CHAPTER 1 TEST ANSWERS

1. Answers may vary, e.g.,
   a) $6^2 - 1^2 = 36 - 1 = 35$
      $7^2 - 2^2 = 49 - 4 = 45$
      $15^2 - 10^2 = 225 - 100 = 125$
      $(-3)^2 - 2^2 = 9 - 4 = 5$
   b) Hilary's conjecture is reasonable since all the evidence supports it. Each difference ends with the digit 5 in the ones place.

2. Possible conjecture: More people shop on their way home from work than later in the evening. This conjecture is reasonable because more people get off work between 4 and 7 p.m. than between 7 and 10 p.m. The increased number of shoppers that Denyse notices between 4 and 7 p.m. could be people stopping on their way home from work.

3. No. Heather's conjecture is not reasonable because it doesn't always work. For example, the sum of 8 and 24 is a multiple of 8. The sum of 12 and 20 is a multiple of 8. But the sum of 8 and 12 is not a multiple of 8. This is a counterexample to the conjecture.

4. Answers may vary, e.g.,

Let x and $x + 1$ be two consecutive numbers.	Given
$x^2 + (x + 1)^2$	Write an expression for the sum of two consecutive perfect squares.
$x^2 + x^2 + 1x + 1x + 1$	Simplify the expression.
$2x^2 + 2x + 1$	Combine like terms.
$2(x^2 + x) + 1$	Factor.
$2(x^2 + x)$	Twice any number is even.
$2(x^2 + x) + 1$	One more than any even number is odd.

5.

Choose any number.	d	
Add 3.	$d + 3$	
Multiply by 2.	$2d + 6$	$[2(d + 3) = 2d + 6]$
Add 6.	$2d + 12$	$[2d + 6 + 6 = 2d + 12]$
Divide by 2.	$d + 6$	$\left[\frac{(2d + 12)}{2} = d + 6\right]$
Subtract your starting number.	6	$[d + 6 - d = 6]$

6. Judd's argument is not reasonable because the second statement cannot be interpreted as *only* places above the Arctic Circle have cold, snowy winters. Since his interpretation is false, his conclusion is invalid.

7. No, the proof is not valid because $a - b$ equals zero and division by zero is undefined.

CHAPTER 2 TEST ANSWERS

1. **a)** Yes; alternate exterior angles
b) Yes; alternate interior angles
c) No; these angles would be equal even if AB and CD were *not* parallel.
d) Yes; interior angles on same side of transversal
e) Yes; corresponding angles

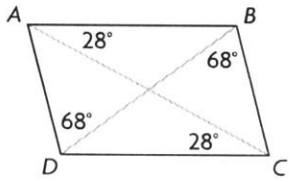
2. Answers may vary, e.g.,

$\angle BQR = 124°$	Supplementary angles
$\angle BQR = \angle SRD = 124°$	Given
$AB \parallel CD$	Corresponding angles are equal.

3. Answers may vary, e.g.,

$\angle ABE = \angle DEB$	Given
$AC \parallel FD$	Alternate interior angles are equal.
$\angle FEH + \angle GHE = 180°$	Given
$FD \parallel GI$	Interior angles on same side of transversal are supplementary.
$AC \parallel GI$	Transitive property

4.

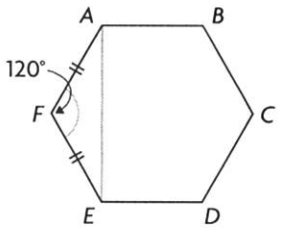


5.

$\angle QTS = 29°$	Supplementary angles
$\angle QST = 68°$	Sum of measures of angles in a triangle
$\angle PQT = 29°$	Alternate interior angles
$\angle RQS = 68°$	Alternate interior angles

6. 147°

7. Answers may vary, e.g.,



$\angle FAB = \angle AFE = \angle FED = 120°$	Sum of measures of interior angles of a regular hexagon is 720°.
$AF = FE$	Sides of a regular hexagon
$\angle FAE = \angle FEA = 30°$	$\triangle AFE$ is isosceles.
$\angle EAB = \angle DEA = 120° - 30° = 90°$	Adjacent angles
$AB \parallel ED$	Interior angles on same side of transversal are supplementary.

CHAPTER 3 TEST ANSWERS

1. **a)** $a = 73.9$ cm, $b = 40.3$ cm
b) $\theta = 51°$

2. **a)** $\angle B = 60°$, $\angle C = 32°$, $b = 13$ cm
b) $\angle D = 65°$, $\angle E = 43°$, $f = 8.4$ cm

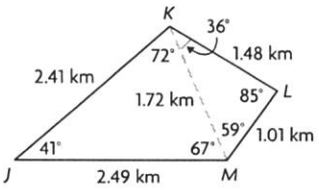
3. 22°

4. 5.3 km

5. 673 m

6. The angle opposite the 30 cm side is about 58°.
The angle opposite the 35 cm side is about 80°.
The angle opposite the 24 cm side is about 42°.

7. 7.40 km

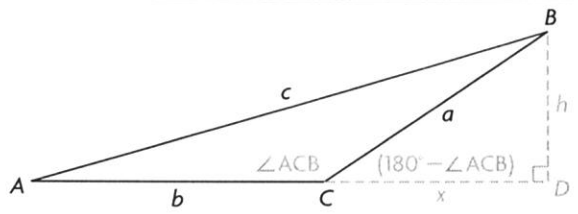


CHAPTER 4 TEST ANSWERS

1. **a)** $\theta = 36.8698...°$
b) $\theta = 148.4298...°$
c) $\theta = 47.3241...°$ and $132.6758...°$

2. **a)** $\theta = 121.2875...°$ **b)** $x = 7.9460...$ mm

3.



$\triangle ABD$ $\quad$ $\triangle CBD$	Nathan made a mistake on the step for the Pythagorean theorem. Because he is solving for a leg of the right triangle, h^2, the formula should include subtraction.
$h^2 = c^2 + (b + x)^2$ $\quad$ $h^2 = a^2 + x^2$	$h^2 = c^2 - (b + x)^2$ $\quad$ $h^2 = a^2 - x^2$
$c^2 + (b + x)^2 = a^2 + x^2$ $c^2 = -(b + x)^2 + a^2 + x^2$ $c^2 = -b^2 - 2bx - x^2 + a^2 + x^2$ $c^2 = -a^2 - b^2 - 2bx$	$c^2 - (b + x)^2 = a^2 - x^2$ $c^2 = (b + x)^2 + a^2 - x^2$ $c^2 = b^2 + 2bx + x^2 + a^2 - x^2$ $c^2 = a^2 + b^2 + 2bx$
$\cos(180° - \angle ACB) = \frac{x}{a}$ $a\cos(180° - \angle ACB) = x$	$\cos(180° - \angle ACB) = \frac{x}{a}$ $a\cos(180° - \angle ACB) = x$
$c^2 = -a^2 - b^2 - 2b[a\cos(180° - \angle ACB)]$	$c^2 = a^2 + b^2 + 2b[a\cos(180° - \angle ACB)]$
$c^2 = -a^2 - b^2 + 2ab\cos\angle ACB$	$c^2 = a^2 + b^2 - 2ab\cos\angle ACB$

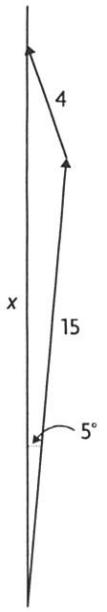
4. **a)** two triangles, because b is longer than the height (8.9 m) and shorter than the adjacent side (15.5 m)
b) zero triangles, because b is shorter than the height (8.9 m)
c) one triangle, because b is longer than the adjacent side (15.5 m)

5. **a)** 4.2 ft
b) 38°

6. 83 ft^2

7. This is the ambiguous case, so there are two possible solutions.

Solution 1:



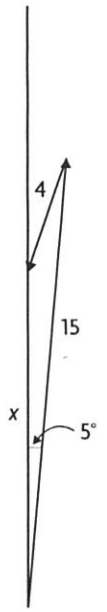
x = 18.7232 M (nautical miles)

actual distance travelled = 19 M

difference = 19 − x or 0.2768... M

This is the more reasonable solution, since it results in the smaller difference.

Solution 2:



x = 11.1625 M

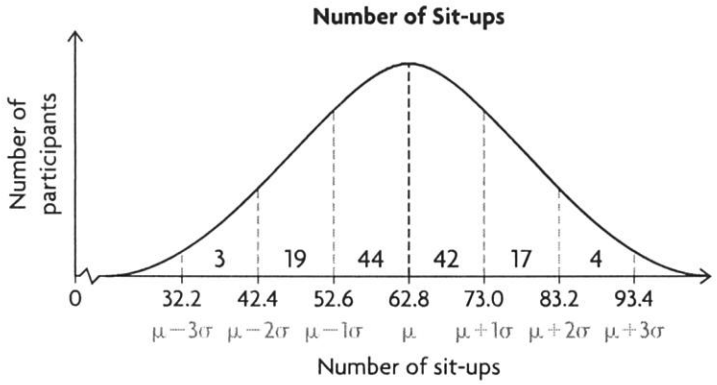
actual distance travelled = 19 M

difference = 19 − x or 7.8374... M

CHAPTER 5 TEST ANSWERS

1. a) The mean is about 62.8. The standard deviation is about 10.2.

b) I drew a normal curve, indicating the values for ± 1, 2, and 3 standard deviations, and then estimated the number of participants for each section of the curve from the frequency table.



The data is reasonably symmetrical about the mean. The percent of data within one standard deviation is $\frac{44 + 42}{129}$ or 66.666...%.

The percent of data within two standard deviations is $\frac{19 + 44 + 42 + 17}{129}$ or 94.573...%. These values are approximately the percents for a normal distribution, so the data is normally distributed.

c) Answers will vary, e.g., no, because the sample is too small. As well, the characteristics of this sample are not given. The sample for a second group would have to be similar.

2. a) 50% **b)** 47.5% **c)** 81.5% **d)** 2.5%

3. a) $z\text{-score for Treena} = \frac{x - \mu}{\sigma}$ $\quad z\text{-score for Maggie} = \frac{x - \mu}{\sigma}$

$z\text{-score for Treena} = \frac{84 - 71}{5.3}$ $\quad z\text{-score for Maggie} = \frac{82 - 66}{6.2}$

$z\text{-score for Treena} = 2.452\ldots$ $\quad z\text{-score for Maggie} = 2.580\ldots$

Maggie's result is slightly better than Treena's result.

b) From the z-score table, the area to left of 2.45 is 0.9929, so $1 - 0.9929$ or 0.71% scored better than Treena.

4. a) The confidence interval is $24.1\% \pm 5\%$, or 19.1% to 29.1%.

The range is 157 979 to 240 691 people.

b) The range will get smaller. A larger sample size will reduce the margin of error and, in turn, reduce the confidence interval.

5. a) The confidence level is $\frac{19}{20}$, or 95%. The confidence interval is $28\% \pm 2.8\%$, or 25.2% to 30.8%.

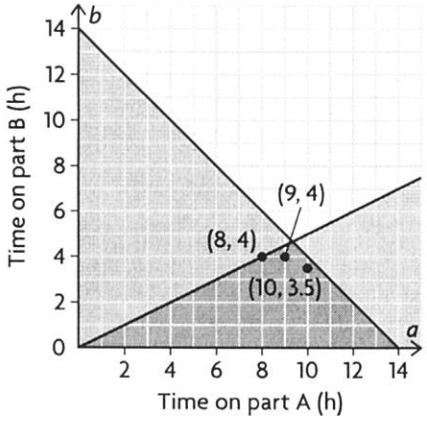
b) The range is 17 267 to 21 104 youth.

CHAPTER 6 TEST ANSWERS

1. Let a represent the study time in hours for part A, and b represent the study time in hours for part B.

The domain is $a \geq 0$ where $a \in \mathrm{R}$, and the range is $b \geq 0$ where $b \in \mathrm{R}$.

$a + b \leq 14$
$a \geq 2b$

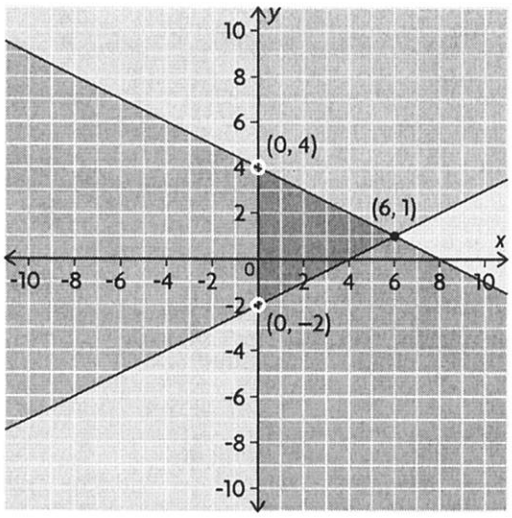


Three possible solutions, (a, b), are

- (8, 4), which is 8 h for part A and 4 h for part B,
- (9, 4), which is 9 h for part A and 4 h for part B, and
- (10, 3.5), which is 10 h for part A and 3.5 h for part B.

2. $\{(x, y) \mid x > -4, y \geq \frac{x}{2} - 2, y \leq -\frac{x}{2} + 4\}$

$x > 0$
$2y \geq x - 4$
$2y \leq -x + 8$



3. The maximum is at (0, 8), and the minimum is at (7, 1).

Answers will vary, e.g., I evaluated the objective function $J = d - f$ for each vertex:

If (f, d) is (7, 1), $J = 1 - 7$ $J = -6$	If (f, d) is (0, 8), $J = 8 - 0$ $J = 8$	If (f, d) is (−2.5, 0), $J = 0 - (-2.5)$ $J = 2.5$
minimum	maximum	

This makes sense, because I know that I need coordinates with the greatest possible value for d, compared to f, for the maximum value because the objective function is $J = d - f$. I also need coordinates with the least possible value for d, compared to f, for the minimum value.

4. The maximum cost will be for 21 bulbs altogether. He will use 3 energy-saving bulbs and 18 regular bulbs, at a total cost of $159.15.

Let x represent the regular bulbs and y represent the energy-saving bulbs.

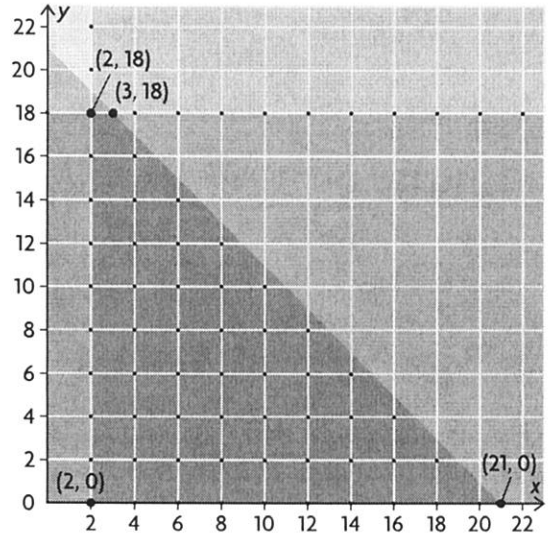
Restrictions:

$x \in W, y \in W$

Objective function:

$C = 5.95x + 7.85y$, where C represents the total cost of the bulbs

Constraints:
$x \geq 0$
$y \geq 0$
$x + y \leq 21$
$x \geq 2$
$y \leq 18$



$C = 5.95x + 7.85y$ for (0, 2), (2, 18), (21, 0) and (3, 18):

If (x, y) is (0, 2), $C = 5.95(0) + 7.85(2)$ $C = 15.70$	If (x, y) is (2, 18), $C = 5.95(2) + 7.85(18)$ $C = 153.20$	If (x, y) is (21, 0), $C = 5.95(21) + 7.85(0)$ $C = 124.95$	If (x, y) is (3, 18), $C = 5.95(3) + 7.85(18)$ $C = 159.15$
minimum			maximum

CHAPTER 7 TEST ANSWERS

1. a) upward, -5 **b)** upward, 0 **c)** downward, 12

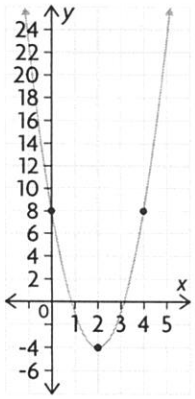
2. 25 m; 20 m

3. $y = -x^2 + 2x + 3$

4. a) $x = 8$ or $x = -4.5$
b) $x = 2$ or $x = 6$
c) $x = -3.354\ldots$ or $x = 0.954\ldots$
d) $z = -0.590\ldots$ or $z = 2.257\ldots$

5. a) $r = -\frac{9}{2}$
b) $n = 12$ or $n = -7$
c) $x = -\frac{5}{3}$ or $x = \frac{3}{4}$
d) $y = -\frac{7}{4}$ or $y = -\frac{1}{2}$

6. $y = 3x(x - 4) + 8$



7. $y = 3.9(x - 3.6)^2 + 9.8$

8. a) $\left(x - \frac{2}{5}\right)(x + 3) = 0$ or $(5x - 2)(x + 3) = 0$

b) e.g., $x^2 - \frac{13}{5}x - \frac{6}{5}$ or $x^2 + 2.6x - 1.2 = 0$ or $5x^2 + 13x - 6 = 0$

9. a) $b = 8$ or $b = 3$
b) $p = \frac{-5 \pm \sqrt{37}}{6}$
c) $z = -\frac{4}{3}$
d) no solution

10. $y = 0.0011x^2 + 4$

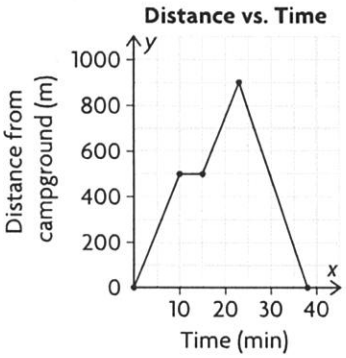
11. a) \$32.10 or \$86.65
b) not possible, since the maximum for this function is at $y =$ \$25 953

CHAPTER 8 TEST ANSWERS

1. a) $8.45 for 1.2 L
b) 30 mph

2. a) Answers may vary, e.g., the second pickup truck has the better fuel efficiency. The unit rate for the first pickup truck, in kilometres per litre, is about 9.3 km/L, which is lower than the unit rate for the second pickup truck.
b) Answers may vary, e.g., I could have used a graph to compare the two rates if I had converted both of the rates to the same units.

3. a) Graphs may vary, e.g.,



b) Answers may vary, e.g., the slope from (0, 0) to (10, 500) represents the first part of the hike, which was at a rate of 50 m/min. The 5 min break is indicated by a segment with a slope of 0, because the distance from the campground did not change (a rate of 0 m/min). The third part of the hike was at a rate of 50 m/min, and the fourth part was at a rate of 60 m/min in the opposite direction.

4. 2.13 h

5. a) About 0.007
b) About 1.1 ft

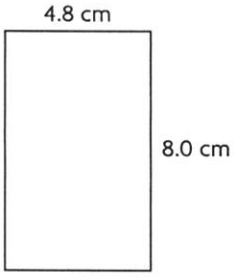
6. a) 37 800 cm^3
b) 11 200 cm^3
c) 0.444...

7. a) Answers may vary, e.g., 424 m^2; the building looks roughly square, and the parts missing from it look like they are $\frac{1}{2}$ the width and $\frac{1}{4}$ the depth. I wrote the following expression for the area of the building:

$(22\text{ m})(22\text{ m}) - (22\text{ m})\left(\frac{1}{2}\right)(22\text{ m})\left(\frac{1}{4}\right)$

b) Answers may vary, e.g., 4.3 m by 7.2 m

c) Floor plans may vary, e.g.,



8. a) 0.40

b) 2.48

c) 0.16

d) 15.25 : 1