-4m^2 - 2m + 8$ **c)** $2x + 2y$
3. (8, 12)
4. 6.78 m
5. a) $\frac{21}{50}$ **b)** almost 1
6. $C = \pi d$
7. C
8. A primary source is data gathered by the person who will use it. A secondary source is data gathered by someone else, such as information found on the Internet.

Practise

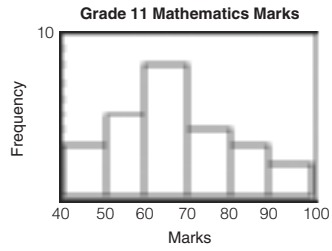
1. a) continuous **b)** discrete **c)** continuous
d) discrete **e)** continuous
2. a) apple juice; the sector is largest
b) tomato; the sector in smallest
c) bar graph **d)** cannot tell from graph
e) 2 students
3. a) Yes.
b) No, a bar graph would not make sense for continuous data.
c) The bar graph; you can only have a whole number of siblings and temperature is continuous.
4. a) 16 **b)** 15 **c)** 50 **d)** 30%

5. Answers may vary. Sample answers:
a) circle graph; shows relation of items to the whole budget
b) bar graph; would show temperature variation clearly
c) histogram; would show pattern of arm spans
d) bar graph; would show the most popular movie of the top ten
e) line graph; would show the decreasing value clearly
f) bar graph; would show each category clearly

6. a)

Mark Interval	Tally	Frequency
[40–50)	| | |	**3**
[50–60)	𝍸	**5**
[60–70)	𝍸 | | |	**8**
[70–80)	| | | |	**4**
[80–90)	| | |	**3**
[90–100]	| |	**2**

b)



3.4 Measures of Central Tendency, pages 46–48

Warm-Up

1. a) 26 **b)** 2
2. a) $x = 2$ **b)** $x = 4$ **c)** $x = 5$
3. vertically shift the graph of $y = x^2$ 3 units up
4. a) 603.19 cm^2 **b)** 4137.85 cm^2
5. mean: 68; median: 77; mode: none
6. $2x - 7 = 42$
7. acute angle; obtuse angle
8. a) line graph **b)** circle graph

Practise

1. a) mean: 32.5; median: 29.5; mode: none
b) mean: 0.337; median: 0.315; mode: none
c) mean: $1.04; median: $1.05; mode: none
2. Answers may vary. Sample answers:
a) median; the mean is affected by the two older ages, 49 and 55
b) mean; the median is too low
c) mean or median; they are very close
3. median: 65; mode: 65; range: 70
4. a) Leroy: mean: 2; median: 2; mode: 2
James: mean: 2.7; median: 2.5; mode: 2
b) James; his performance is better and more consistent.
5. a) mean; no specific donation amounts are given
b) median: 10–19; mode: 10–19
c) mode; describes the amount donated most often

3.5 Measures of Spread, pages 49–51

Warm-Up

1. −1.91, −1.03, −0.99, 0.93, 1.21, 1.71

2. a) $x = -3$ **b)** $m = -4$ **c)** $m = -2$

3. maximum: −5

4. 197.92 m^2

5. 22 values

6. $4x - 8 = 32$

7. B

8. a) mean: 8.5; median: 9; mode: 10 **b)** mean

Practise

1. 125

2. 6.2

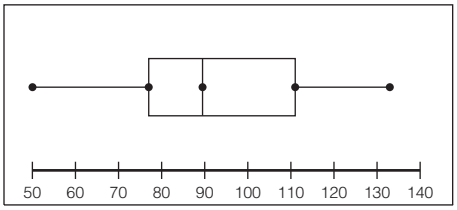
3. a) 9 **b)** 15 **c)** 7.21 **d)** 2.79

4. a) 16 **b)** 784 **c)** 2787.84 **d)** 39.69

5. a) 49, 59, 62, 72, 77, 83, 84, 84, 87, 89, 90, 92, 93, 95, 111, 113, 120, 120, 122, 133

b) \$89.5 **c)** Q1: \$77; Q3: \$111 **d)** \$34

e)



6.

	Range	Mean	Variance	Standard Deviation
a)	27	186	66.33	8.14
b)	1.2	2.07	0.12	0.35
c)	9	3.9	7.29	2.7
d)	503	1141.5	25 869.65	160.84

7. a) Class B; their standard deviation is greater

b) Class A's marks are more consistent that Class B's.

3.6 Common Distributions, pages 52–54

Warm-Up

1. a) 7.14 **b)** 2.53 **c)** 9.49 **d)** 1.52

2. a) $x = -9$ **b)** $x = 8$ **c)** $x = 5$

3. $x = -4$

4. 44.4°

5. a) $\frac{1}{8}$ **b)** $\frac{7}{8}$

6. $A = (x + 3)(x + 5)$

7. origin

8. 3.44

Practise

1. a) normal distribution **b)** skewed distribution

c) skewed distribution **d)** bimodal distribution

2. a) skewed distribution; there is a wide range of prices, but more affordable cars than expensive cars

b) normal distribution; the heights of students at a public elementary school should distribute normally

c) bimodal distribution; the gas efficiency of motorcycles and SUVs are very different

d) skewed distribution; there may be more heavy males than underweight males

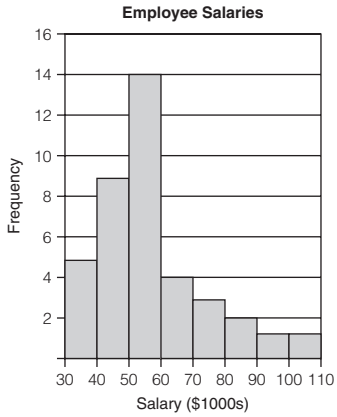
3. Answers may vary. Sample answers:

a) the heights of maple trees

b) the size of corgi dogs compared to the size of all dogs

c) the ages of participants in a father-son charity walk

4. a)



b) normal distribution; data is distributed symmetrically about the mean

c) Most employees earn between \$40 000 to 60 000.

d) Yes. Explanations may vary.

e) skewed distribution; data clusters in lower range

Chapter 3 Review, pages 55–56

1. random sampling

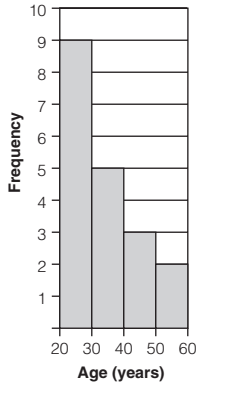
2. sample: random Ottawa library card-holders; population: people living in Ottawa

3. a) primary source **b)** secondary source

4. a)

Age Interval	Tally	Frequency
[20–29)	|||| ||||	9
[30–39)	++++	5
[40–49)	|||	3
[50–59)	||	2

b)



5. a) $152.78 **b)** $25 **c)** $25
d) mode **e)** mean; it is the average value of all prizes
6. a) range: 4.5; standard deviation: 1.72
b) range: $270; standard deviation: $78.55
7. a) skewed distribution **b)** bimodal distribution

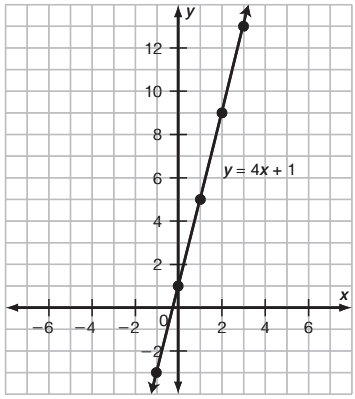
Chapter 4 Quadratic Relations I

Get Set, page 57

1. a) 14.1 **b)** −15.7 **c)** 6.8
d) 55.2 **e)** −63 **f)** 46.2
2. a) $5x^2 - 10x + 4$ **b)** $5x^2 - 7x + 2$
3. a) $y = 30$ **b)** $y = -8$
4.

x	y
−1	−3
0	1
1	5
2	9
3	13

slope = 4,
y-intercept = 1



5. a) (−7, −15) **b)** (−3, −3) **c)** (−5, 3)

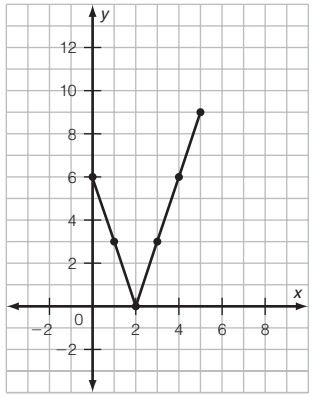
4.1 Modelling with Quadratic Relations, pages 58–60

Warm-Up

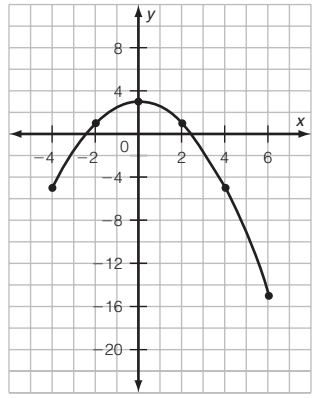
1. a) 0.1 **b)** 15 **c)** 13
2. a) $x = \frac{7}{3}$ **b)** $x = -\frac{1}{4}$
3. (−2, 1)
4. a) 8 cm **b)** 14 cm
5. $\frac{5}{18}$
6. A
7. A
8. first differences are all 4

Practise

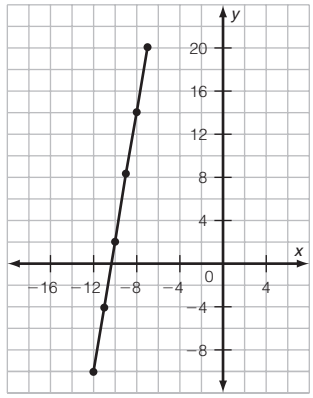
1. a) neither



b) quadratic



c) linear

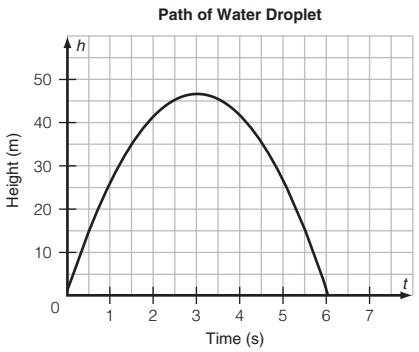


2. a) first and second differences vary
b) first differences vary; second differences are all −4
c) first differences are all −6
3. a) not quadratic; linear **b)** quadratic; x^2 term
c) not quadratic; linear **d)** quadratic; x^2 term
4. a)

Time (s)	Height (m)
0	**1.0**
1	**26.1**
2	**41.4**
3	**46.9**
4	**42.6**
5	**28.5**
6	**4.6**

b) about 3 s

c)



d) after about 6.2 s, estimates may vary

5. a) the blue team; the red team

b) the red team; methods may vary

4.2 The Quadratic Relation $y = ax^2 + k$, pages 61–63

Warm-Up

1. a) 85 **b)** −1

2. a) $x = 3y - 8$ **b)** $x = \dfrac{-3y + 5}{2}$

3. (4, −5)

4. 8.1 cm

5. mean: 6.875; median: 6.5; mode: 9

6. 200 m^3

7. B

8. a) not quadratic; linear **b)** quadratic; x^2 term

Practise

1. a) i), ii) $y = 2x^2 + 7$, parabola is wider and its vertex is farther from x-axis

b) i), ii) $y = -0.5x^2 + 2$; parabola is wider and its vertex is farther from x-axis

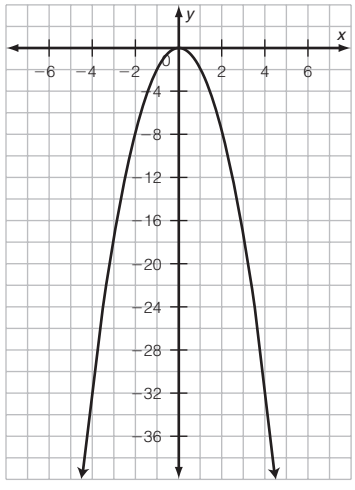
c) i) $y = -0.01x^2 - 0.9$, parabola is wider

ii) $y = 0.1x^2 - 9$, vertex is farther from x-axis

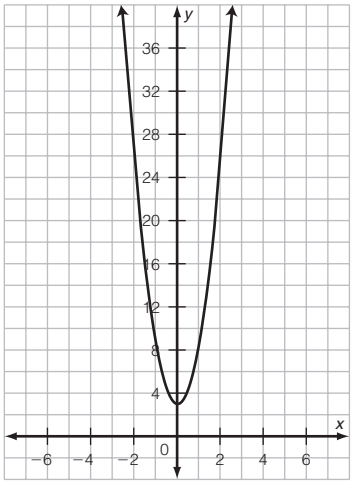
d) i), ii) $y = 10x^2 - 10$, parabola is wider and its vertex is farther from x-axis

2. Graphs may vary.

a) reflected in the x-axis, vertically stretched by a factor of 2



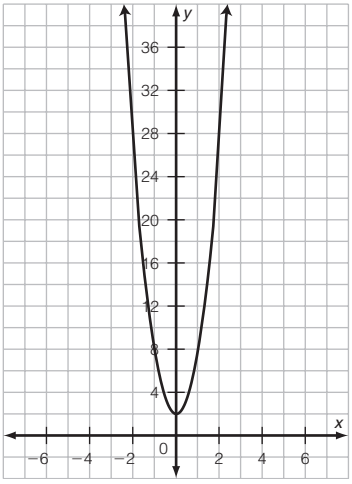
b) translated 3 units up, vertically stretched by a factor of 6



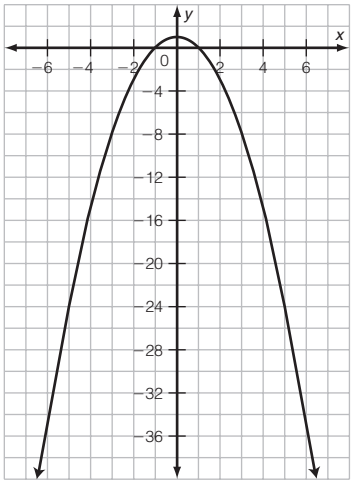
3. a) $y = -0.25x^2 + 8$ **b)** $y = 2x^2 - 5$ **c)** $y = 1.5x^2 + 1$

4. Graphs may vary.

a) translate 2 units up, vertically stretch by a factor of 6



b) reflect in the x-axis, translate 1 unit up



5. a) (0, 11) **b)** $y = -4.9x^2 + 11$

4.3 The Quadratic Relation $y = a(x - h)^2$, pages 64–66

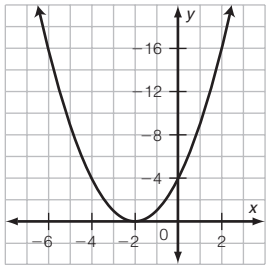
Warm-Up

1. a) 2^7 **b)** 2^6 **c)** 2
2. a) $y = -2x + 3$ **b)** $y = x - 2$
3. (–1, 3)
4. 1.32 m
5. A
6. 1.94 cm
7. B
8. a) $y = -2x^2 + 1$ **b)** $y = 5x^2 - 3$

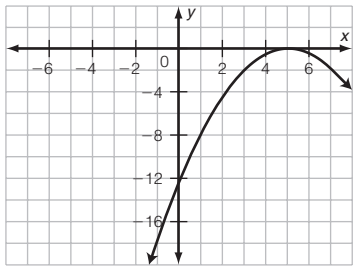
Practise

1. Graphs may vary.

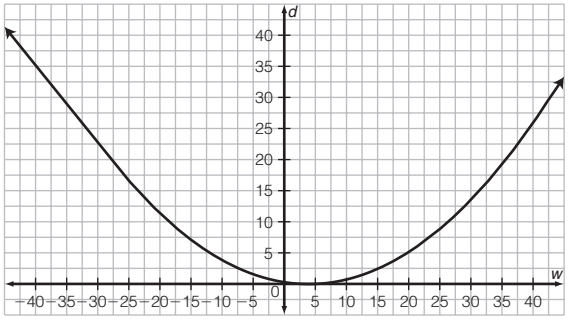
a) $a = 1$, not stretched or compressed; $h = -2$, translated 2 units left



b) $a = -0.5$, vertically compressed by a factor of 0.5, reflected in the x-axis; $h = 5$, translated 5 units right



2. a) $y = 2(x - 1)^2$ **b)** $y = -(x + 3)^2$ **c)** $y = 0.5(x - 6)^2$
3. a) $y = 10(x + 7)^2$; $7 > 3$ **b)** $y = 0.375(x - 10)^2$, $10 > 9$
4. $a = \frac{5}{3}$, vertically stretched by a factor of $\frac{5}{3}$; $h = -2$, translated 2 units left
5. a) Graphs may vary.



b) about 70 cm; about 6.5 cm wider

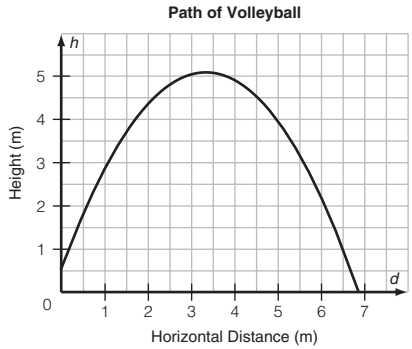
4.4 The Quadratic Relation $y = a(x - h)^2 + k$, pages 67–69

Warm-Up

1. a) $\frac{16}{9}$ **b)** 4
2. a) $9x - 4y + 1$ **b)** $-x - 3y - 10$
3. one solution
4. 46.5 m
5. a) $\frac{1}{26}$ **b)** $\frac{1}{26}$
6. 111 cm^3
7. B
8. a); $3 > 2$

Practise

1. a) i) (4, –2) **ii)** upward **iii)** vertically stretched
b) i) (–1, –5) **ii)** downward **iii)** neither
c) i) (5, –1) **ii)** upward **iii)** vertically compressed
d) i) (–9, 3) **ii)** downward **iii)** vertically compressed
2. a) i) (3, –2) **ii)** positive **iii)** $y = 2(x - 3)^2 - 2$
b) i) (–2, 5) **ii)** negative **iii)** $y = -0.5(x + 2)^2 + 5$
c) i) (–5, 3) **ii)** negative **iii)** $y = -5(x + 5)^2 + 3$
d) i) (4, –4) **ii)** positive **iii)** $y = 0.25(x - 4)^2 - 4$
3. a) $y = 1.5(x - 4)^2 - 1$ **b)** $y = -2(x + 3)^2 + 4$
4. a) (3.3, 5.1) **b)** 0.5 m
c) Graphs may vary.



d) the maximum height of the ball and the ball's horizontal distance
e) no; the ball will clear the net

4.5 Interpret Graphs of Quadratic Relations pages 70–72

Warm-Up

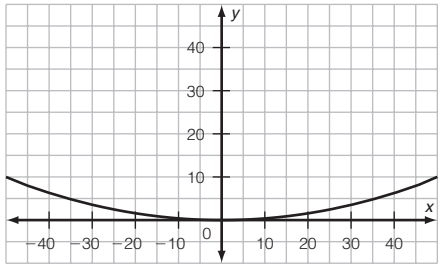
1. $\frac{13}{36}$
2. $x = -7$
3. (2, 4), (–1, –2), (8, –2)
4. 4072 cm^3
5. $\frac{5}{8}$
6. 24 m
7. B
8. a) 6 m **b)** 20 s after kicking

Practise

1. a) $y = 1$ **b)** $y = -75$ **c)** $y = -48$
d) $y = 0$ **e)** $y = 144$ **f)** $y = 0$

2. a) $x = -1$, $x = 5$; $y = 5$; maximum 9; (2, 9)
b) none; $y = -4$; maximum -4; (0, -4)

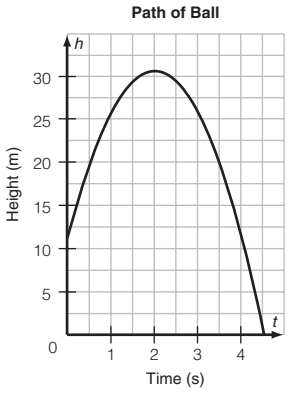
3. a) Graphs may vary.



b) $y = 0.004x^2$

4. a)

t	h
0	**11**
0.5	**19.575**
1.0	**25.7**
1.5	**29.375**
2.0	**30.6**
2.5	**29.375**
3.0	**25.7**
3.5	**19.575**
4.0	**11**
4.5	**−0.025**

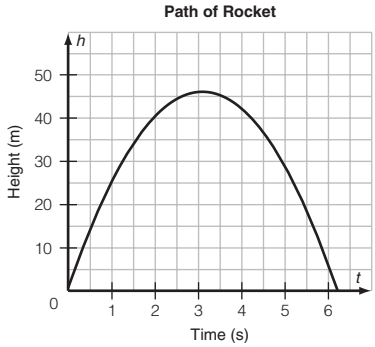


b) $h = -4.9(t - 2)^2 + 30.6$
c) about 1.3 s and 2.7 s

5. a) $h = -4.9(t - 5)^2 + 122.5$
b) 102.9 m

Chapter 4 Review, pages 73–74

1. a)

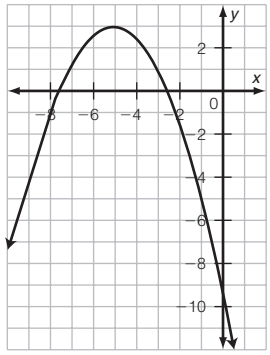


b) about 6.1 s **c)** B

2. a) $y = 1.5x^2 + 1.5$ **b)** $y = 0.5x^2 - 8$

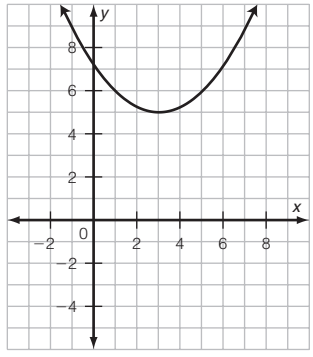
3. Graphs may vary.

a)



$y = -0.5(x + 5)^2 + 3$

b)

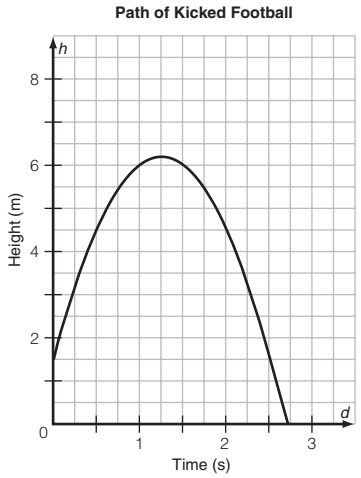


$y = 0.25(x - 3)^2 - 5$

4. a) translated 2 units down, 3 units right, reflected in the x-axis, vertically stretched by a factor of 9
b) translated 1 unit up, 1 unit right, vertically compressed by a factor of 0.9

5. a)

d	0	0.5	1.0	1.5	2.0	2.5
h	1.5	4.5	6	6	4.5	1.5



b) 1.5 m **c)** $h = -3(d - 1.25)^2 + 6.1875$

Chapter 5 Quadratic Relations II

Get Set, page 75

1. a) $35x$ **b)** $-26x$ **c)** $-27x$
d) $5x^2 + 6x$ **e)** $21x^2 - 17x$ **f)** $4x + 7x^2$
2. a) $14x - 7$ **b)** $4x^2 - 12x$ **c)** $-6x - 10$
3. a)

x^2	x	x	x	x

b)

x^2	x	x
x	1	1

c)

x^2	x	x	x
x	1	1	1
x	1	1	1

4. a) 8, 2 **b)** −4, 5
5. a) $x = -3$ **b)** $x = 9$ **c)** $x = 2$
6. a) $x(x - 8)$ **b)** $(x - 4)(x + 3)$ **c)** $2(x + 4)(x + 2)$

5.1 Expand Binomials, pages 76–77

Warm-Up

1. a) 54.4 **b)** 3.85 **c)** 2.03
2. $7x - 5$
3. $y = 2x - 4$
4. $a = 50°$; $b = 71°$
5. $\frac{5}{6}$
6. $320 = 5x$
7. B
8. (0, 4)

Practise

1. a) $(3x + 2)(x + 3)$ **b)** $3x^2 + 11x + 6$
2. a) $x^2 + x$ **b)** $x^2 + 7x + 10$ **c)** $3x^2 + 9x + 6$
3. a) $21x^2 + 16x + 3$ **b)** $-16x^2 + 36$ **c)** $9x^2 + 71x - 8$
4. a) $x^2 - 36$ **b)** $25x^2 - 9$ **c)** $x^2 - 1$
5. a) $x^2 + 8x + 16$ **b)** $x^2 + 26x + 169$ **c)** $9x^2 - 12x + 4$
6. a) $12x^2 + x - 6$; 432 m² **b)** $40x^2 - 62x + 24$; 1092 m²

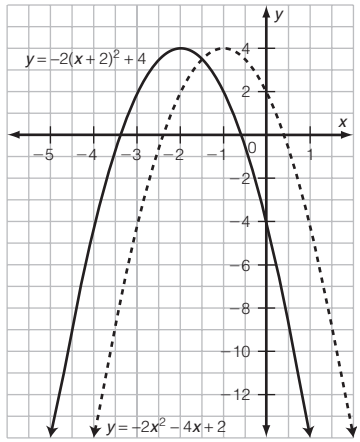
5.2 Change Quadratic Relations From Vertex Form to Standard Form, pages 78–79

Warm-Up

1. a) $8.956\,713\,402 \times 10^9$ **b)** 6.7×10^{-8}
2. $d^2 - 31d$
3. $-\frac{4}{3}$
4. 23.5 cm²
5. a) Q1: 10; Q3: 30 **b)** 20
6. $3x + 5 = 2x - 3$
7. C
8. $15k^2 - 13k - 6$

Practise

1. a) $y = x^2 + 4x + 4$ **b)** $y = x^2 - 16x + 64$
c) $y = x^2 - 22x + 121$
2. a) $y = 6x^2 + 36x + 54$ **b)** $y = -x^2 + 2x - 1$
c) $y = 0.75x^2 + 6x + 12$
3. a) $y = x^2 + 10x + 27$ **b)** $y = x^2 + 6x$
c) $y = x^2 - 14x + 45$
4. a) $y = 8x^2 + 32x + 29$ **b)** $y = -3x^2 - 36x - 102$
c) $y = -4x^2 + 40x - 99$
5. no



6. a) $y = -x^2 + 20x - 100$ **b)** $y = 5x^2 - 10x$

5.3 Factor Trinomials of the Form $x^2 + bx + c$, pages 80–81

Warm-Up

1. a) $\frac{1}{20}$ **b)** $\frac{15}{8}$
2. 3
3. $y = -\frac{3}{5}x + 2$
4. $m = n = p = 122°$; $q = 58°$
5. 60
6. Answers may vary. Sample answers: $2x + 3$ by $x + 1$ or $3x$ by 4
7. TRINOMIAL
8. $y = -2x^2 - 12x - 22$

Practise

1. a) $(x + 5)(x + 9)$ **b)** $(x - 1)^2$ **c)** $(x + 3)(x + 14)$

2. a) $(x - 5)(x + 12)$ **b)** $(x - 19)(x + 3)$ **c)** $(x - 2)(x + 1)$

3. a)

x^2	x	x	x	x	x	x	x
x	1	1	1	1	1	1	1
x	1	1	1	1	1	1	1

$(x + 7)(x + 2)$

b)

x^2	x	x	x	x	x	x	x	x	x	x
x	1	1	1	1	1	1	1	1	1	1

$(x + 1)(x + 10)$

4. a) $x^2 + 4x + 3$; $(x + 1)(x + 3)$

b) $x^2 + 9x + 20$; $(x + 4)(x + 5)$

5. a) $x(x + 13)$ **b)** $x(x - 1)$

6. a) $(x - 7)(x - 3)$ **b)** $(x + 4)(x - 4)$ **c)** $x(x - 100)$

5.4 Factor Trinomials of the Form $ax^2 + bx + c$, pages 82–83

Warm-Up

1. a) 504 **b)** 324

2. $14x^3 + 10x^2 - 4x$

3. $y = -\frac{1}{2}x + 11$

4. 5.7 cm

5. variance: 1077.81; standard deviation: 32.83

6. $3^5 = 243$

7. congruent figures

8. $(x - 7)(x + 1)$

Practise

1. a) $2(x - 2)(x + 4)$ **b)** $3(x + 6)(x + 1)$ **c)** $6(x - 4)(x - 3)$

2. a) $2(x - 3)(x + 8)$ **b)** $8(x - 5)(x + 4)$ **c)** $-4(x - 2)(x - 1)$

3. a) $1.75(x^2 - 4x - 36)$ **b)** $-2.8(x + 1)(x + 3)$

c) $3.25(x + 8)(x + 8)$

4. a) $7x(x - 5)$ **b)** $-5x(x + 24)$ **c)** $-13.5x(x + 13)$

5. a) $7(x - 3)(x + 3)$ **b)** $-(x - 1)(x + 1)$ **c)** $8.8(x - 5)(x + 5)$

6. a) $8(x - 2)(x + 2)$ **b)** $3(x - 3)(x + 5)$ **c)** $12x(x + 5)$

d) $9(x - 5)(x + 4)$ **e)** $-5.6(x^2 - 5)$ **f)** $3.1(x - 6)(x + 2)$

7. b) $3x^2 + 6x - 9 = 3(x^2 + 2x - 3) = 3(x + 3)(x - 1)$

$5x^2 - 10x - 25 = 5(x^2 - 2x - 5) \neq 5(x - 5)(x - 5)$

5.5 The x-Intercepts of a Quadratic Relation, pages 84–86

Warm-Up

1. 37

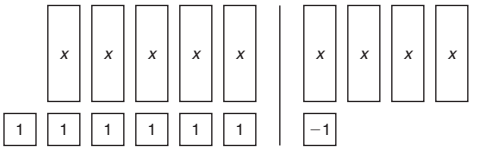
2. $p = \frac{8}{9}$

3. $y = \frac{3}{2}x + 6$

4. 53.8 cm^3

5. $\frac{1}{2}$

6.



7. D

8. $3(x + 2)(x - 5)$

Practise

1. a) x-axis **b)** intercept **c)** vertex **d)** standard

2. a) $x = -2$ and $x = 14$ **b)** $x = -2$ and $x = 4$

3. a) no zeros **b)** $x = -3$ and $x = 3$

4. a) $x = 7$ and $x = -3$ **b)** $x = -5$

c) $x = -1$ and $x = 1$ **d)** $x = 0$ and $x = 100$

5. a) $x = -6$ and $x = 3$ **b)** $x = -3$ and $x = 2$

c) $x = 1$ and $x = 5$ **d)** $x = -4$ and $x = 4$

6. a) $y = 2x^2 + 16x + 30$; $y = 2(x + 3)(x + 5)$; two

b) $y = x^2 + 8x$; $y = x(x + 8)$; two

c) $y = 3x^2 + 6x - 9$; $y = 3(x - 1)(x + 3)$; two

d) $y = -2x^2 - 4x + 16$; $y = -2(x - 2)(x + 4)$; two

7. a) one **b)** two **c)** none

8. a) $x^2 - 2x - 3$ **b)** $(x - 3)(x + 1)$

c)

y	Vertex Form: $y = (x - 1)^2 - 4$	Standard Form: $y = x^2 - 2x - 3$	Intercept Form: $y = (x - 3)(x + 1)$
−2	5	5	5
−1	0	0	0
0	−3	−3	−3
1	−4	−4	−4
2	−3	−3	−3
3	0	0	0
4	5	5	5
5	12	12	12

5.6 Solve Problems Involving Quadratic Relations, pages 87–88

Warm-Up

1. a) 2413 **b)** 524

2. $9b^2 - 6b - 10$

3. $y = -\frac{1}{4}x + 3$

4. $s = 53°$; $t = 64°$

5. mean: 12.9; median: 13.5; mode: 6, 15, 19

6. $C = 6n + 1200$

7. population: students in Annie's grade; sample: students in Annie's class

8. $x = -4$ and $x = 1$

Practise

1. a) $x = -10$ and $x = 1$ **b)** $x = 2$ and $x = -1$

2. a) $y = (x - 7)(x + 6)$ **b)** $y = 3(x - 3)(x + 12)$

3. a) $x = -9$ and $x = 5$ **b)** $x = -6$ and $x = 3$

c) $x = -12$ and $x = 12$ **d)** $x = -4$ and $x = 8$

4. **a)** $x = 4$ **b)** $x = -2$

5. **a)** $x = 7$ **b)** $x = -9$ **c)** $x = -4.5$
d) $x = 18$ **e)** $x = 3$ **f)** $x = 0.5$

Chapter 5 Review, pages 89–90

1. **a)** $x^2 + 11x + 30$ **b)** $x^2 + 2x + 1$
c) $x^2 - 25$ **d)** $6x^2 - 24$

2. $17x^2 - 12x + 20$

3. **a)** $y = 7x^2 + 42x + 70$
b) $y = -4x^2 + 40x - 99$
c) $y = 0.25x^2 - 6x + 30$

4. **a)** $y = 52$ **b)** $y = -20$

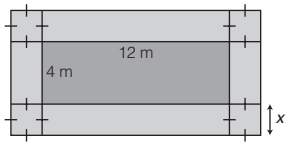
5. **a)** $(x + 2)(x + 2)$ **b)** $(x + 4)(x + 9)$
c) $x(x - 16)$ **d)** $(x - 1)(x + 1)$
e) $(x - 3)(x + 1)$ **f)** $(x - 3)(x + 16)$

6. **a)** $6(x + 4)(x + 6)$ **b)** $-3(x - 2)(x + 3)$
c) $-14x(x - 30)$ **d)** $5(x - 15)(x + 3)$
e) $-1(x - 10)(x + 10)$ **f)** $-13x(x + 17)$

7. **a)** $x = -11$ and $x = 11$ **b)** $x = -3$ and $x = -4$

8. **a)** $3x^2 + 18x + 24$; $x = -4$ and $x = -2$
b) $-2x^2 - 28x - 80$; $x = -10$ and $x = -4$

9. **a)**



b) $y = 4x^2 + 32x + 48$ **c)** about 2.8 m

Chapter 6 Geometry in Design

Get Set, page 91

1. **a)** circle **b)** rectangle **c)** cylinder **d)** rectangular prism

2. perimeter: 31.4 in.; area: 78.5 in.^{2}

3. **a)** 4900 cm^2 **b)** 30 000 mL

4. 50°

5. foremast: 22 m; topmast: 33 m

6.1 Investigate Geometric Shapes and Figures, pages 92–94

Warm-Up

1. **a)** B **b)** D **c)** A **d)** C

2. **a)** $3(x + 3)(x + 5)$ **b)** $3(x + 2)(x - 1)$

3. 10 and −1

4. C

5. mean: 6; median: 2; mode: 4

6. 384 cm^2

7. **a)** square **b)** regular octagon

8. 65°, 115°, 115°

Practise

1. Answers may vary.

2. **a)** and **c)**

3. 3 × 5 in.

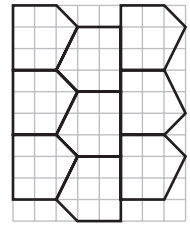
4. ACJG

5. Her claims are true; $\frac{195}{120} = 1.625$, $\frac{120}{75} = 1.6$; both are very close to the golden ratio

6. 6.5 in.

7. 9:16

8. Answers may vary. Sample answer:



6.2 Perspective and Orthographic Drawings, pages 95–97

Warm-Up

1. **a)** 3.41 **b)** 411.05 **c)** 88.70 **d)** 64.71

2. **a)** $3x^2 - 42x + 191$ **b)** $x^2 + 26x - 40$

3. x-intercepts: −4 and 2; y-intercept: −4

4. **a)** 360° **b)** 360°

5. 0.6

6. $x^2 + 2x$

7. ISOMETRIC

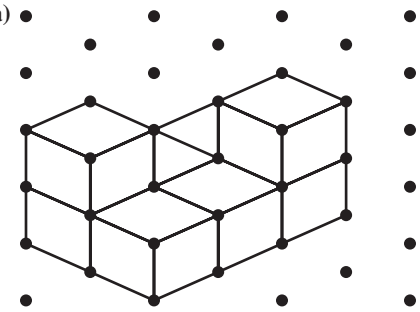
8. 12.4 cm wide

Practise

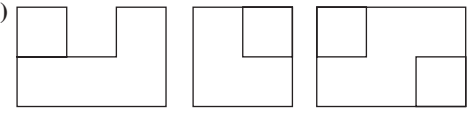
1. A; it would be easier to visualize the statue from a model than from two-dimensional drawings.

2. **a)** B **b)** front view: A; side view: A, C

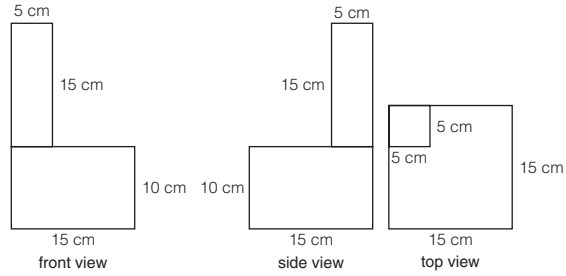
3. **a)**



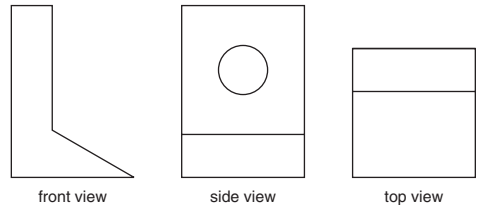
b)



4.



5.



6.3 Create Nets, Plans, and Patterns, pages 98–100

Warm-Up

1. **a)** $\frac{9}{31}$ **b)** cannot simplify **c)** $\frac{3}{8}$ **d)** $\frac{73}{100}$

2. **a)** $12x^2 - 56x + 64$ **b)** $10x^2 - 103x - 77$

3. two

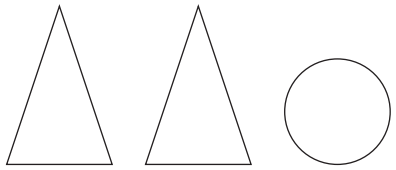
4. 48 m

5. mean: 10.07; median: 11; mode: 12

6. 2 mm by 10 mm

7. Answers may vary. Sample answers:
a) dice **b)** tennis ball

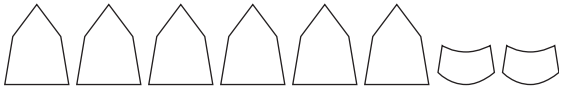
8.



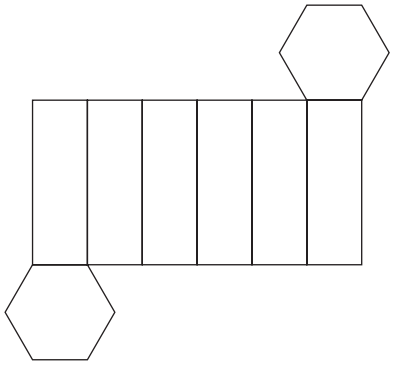
Practise

1. A plan; it would show what the final bookcase should look like and how the pieces fit together.

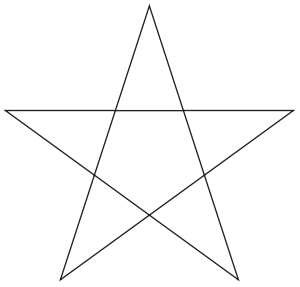
2. Answers may vary. Sample answer:



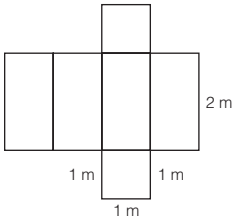
3. Answers may vary. Sample answer:
a)



b)

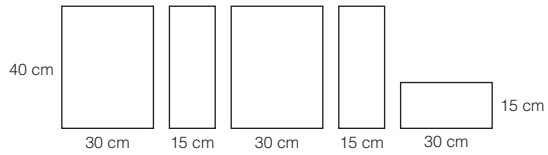


4. Answers may vary. Sample answer:

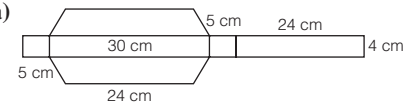


5. A and C. B folds all the triangles around one vertex, so it cannot form a tetrahedron.

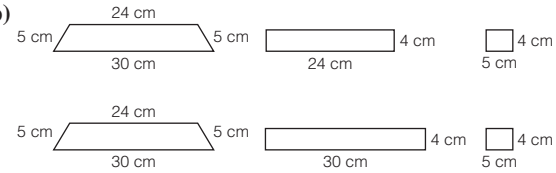
6.



7. Answers may vary. Sample answer:
a)



b)



6.4 Scale Models, pages 101–103

Warm-Up

1. **a)** 36 **b)** 42 **c)** 3.4

2. **a)** $2(x + 6)(x + 4)$ **b)** $-5(x - 16)(x + 2)$

3. −110

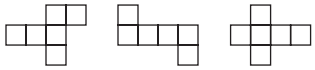
4. all the words apply

5. 0.3

6. $x = 16$ cm

7. C

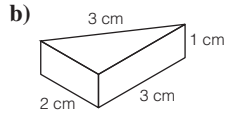
8. Answers may vary. Sample answers.



Practise

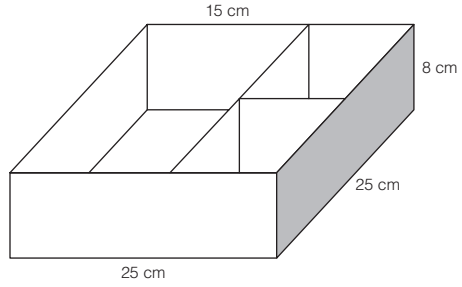
1. **a)** height: 1 cm; base: 2 cm, 3 cm, 3 cm

b)



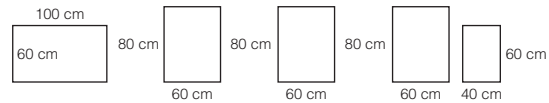
2. 40 in. long, 20 in. wide, 18 in. tall

3. Answers may vary. Sample answer:



4. **a)** D **b)** The diameter is 40 m and the pyramid has a square base.

5.



6.5 Solve Problems With Given Constraints, pages 104–106

Warm-Up

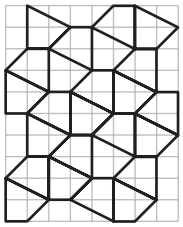
1. Estimates may vary. **a)** 30 **b)** 67 **c)** −30
2. **a)** $y = -x^2 + 6x + 8$ **b)** $y = -12x^2 - 36x - 24.7$
3. $y = -2(x + 2)^2 + 8$
4. 1800 cm^3
5. 0.6
6. 96.8 cm^2
7. a right isosceles triangle
8. 14 cm tall, 2.5 cm wide, 8.5 cm long

Practise

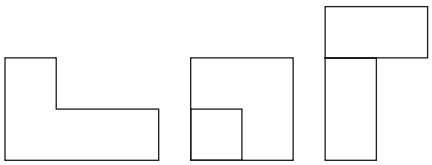
1. **a)** cube with side length 0.7 m **b)** 0.3 m^3
2. **a)** radius: 5.98 cm, height: 11.97 cm **b)** 2073 cm^3
3. **a)** 908 cm^2, 1257 cm^2, 1590 cm^2
b) 36 cm, 42 cm, 47 cm
c) 3456 cm^3, 4536 cm^3, 5546 cm^3
4. **a)** 217 ft **b)** 307 ft
c) Doubling the radius more than doubles the area, so the radius in part b) does not need to be double the radius in part a).
5. **a)** 3 ft; she needs a minimum width of 30 in.
b) 8-ft; three 8-ft lengths will cover the 23 ft.
6. **a)** length: 20 cm, width: 10 cm, height: 20 cm **b)** $25

Chapter 6 Review, page 107–108

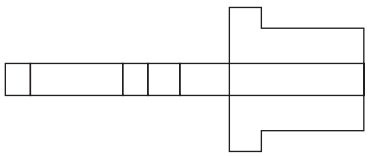
1. decrease the width to 52.5 mm
2. Answers may vary. Sample answer:



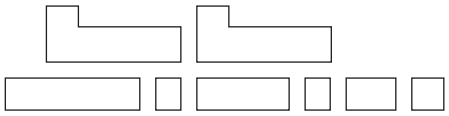
3.



4. Answers may vary. Sample answer:
a)



b)



5. **a)** 1 cm represents 0.2 m **b)** 40 cm by 50 cm
6. **a)** circle **b)** $2570

Chapter 7 Exponents

Get Set, page 109

1. **a)** 5^3 **b)** $(-2)^5$ **c)** $(-3)^6$ **d)** $\left(\frac{1}{4}\right)^5$
2. **a)** 36 **b)** 81 **c)** −128 **d)** −8 **e)** −1024
3. **a)** slope: 2, y-intercept: 1 **b)** slope: $\frac{1}{2}$, y-intercept: −5
c) slope: −3, y-intercept: 0
4. $y = 2x + 100$
5. **a)** $P = 2443.34$ **b)** $V = 62.83$ m^3
6. **a)** translated 3 units right
b) translated 1 unit left and 2 units down
c) reflected in the x-axis and compressed vertically by a factor of 5

7.1 Exponent Rules, pages 110–111

Warm-Up

1. **a)** 0.29 **b)** 0.031 **c)** 2.35
2. $x = 3$
3. slope: −3, y-intercept: 1
4. $A = 54$ cm^2; $P = 32.5$ cm
5. $\frac{3}{8}$
6. $E = h + 5$
7. A
8. (−1, −5)

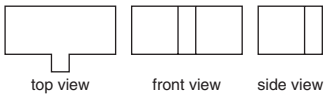
Practise

1. **a)** 2^5; 32 **b)** $(-4)^3$; −64 **c)** $(-1)^6$; 1 **d)** $\left(\frac{3}{4}\right)^6$; $\frac{729}{4096}$
2. **a)** 7^2; 49 **b)** 3^2; 9 **c)** $(-4)^3$; −64 **d)** $3^5 = 243$
3. **a)** 2^8; 256 **b)** $(-2)^6$; 64 **c)** $\frac{1}{4^6}$; $\frac{1}{4096}$ **d)** $(-1)^{20}$; 1
4. **a)** $27 \times 9 = 243$ or $3^5 = 243$
b) $\frac{625}{125} \times 25 = 5 \times 25$ or $5 \times 5^2 = 5^3$
$= 125$ $= 125$
5. **a)** 6^5; 7776 **b)** $(-5)^6$; 15 625 **c)** $\left(\frac{8}{9}\right)^2 = \frac{64}{81}$
d) $\left(-\frac{3}{5}\right)^3 = -\frac{27}{125}$
6. Answers may vary. Sample answers:
a) $9^2 \times 9^5$ or $9^3 \times 9^4$ **b)** $3^{11} \div 3^3$ or $3^{15} \div 3^7$

7.2 Zero and Negative Exponents, pages 112–113

Warm-Up

1. $\frac{3}{10}, \frac{3}{8}, \frac{2}{3}, \frac{4}{5}$
2. $x^2 + 8x + 15$
3. **a)** quadratic **b)** quadratic **c)** linear
4.



5. mean: 16.5; median: 17; mode: 22
6. $10
7. TRIGONOMETRY
8. **a)** 6^9 **b)** $(-4)^8$ **c)** $(-5)^8$

Practise

1. **a)** 8^{-7} **b)** $\left(\frac{1}{6}\right)^{-5}$ **c)** $\left(\frac{1}{4}\right)^{2}$ **d)** 3^{6}

2. **a)** 8, $\frac{1}{8}$ **b)** 16, $\frac{1}{16}$ **c)** 100 000, $\frac{1}{100\,000}$ **d)** 64, $\frac{1}{64}$

3. **a)** -27 **b)** $\frac{1}{400}$ **c)** 1

d) $\frac{1}{10\,000}$ **e)** 1 **f)** 16

4. **a)** 10^{3}; 1000 **b)** $\left(\frac{1}{6}\right)^{-2}$; 36 **c)** 3^{6}; 729

d) 2^{-6}; $\frac{1}{64}$ **e)** $\left(\frac{1}{5}\right)^{-3}$; 125 **f)** $(-5)^{2}$; 25

5. **a)** $\frac{5^{4}}{5^{2}}$; 25 **b)** $\frac{7^{3}}{7^{2}}$; 7 **c)** $\frac{2^{7}}{2^{5}}$; 4 **d)** $\frac{9^{4}}{9^{2}}$; 81

7.3 Investigate Exponential Relationships, pages 114–116

Warm-Up

1. **a)** 1000 **b)** 7000 **c)** 32 700

2. -10

3. maximum; -6

4. $x = 5.9$ cm

5. **a)** $\frac{1}{2}$ **b)** $\frac{7}{8}$

6. **a)** 25 mg **b)** 3.125 mg

7. square-based pyramid

8. **a)** $\frac{1}{125}$ **b)** 1 **c)** $\frac{16}{9}$

Practise

1. b); a) is linear

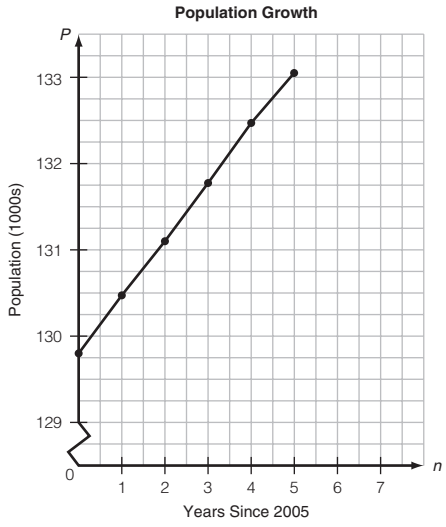
2. c) and d); a) is linear, b) is quadratic

3.

Time (years)	Value ($)
0	30 000.00
1	22 500.00
2	16 875.00
3	**12 656.25**
4	**9492.19**
5	**7119.14**

4.

n	*P*
0	129 800
1	130 449
2	**131 101**
3	**131 757**
4	**132 416**
5	**133 078**
6	**133 743**



5. **a)** exponential **b)** quadratic **c)** quadratic **d)** linear

6. **a)** $\frac{1}{2}$ **b)** 6 days

7.4 Exponential Relations, pages 117–119

Warm-Up

1. **a)** -13 **b)** 42

2. $x = 12$

3.

x	*y*
-4	**256**
-3	**64**
-2	**16**
-1	**4**
0	**1**
1	**0.25**

4. $x = 26.2$ cm

5. 0.25

6. 28 dots

7. The slope of a linear relation is a measure of the steepness of the line. It is the ratio of the vertical distance between two points (the rise) and the horizontal distance between the same two points (the run).

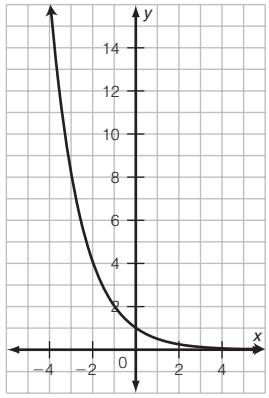
8. $y = 4^{x}$

Practise

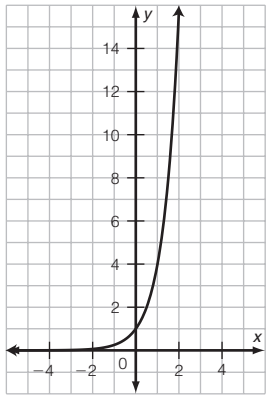
1. **a)** exponential **b)** quadratic **c)** linear

2. The graphs are reflections of each other through the *y*-axis.

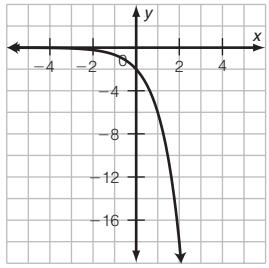
3. a)



b)

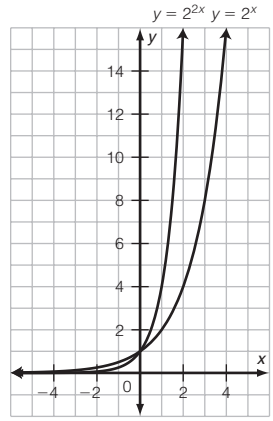


c)



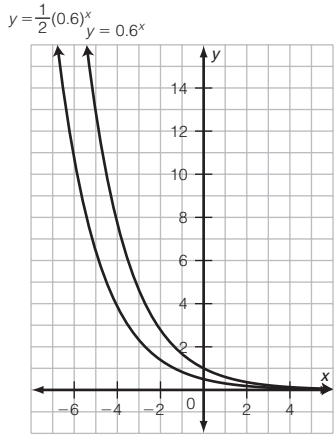
4. a)

x	$y = 2^x$	$y = 2^{2x}$
−2	$\frac{1}{4}$	$\frac{1}{16}$
−1	$\frac{1}{2}$	$\frac{1}{4}$
0	1	1
1	2	4
2	4	**16**
3	**8**	**64**
4	**16**	**256**



b)

x	$y = (0.6)^x$	$y = \frac{1}{2}(0.6)^x$
−6	**21.43**	**10.72**
−5	**12.86**	**6.43**
−4	**7.72**	**3.86**
−3	**4.63**	**2.31**
−2	**2.78**	**1.39**
−1	**1.67**	**0.83**
0	1	0.5
1	0.6	0.3
2	**0.36**	**0.18**



5. 1965

7.5 Modelling Exponential Growth and Decay, pages 120–122

Warm-Up

1. a) about 8 **b)** about 100 **c)** about 10

2. $(x + 11)(x - 1)$

3. $y = \frac{1}{3}x + 2$

4. $a = 55°$

5. Answers may vary. Sample answers:
a) selecting a blue token **b)** selecting a purple token

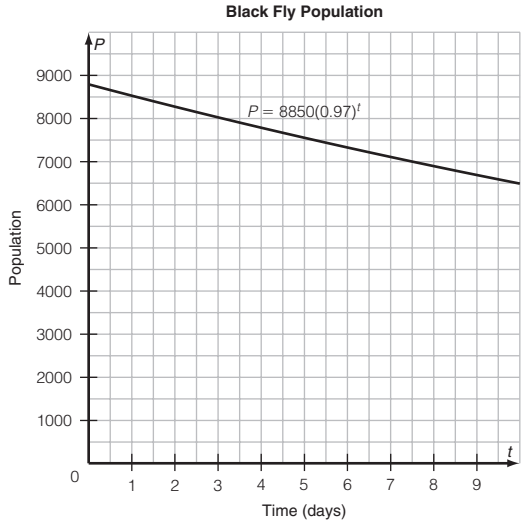
6. $238 = 2h + 8$

7. The height is the perpendicular distance from the vertex to the base. The slant height is the distance from the vertex to the edge of the base.

8. (0, –2)

Practise

1. a) Graphs may vary.



b) 8850 black flies **c)** 7151 black flies
d) about 22.5 days

2. a) 1500 elk **b)** 1129 elk **c)** about 24 years

3. a) \$12 000; the amount Joel invested **b)** about \$14 600

4. a) $P = 4.5(1.02)^t$, where P is the population in billions and t is the number of years since 1980
b) 9 billion people
c) 3.7 billion people; assume the population increased at the same rate prior to 1980
d) 2023

5. a) $A = 1000(0.94)^t$ **b)** 539 g **c)** after 63 days

7.6 Solve Problems Involving Exponential Growth and Decay, pages 123–124

Warm-Up

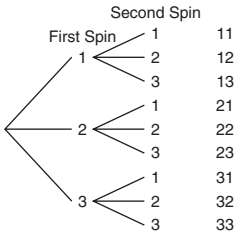
1. a) 0.875 **b)** $0.\overline{4}$ **c)** $0.1\overline{3}$

2. $6x(x + 3)$

3. reflected in the x-axis, translated 3 units right and 1 unit down

4. 112.5 cm^3

5.



6. a) –486, 1458, –4374 **b)** 33, 65, 129

7. obtuse angle

8. a) 400 cells **b)** 76 441 cells

Practise

1. a) 0.500 **b)** 0.298

2. a) the time it takes for the population of penguins to double **b)** 962 penguins

3. 108.864 W/cm^2

4. a) $P = 19\,800(0.93)^t$ **b)** 14 811 people **c)** 2016

Chapter 7 Review, pages 125–126

1. a) 4^3; 64 **b)** $\left(\frac{1}{3}\right)^5; \frac{1}{243}$ **c)** $(-5)^4$; 625
d) $\left(-\frac{1}{2}\right)^7; \frac{1}{128}$ **e)** $(-3)^1$; –3 **f)** $\left(\frac{1}{4}\right)^4; \frac{1}{256}$

2. a) 1 **b)** $\frac{1}{6}$ **c)** $\frac{1}{9}$ **d)** $\frac{1}{25}$ **e)** $\frac{1}{256}$ **f)** $\frac{27}{64}$

3. a) 12 000 bacteria **b)** 24 000 bacteria
c) 384 000 bacteria

4. a) C **b)** A **c)** D **d)** B

5. a) normal conversation: $P = 20 \times 10^3$; rock concert: $P = 20 \times 10^6$; the sound pressure at a rock concert is 10^3 times of the sound pressure of normal conversation
b) $P = 20 \times 10^8$

6. a) 1300 rabbits **b)** 1400 rabbits

7. a) about 77% **b)** about 360 s

8. a) 2 h **b)** 125 mg **c)** 6 h

Chapter 8 Compound Interest

Get Set, page 127

1. a) 1458 **b)** 12 272 **c)** 3430

2. a) 0.15 **b)** 0.065 **c)** 0.0113
d) 0.464 **e)** 0.003

3. a) 0.015 **b)** 0.15 **c)** 0.01

4. a) 4 **b)** 180 **c)** 384

5. a) 1.413 **b)** 8811.708 **c)** 0.437

6. a) \$33.75 **b)** \$120

7. \$6200

8.1 Simple and Compound Interest, pages 128–130

Warm-up

1. a) 20 **b)** 0 **c)** 80

2. a) $-x + 3$ **b)** $x + 3$ **c)** $3x - 5$

3. –3 and –4

4. 785.4 m^3

5. a) $\frac{1}{2}$ **b)** $\frac{7}{30}$

6. 961

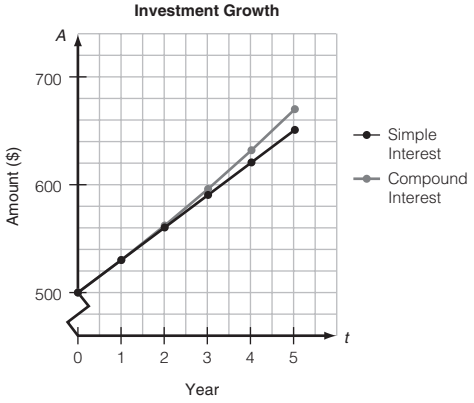
7. convenience sample

8. a) \$240 **b)** \$90

Practise

1.

Year	Simple Interest Amount ($)	Compound Interest Amount ($)
0	500	500
1	530	530
2	**560**	**561.80**
3	**590**	**595.51**
4	**620**	**631.24**
5	**650**	**669.11**

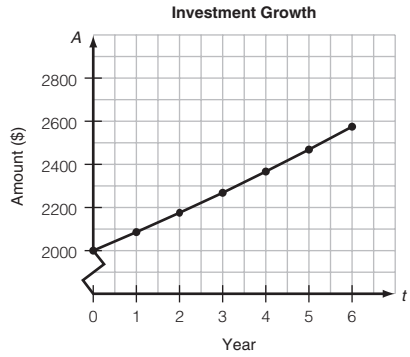


2.

Year	Value of Peng Hao's Investment ($)	Value of Peng Jin's Investment ($)
0	1000	1000
1	**1050**	**1050**
2	**1100**	**1102.50**
3	**1150**	**1157.63**
4	**1200**	**1215.51**
5	**1250**	**1276.28**

3. a)

Year	Value ($)
1	**2086.00**
2	**2175.70**
3	**2268.25**
4	**2366.83**
5	**2468.60**
6	**2574.75**



b) It grows faster.

4. a) about $1010 **b)** about 20 years

c) The new graph would not be as steep.

5. $153.36

8.2 Compound Interest, pages 131–133

Warm-up

1. a) $\frac{3}{5}$ **b)** $\frac{18}{25}$ **c)** $\frac{21}{50}$ **d)** $\frac{111}{200}$

2. a) $6x$ **b)** $-2x$ **c)** y

3. a) $y = \frac{1}{2}x + \frac{3}{2}$ **b)** $y = \frac{1}{3}x - \frac{2}{3}$

4. 1080 m^3

5. $\frac{1}{6}$

6. $1400

7. mode

8. $13 498.37

Practise

1. a) 874.18 **b)** 1766.36 **c)** 5723.89 **d)** 3587.66

2. a) $P = 4000$, $i = 0.06$, $n = 5$, $A = \$5352.90$

b) $P = 1200$, $i = 0.042$, $n = 7$, $A = \$1600.50$

3. a) $1344.89 **b)** $1279.02

4. a) $5978.09 **b)** $978.09

5. a) $7422.23, $7869.92 **b)** $474.70 **c)** $600.02

6. a) $10 067.62 **b)** $10 127.41

c) $10 158.61 **d)** $10 179.93

e) $10 188.24 **f)** $10 190.39

7. a) $3634.64 **b)** $5335.10

8. a) Rate 2 **b)** $737.53 less

8.3 Present Value, pages 134–136

Warm-up

1. a) 7.93 **b)** 794.30 **c)** 0.14 **d)** 0.00

2. a) $y = 8$ **b)** $x = 2$ **c)** $x = -6$ **d)** $x = -5$

3. x-intercept at 4, y-intercept at -2

4. a) 81.68 cm **b)** 60 m

5. $\frac{1}{12}$

6. 36

7. outliers

8. $3772.45

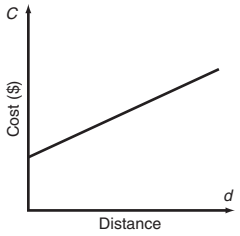
Practise

1. **a)** 5311.59 **b)** 619.36
2. **a)** $A = 3000$, $n = 6$, $i = 0.03$, $P = \$2512.45$
b) $A = 995$, $n = 8$, $i = 0.025$, $P = \$816.64$
c) $A = 12\,250$, $n = 168$, $i = 0.0042$, $P = \$6092.02$
d) $A = 9800$, $n = 8$, $i = 0.04$, $P = \$7160.76$
3. \$1800
4. \$894.39
5. \$16 892.61
6. **a)** \$20 670.26 **b)** \$4329.74
7. \$20 139.07
8. \$5656.33
9. \$37 143.98
10. Plan A
11. **a)** 20 years **b)** 5 years

8.4 The TVM Solver, pages 137–138

Warm-Up

1. **a)** 45 **b)** 200 **c)** 104
2. **a)** $a = 7$ **b)** $b = -3$ **c)** $c = 2$ **d)** $d = 12$
3. Graphs may vary. Sample graph:



4. 23.1 m
5. $\frac{1}{6}$
6. either order
7. range
8. \$7718.52

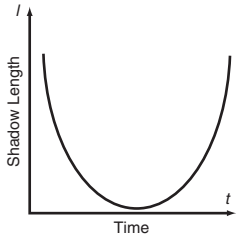
Practise

1. **a)** N = 8, I% = 3.8, PV = 4500, C/Y = 4
b) \$6089.97
2. \$10 074.37
3. \$55 203.34
4. 66 months
5. \$24 460.32, \$17 120.11

8.5 Effects of Changing the Conditions on Investments and Loans, pages 139–140

Warm-up

1. $\frac{1}{8}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}$
2. **a)** $x = \frac{3 - y}{2}$ **b)** $x = 2 - y$ **c)** $x = \frac{-1 - 2y}{3}$ **d)** $x = \frac{5 - 2y}{2}$
3. Graphs may vary. Sample graph:



4. 18.5 m
5. $\frac{1}{4}$
6. 5 and 11
7. curve of best fit
8. 4 years and 9 month

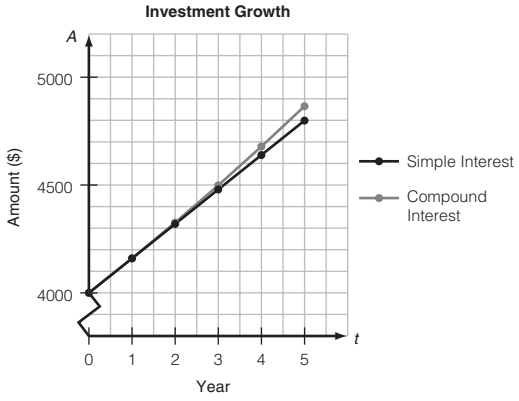
Practise

1. the graph becomes steeper; the value of the investment is growing faster
2. **a)** \$40 243.93 **b)** \$40 665.88 **c)** \$41 015.02
d) \$41 071.61 **e)** \$41 086.23
3. **a)** \$4529.75 **b)** \$4438.56
4. **a)** \$49 824.00 **b)** \$51 553.59
5. **a)** \$14.40 **b)** \$21.89 c) \$27.00
6. Plan A; it will earn the most interest: \$990 compared to Plan B, \$973.14, and Plan C, \$940.37

Chapter 8 Review, pages 141–142

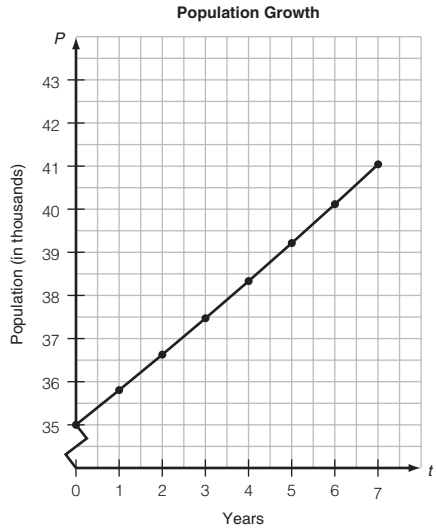
1.

Year	Amount at 4% Simple Interest ($)	Amount at 4%, Compounded Annually ($)
0	**4000**	**4000.00**
1	**4160**	**4160.00**
2	**4320**	**4326.40**
3	**4480**	**4499.46**
4	**4640**	**4679.43**
5	**4800**	**4866.61**



2. a)

Year	Population
0	**35 000**
1	**35 805**
2	**36 628**
3	**37 471**
4	**38 333**
5	**39 214**
6	**40 116**
7	**41 039**



b) The rate of growth would be slower, thus flattening out the graph more.

3. a) \$1077.48 **b)** \$10 460.77
4. \$17 567.66
5. \$18 115.13
6. \$7134.96
7. approximately 9 years
8. \$9396.78
9. a) \$19 152.95 **b)** \$20 087.08

Chapter 9 Personal Finance

Get Set, page 138

1. a) 33.32 **b)** 36.7 **c)** 51 191.25 **d)** 206.77
2. a) 0.7 **b)** 0.455 **c)** 0.328
3. a) 800 **b)** 150 **c)** 300 **d)** 4.6
4. a) 0.0625 **b)** 0.000 015 258 789 062 5
c) 17.085 937 5 **d)** 6.561×10^{-13}
5. a) $n = 8$ **b)** $n = 730$ **c)** $n = 12$ **d)** $n = 60$

9.1 Savings Alternatives, pages 139–140

Warm-Up

1. a) –9 **b)** $\frac{11}{28}$
2. a) $5x + 5y$ **b)** $-x + 6y$
3. $-\frac{1}{5}$
4. $x = 14.15$ m
5. a) $\frac{2}{3}$ **b)** $\frac{1}{3}$
6. $V_1 = 2V_2$, where V_1 is the volume of the first cylinder and V_2 is the volume of the second cylinder.
7. True
8. a) 1450 **b)** 9.34

Practise

1. a) \$5.95 **b)** \$8.45 **c)** \$9.95 **d)** \$12.45
2. a) 7 to 13 transactions
b) Option 2. The monthly fees are the lowest given his average monthly transactions.
c)

	Total Cost (\$)	Cost per Transaction (\$)
Option 1	11.95 to 17.95	1.71 to 1.38
Option 2	7.95 to 10.20	1.14 to 0.78
Option 3	12.95 to 14.45	1.85 to 1.12

d) Answers may vary. Sample answer: Make only 1 transaction per week.
3. a) \$162.50 **b)** \$487.50
c) i) \$325.54 **ii)** \$2297.88 **iii)** \$3972.30

9.2 Investment Alternatives, pages 141–142

Warm-Up

1. a) 16 **b)** 9 **c)** 2.45 **d)** 51.84
2. a) $4x + 7$ **b)** $3x + 9y + 4z$
3. 0; undefined
4. D
5. mean: 9.4; median: 9.5; mode: 8
6. $8x = 35$
7. median
8. \$11.70

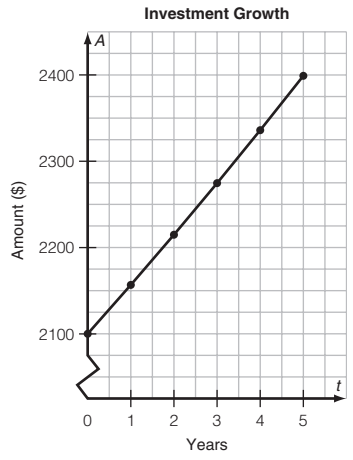
Practise

1. a) 0.07 **b)** 0.0425 **c)** 0.065 **d)** 0.0391
2.

	r (%)	Compounding Frequency	*i*
a)	8.0	**semi-annually**	0.04
b)	**4.015**	daily	0.000 11
c)	4.4	quarterly	**0.011**
d)	**6**	monthly	0.005

3. a) \$2604.62 **b)** \$5519.91 **c)** \$18 511.61
4. \$1524.75

5. a) \$2157.08 **b)** \$2215.72
c) FV = $2100(1.0135)^t$ **d)** \$2401.36
e)



9.3 Manage Credit Cards, pages 143–144

Warm-Up

1. a) 46 **b)** 61
2. a) $3(x + 1)$ **b)** $2x(x - 2)$ **c)** $(x + 1)(x + 4)$
3. $x = -3$, $x = 2$
4. 100.85 m
5. $\frac{1}{2}$
6. square; 9 cm^2 more
7. midpoint
8. \$5952.10

Practise

1. a) 0.0499% **b)** 0.08192% **c)** 0.0134%
2. a) \$735.93 **b)** \$743.03 **c)** \$727.92
3. a) \$129.36 **b)** \$412.30 **c)** \$20
d) \$1087.70 **e)** 0.0353%

9.4 Obtain a Vehicle, pages 145–146

Warm-Up

1. a) $\frac{1}{4}, \frac{1}{3}, \frac{2}{5}, \frac{4}{7}, \frac{7}{8}$ **b)** −3.91, −3.02, 3.01, 3.11, 3.13
2. a) $(x + 1)(x + 9)$ **b)** $6(x^2 + 9)$
3. (0, 0)
4. $x = 33.87°$
5. 20.67
6. $9\pi x^2 - x^2$
7. C
8. \$29.28

Practise

1. a) \$33 054.30 **b)** \$13 674.30 **c)** \$37 614.30
2. a) \$18 360 **b)** \$9072
3. a) \$268.12 **b)** \$18 587.20 **c)** \$1492.90
4. a) \$17 160 **b)** \$357.50
5. a) \$242.74 **b)** \$14 564.40 **c)** \$2592.40

9.5 Operate a Vehicle, pages 147–148

Warm-Up

1. a) 2.35 **b)** −100.54 **c)** 94.00
2. a) 3 **b)** 15 **c)** −75
3. exponential relation
4. $x = 8.45$ cm
5. when the set of data is large and has a normal distribution
6. $x = 5$, $y = 2$
7. radius
8. \$20 514.30

Practise

1. a) \$11.21 **b)** \$53.10 **c)** \$97.94
2. a) 792 km **b)** 849 km **c)** 692 km
3. a) Her car can travel 100 km on 6.7 L of gas.
b) 746.27 km **c)** 40.2 L
4. a) \$3300 **b)** \$50
5. a) \$3020 **b)** 18% **c)** 44.7%
6. a) 12.4 km/L **b)** 19.8 km/L **c)** 43.7 km/L
7. a) \$26 624.11
b) $V = 54\,000(0.79)^t$, where V is the value of the sedan, in dollars, and t is the time, in years.
c) i) \$13 126.72 **ii)** \$3190.94

Chapter 9 Review, pages 149–150

1. a) \$3.95 **b)** \$8.95 **c)** 11.95
2. a) \$2207.49 **b)** \$1304.07 **c)** \$15 132.18 **d)** \$1652.85
3. a) \$6253.92 **b)** \$14 854.02 **c)** \$1061.95
4. \$9853.08
5. a) 0.0216% **b)** 0.0359% **c)** 0.0890% **d)** 0.0347%
6. a) \$1211.74 **b)** \$1219.53 **c)** \$1249.04 **d)** \$1218.86
7. a) \$26 532 **b)** \$552.75
8. a) \$13 338.00 **b)** \$10 538 **c)** \$198.38
9. a) 47.87 km/L **b)** 10.65 km/L