

ANSWERS

Chapter 1 Factors and Multiples

Try It!

- 105: 1, 3, 5, 7, 15, 21, 35, 105
- (a) prime number
(b) composite number
- $$585 = 3^2 \times 5 \times 13$$
- $2 \times 3^3 \times 13$
- 36
- 22
- 7 cm
- 600
- 1,938
- 41,580
- (a) 80 tooth contacts
(b) big wheel: 4 revolutions
small wheel: 5 revolutions
- 22
- 85 in.
- 10
- 14 cm

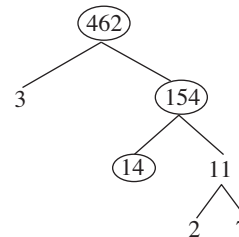
Exercise 1.1

- (a) 1, 3, 5, 15 (b) 1, 2, 4, 7, 14, 28
(c) 1, 2, 4, 8, 16, 32 (d) 1, 43
- (a) 2, 4, 6, 8 (b) 5, 10, 15, 20
(c) 11, 22, 33, 44 (d) 23, 46, 69, 92
- not a factor of 2,395
- 2,816 is a multiple of 111
- 96, 144, 304
- 8, 16, 24, 48, 72
- 9, 12, 24, 27, 36, 54
- 986
- 513
- (a) 1, 2, 4, 7, 8, 14, 28, 56
(b) 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
(c) 1, 2, 4, 7, 14, 28
- (a) 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
(b) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30
(c) 6, 12, 18
(d) first 3 multiples of 6
- (a) true (b) true (c) false
- (a) true (b) false
- 2016, 2020, 2024
- (a) 6
(b) 2

- (a) 7 groups of 5 or 5 groups of 7
(b) 6 ways
(c) 7 groups of 11, each group with 5 U.S. and 6 overseas participants

Exercise 1.2

- (a) prime (b) prime
(c) not prime
- (a) 2×3^3 (b) $2^3 \times 3^2$
- (a) $2^5 \times 3$ (b) $2^3 \times 13$
(c) $3^3 \times 5$ (d) $2^2 \times 7^2$
(e) $2^2 \times 3 \times 17$ (f) $2^2 \times 3^2 \times 7$
(g) $3^2 \times 5 \times 7$ (h) $2^3 \times 3^2 \times 5$
- (a) 8^3 (b) 3^5
(c) $7^2 \times 9$ (d) $4^2 \times 6^2$
(e) $2 \times 3 \times 11^3$ (f) $5^3 \times 13^2 \times 37$
- (a) 289 (b) 125
(c) 484 (d) 2,592
- (a) $2^2 \times 3^2 \times 5$ (b) $2^3 \times 7 \times 11$
(c) $3 \times 5 \times 7^2$
(d) $2 \times 3^3 \times 5^2$



- (b) Yes, the top number = $2 \times 3 \times 7 \times 11 = 462$.
- (a) $2^2 \times 3^2 \times 5$ (b) $2^2 \times 3^3 \times 7^2$
(c) $2^2 \times 3^3 \times 5^3$ (d) $2^2 \times 3^2 \times 5^4 \times 11$
- 997
- (a) 2^5 (b) 3^9 (c) 11^3 (d) 5^6
- 3 and 5, 5 and 7, 11 and 13, ...
- (a) (i) $13 + 19$
(ii) $11 + 67$
(iii) $13 + 103$
(b) The statement is known as the Goldbach Conjecture. No one can approve or disprove it. The statement is true to a large extent. Therefore, we should agree.
- 528, 336, 243
- 3, 7, 13, 21, 49, 91, ...

Exercise 1.3

- (a) 4 (b) 9 (c) 21 (d) 18
(e) 1 (f) 15 (g) 12 (h) 33
- (a) 7 (b) 15 (c) 12 (d) 22
(e) 1 (f) 70
- 24 cm
- (a) 40 cm (b) 63
- 36 and 54 or 18 and 90
- 15, 21, 35

7.

Price (\$)	Number of model cars sold	
	Day 1	Day 2
2	759	1,173
3	506	782
6	253	391
23	66	102
46	33	51
69	22	34
138	11	17

Exercise 1.4

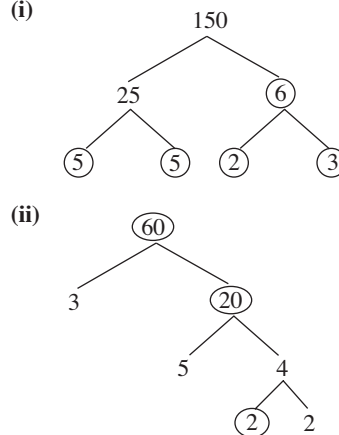
- (a) 60 (b) 84 (c) 200 (d) 736
(e) 216 (f) 300 (g) 118 (h) 455
- (a) 180 (b) 2,730 (c) 120 (d) 420
(e) 3,036 (f) 819
- (a) $2^3 \times 3^5 \times 5 \times 7^2$ (b) $2^4 \times 3^6 \times 5^3 \times 7^8$
- (a) GCF: 6 LCM: 90
(b) GCF: 7 LCM: 70
(c) GCF \times LCM = product of given numbers
- after 30 seconds
- (a) 336
(b) John: 7
Andrew: 6
- (a) 140 mm
(b) Science: 7
Mathematics: 5
- (a) 180 cm
(b) rows: 4
columns: 3
- 8 and 3, 4 and 24, 2 and 24, 8 and 6
- 21 and 630, 42 and 315, 105 and 126

Exercise 1.5

- (a) 6 (b) 11 (c) 14
(d) 16 (e) 21 (f) 26
- (a) 7 (b) 8 (c) 9
(d) 11 (e) 16 (f) 20
- (a) $5^2 \times 7$ (b) $2^3 \times 11^5$
- (a) 2×19^2 (b) $3^4 \times 5^3$
- (a) GCF: 9 (b) 3
- (a) LCM: 216 (b) 6
- (a) $2^{12} \times 5^6$ (b) $2^6 \times 5^3$
- (a) $7^{12} \times 19^6$ (b) $7^4 \times 19^2$
- 84 in.
- 204 cm
- 12 mm
- (a) 22 cm (b) 264 cm
- (a) 2, 5, and 8
(b) (i) 8 (ii) 18
(c) Numbers are all even;
sum of digits of each number is a multiple of 3
- (a) 6 (b) 45

Review Exercise 1

- 70
- $999 = 3^3 \times 37$
- (a) composite (b) composite
- (a) true (b) false
- (a) (i)

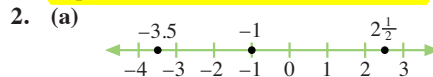


- (b) $150 = 2 \times 3 \times 5^2$ (c) LCM: 300
 $60 = 2^2 \times 3 \times 5$ GCF: 30
- (a) GCF: 1 (b) 360 (c) 9,720
- (a) (i) $2^2 \times 3$ (ii) $2^4 \times 3^2$
(b) 420
- (a) $(2^6 \times 5^2 \times 7^4)$ cm²
(b) 1,960 cm
- (a) 39 (b) 45 (c) GCF: 3
- 9:20 A.M.
- (a) 6 (b) 5
- (a) (i) 18 cm (b) 5
(ii) 770
(b) (i) 9 cm (ii) 3,080

Chapter 2 Real Numbers

Try It!

- airplane: 3,200 m; submarine: -456 m

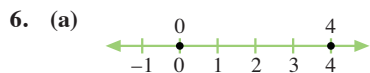


- (b) $2\frac{1}{2}$, -1, -3.5
- (a) 5 (b) -24 (c) -3
- (a) 106, -13.4, -218
(b) $|-13.4|$, $|106|$, $|-218|$
- (a) -11 (b) 8 (c) -21
- (a) -60 (b) 244 (c) 8,921
- (a) -13 (b) -8 (c) 13
- (a) -20 (b) -12
(c) 16 (d) -6
- 67 m below sea level
- 56 units
- (a) -96 (b) 18 (c) 120
- (a) -9 (b) 15
- (a) 56 (b) -13 (c) -512 (d) -512

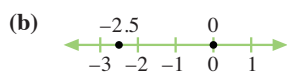
14. -32
 15. $-3\frac{7}{12}$
 16. $-\frac{31}{36}$
 17. (a) -1 (b) 14 (c) $-\frac{1}{32}$
 18. $-\frac{8}{3}$
 19. $1\frac{13}{32}$
 20. 0.625
 21. 0.63
 22. (a) $1,574$ (b) $1,570$
 23. (a) $37,254,000$ (b) $37,000,000$
 24. (a) 9.0 (b) 9.048
 25. (a) $-5\frac{3}{11}$ (b) -5.2727

Exercise 2.1

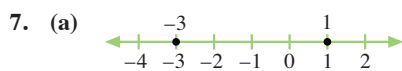
1. (a) 2 lb (b) -3 lb
 2. (a) $-\$2,800$ (b) $\$1,650$
 3. 12 mph means 12 mph above the speed limit.
 4. 5°C means a temperature rise of 5°C .
 5. $A = -4, B = -\frac{1}{2}, C = 2$



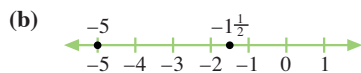
$0 < 4$



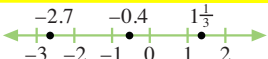
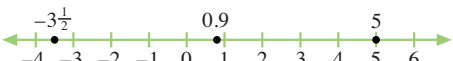
$-2.5 < 0$



$1 > -3$



$-1\frac{1}{2} > -5$

8. (a) $<$ (b) $>$ (c) $>$
 (d) $<$ (e) $<$ (f) $<$
 9. (a) 45 (b) 8 (c) -22 (d) -4
 10. (a) $<$ (b) $<$ (c) $=$
 (d) $>$ (e) $>$ (f) $<$
 11. (a) The hourly wage is decreased by $\$5$.
 (b) The elevator moves up by 2 levels.
 (c) The bank account is $\$1$ in debit.
 12. (a) 
 (b) $-2.7, -0.4, 1\frac{1}{3}$
 13. (a) 
 (b) $5, 0.9, -3\frac{1}{2}$

14. $|9.5|, |-12.3|, |-46|$
 15. (a) $-300, -50, 0, 210$
 (b) $|-300|, |210|, |50|, |0|$
 16. (a) $18, 0.7, -4.2, -42$
 (b) $|0.7|, |-4.2|, |18|, |-42|$

17.

Date	Deposit/ Withdrawal	Balance
01/02/2012	$\$3,000.00$	$\$3,000.00$
01/04/2012	$-\$200.00$	$\$2,800.00$
01/11/2012	$\$150.00$	$\$2,950.00$
01/23/2012	$-\$400.00$	$\$2,550.00$

18. Churchill, Denver, Portland, Singapore
 19. (a) Sue (b) Rex
 20. (a) does not exist (b) 1
 (c) -1 (d) does not exist
 21. (a) false; '0' is neither positive nor negative.
 (b) true (c) true

Exercise 2.2

1. (a) 3 (b) -2 (c) -2
 (d) -4 (e) -5 (f) 3
 2. (a) 12 (b) -37 (c) -6
 (d) -32 (e) -100 (f) 66
 3. (a) -50 (b) 17
 (c) -123 (d) $4,560$
 4. (a) 0 (b) 1 (c) -27
 (d) -37 (e) -21 (f) 29
 5. (a) -4 (b) -16
 (c) 14 (d) -1
 6. (a) 55 (b) 2
 (c) -12 (d) 15
 7. (a) 16 (b) -11 (c) 0
 (d) -10 (e) 0
 8. (a) $\$210$ (b) $-\$240$
 9. 5 miles North
 10. It still holds.
 Suggested Solution:
 If $a = -4, b = -5$, then
 $-a + (-b) = -(a + b)$
 $-(-4) + (-(-5)) = -(-4 - 5)$
 $9 = 9$

Exercise 2.3

1. (a) -4 (b) 6 (c) -8 (d) 3
 2. (a) -9 (b) -20 (c) 35
 (d) -24 (e) 14 (f) -17
 3. (a) -7 (b) 20 (c) 6 (d) -18
 4. (a) -13 (b) -1 (c) -8
 (d) 7 (e) -13 (f) 3
 5. (a) 15 (b) 27
 (c) 14 (d) 6
 6. (a) -2 (b) 21
 (c) -11 (d) -4
 (e) -7 (f) -14

7. (a) = (b) > (c) > (d) >
 8. 159 m
 9. (a) Tuesday (b) Wednesday
 10. -15°F
 11. (a) 2 A.M., May 5, 2012
 (b) 6 P.M., May 4, 2012

Exercise 2.4

1. (a) -72 (b) 20 (c) -42
 (d) 51 (e) 19 (f) -12
 (g) 13 (h) -19 (i) 144
 (j) -64
 2. (a) 18 (b) -60 (c) 8
 (d) 13 (e) -15 (f) 28
 (g) -36 (h) 10 (i) -100
 (j) 24
 3. (a) -1 (b) -16 (c) 25
 (d) 4
 4. (a) \$1,300 (b) \$5,300
 5. \$200 gain
 6. 1,500 m South
 7. (a) 15
 (b) -10
 (c) 1 correct, 4 unanswered
 (d) 3 incorrect, 1 correct, 1 unanswered

Exercise 2.5

1. (a) 4 (b) 8 (c) -80 (d) 3
 2. (a) $-\frac{13}{4}, -3, \frac{7}{12}, \frac{2}{3}$ (b) $\frac{4}{5}, \frac{7}{10}, -\frac{3}{4}, -\frac{11}{12}$
 3. (a) $\frac{9}{4}$ (b) $-\frac{13}{7}$ (c) $-\frac{1}{20}$ (d) $\frac{5}{8}$
 4. (a) $\frac{17}{35}$ (b) $-1\frac{1}{4}$
 (c) $-1\frac{1}{6}$ (d) $-1\frac{11}{30}$
 (e) $-2\frac{7}{10}$ (f) $-\frac{28}{121}$
 (g) $1\frac{1}{5}$ (h) 1
 5. (a) $\frac{1}{24}$ (b) -250
 (c) -60 (d) $2\frac{1}{3}$
 6. (a) 0 (b) $-\frac{4}{21}$
 (c) $\frac{7}{12}$ (d) $\frac{1}{2}$
 7. $\frac{6}{10}$
 8. (a) $\frac{17}{28}, \frac{9}{14}$ (b) $-\frac{3}{4}, -\frac{17}{22}$
 9. (a) $1\frac{3}{20}$ hours
 (b) Julia: 20 min, Katie: 24 min, Lisa: 25 min
 (c) Julia: 30 loops, Katie: 25 loops, Lisa: 24 loops
 10. (a) $\frac{9}{11}$ (b) $\frac{17}{22}, \frac{35}{44}$

Exercise 2.6

1. (a) 0.75 (b) -1.4 (c) $0\bar{2}$
 (d) $-1.1\bar{8}$ (e) $-0.58\bar{3}$ (f) -0.85
 2. (a) 841 (b) 3,375 (c) 7,776
 (d) 123 (e) 3.107232506 (f) 99
 (g) 2.24 (h) -0.714285714
 (i) $0.91\bar{6}$ (j) -4.75
 3. (a) $0.0\bar{6}$ (b) 0.75
 4. (a) 12 (b) 2.732150083
 (c) 0.421875 (d) 0.76
 (e) $-0.013\bar{7}$ (f) -9.09375

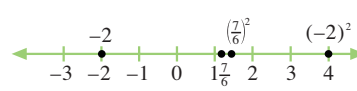
Exercise 2.7

1. (a) 13 (b) 322
 2. (a) 7,300 (b) 13,600
 3. (a) 23.7 (b) 0.7
 4. (a) 10.75 (b) 3.00
 5. (a) 0.040 (b) 17.927
 6. (a) 3.0041 (b) 8.4713
 7. (a) 377 (b) 380
 8. (a) 14,348,907 (b) 14,000,000
 9. (a) 0.5556 (b) 0.9091
 10. (a) 2.667 (b) -0.982
 (c) -2.667 (d) 1.154
 11. (a) 12,800 (b) 13,000
 12. (a) 219 ft² (b) 220 ft²
 13. (a) 2.10 m (b) 2.104 m
 14. (a) 30 cm (b) 29.7 cm
 (c) 29.730 cm
 15. (a) 1.8 mm (b) Yes
 16. (a) nearest thousand, hundred, ten or whole number
 17. 9.957; 9.962

Review Exercise 2

1.

+	8	1	-2
2	10	3	0
-5	3	-4	-7
-3	5	-2	-5
2.

×	-3	-4	-6
-5	15	20	30
-2	6	8	12
7	-21	-28	-42
3. (a) -8°F (b) 2.6°F
 4. (a) 68 m (b) 9,002 m
 5. (a) 4; $\frac{49}{36}$
 (b) 
 (c) (i) < (ii) >

6. (a) Packet 1: 370 mL
Packet 2: 387 mL
(b) 2,247 mL
7. (a) Alex
(b) Alex: -8, Ben: 0, Charles: 9, Dave: -2
(c) Alex
8. (a) 88 (b) -729
(c) -10 (d) $\frac{1}{96}$
9. (a) $9\frac{1}{2}$ (b) -4 (c) -25
10. (a) 27,120 (b) 27,100
11. (a) 1.44 (b) 1.4
12. (a) Auckland and Los Angeles; 21
(b) (i) 16 hours
(ii) 3 hours
(c) (i) behind of
(ii) ahead of
(d) 6 A.M., December 31, 2011

Chapter 3 Introduction to Algebra

Try It!

1. (a) 12 (b) 19 (c) $9 + t$
2. (a) \$2,200 (b) \$2,800 (c) $\$ \left(\frac{m}{3} - 200 \right)$
3. (a) \$39 (b) $\$(5n + 12m)$
4. (a) de^2 (b) $20m^3n$ (c) $\frac{14t}{y}$
5. $3z^2 = 3 \times z \times z$
 $(3z)^2 = 3z \times 3z$
 $= 9 \times z \times z$
 $= 9z^2$
6. (a) $u(c + d)$ (b) $v^3 - \frac{a}{b}$
7. (a) -4 (b) 0
8. (a) -2 (b) $3\frac{2}{3}$
9. 210 m
10. (a) 5 (b) 54
11. $11\frac{1}{4}$
12. (a) $s + \frac{1}{4}$ (b) $p = s + \frac{1}{4}$
13. (a) $\frac{2}{3}b - 7$ (b) $g = \frac{2}{3}b - 7$
14. (a) $v = \frac{f}{6} + 7$
 $m = 3 \left(\frac{1}{6}f + 7 \right) - 4$
(b) $v = 15$
 $m = 41$

Exercise 3.1

1. (a) \$1,100 (b) \$200 (c) $\$(3,600 - x)$
2. (a) 165 cm (b) 173 cm (c) $(h + 5)$ cm
3. (a) 35 days (b) 84 days (c) $7n$ days
4. (a) 57 (b) 69 (c) $\frac{3s}{4}$

5. (a) 43 (b) $2p + 23$
6. (a) $1\frac{5}{6}$ hours (b) $\left(\frac{t}{8} + \frac{1}{3} \right)$ hours
7. (a) $5a$ (b) $4b^2$ (c) $\frac{2c}{d}$
(d) $\frac{eg}{f}$ (e) $18hk$ (f) $\frac{m}{3}$
(g) $15p^3$ (h) $20q^2r$ (i) $\frac{s}{6} + t$
(j) $u + \frac{2v}{3w}$
8. (a) $hk + 5$ (b) $\frac{n}{p} - 3m$
(c) $\frac{2t + 3u}{v}$ (d) $7y^2z$
9. (a) \$15 (b) $\$(2x + 5y)$
10. (a) 4,236 g (b) $\$(759p + 400q)$ g
11. (a) \$350 (b) $\$(500 - k - d)$
12. (a) \$33 (b) $\$[(n - 2)p]$
(b) $\frac{n - 4}{m}$
13. (a) 8 (b) $\$(2,000 + 800n)$
(b) $p(q - r)$
14. (a) \$16,400 (b) $\left(\frac{nL + k}{m} \right)$ ft
15. (a) pq (b) $2(x + 5)$ years
(d) $(2x - 1)$ years
16. (a) $(nL + k)$ ft (b) $2(x + 5)$ years
(c) $(3x + 4)$ years (d) $(2x - 1)$ years
17. (a) $(x + 5)$ years (b) $2(x + 5)$ years
(c) $(3x + 4)$ years (d) $(2x - 1)$ years
18. (a) 100 points (b) $(an + bm)$ points
(c) $[am + b(m - 1)]$ points
19. (a) 100 points (b) $(an + bm)$ points
(c) $[am + b(m - 1)]$ points
20. (b) (i) 60n (ii) 1,440n

Exercise 3.2

1. (a) 2 (b) $\frac{7}{5}$
2. (a) 25 (b) 15
3. (a) 1 (b) -3
4. (a) 39 (b) 288
5. (a) 7 (b) 12
(c) 15 (d) 96
(e) $\frac{1}{7}$ (f) $-\frac{1}{7}$
6. (a) 23 (b) 60
(c) 20 (d) $-2\frac{1}{2}$
(e) -162 (f) 32
7. (a) 13 (b) 55
8. (a) 156 (b) 17
9. (a) 4 (b) 37
10. (a) $\frac{3}{20}$ (b) 20
11. $3\frac{1}{8}$
12. 250
13. (a) \$120 (b) hourly wage in dollars
14. (a) \$75 (b) \$200
15. (a) \$310
(b) \$80 is the fee for each adult.
\$50 is the fee for each child.
16. (a) 100°C (b) 25°C

17. (a) \$32 (b) \$8 increase

18. (a) 12 (b) $6\frac{2}{3}$ ohms

Exercise 3.3

1. $(w + 10)$ ft
 2. $\$(p - 6)$
 4. $m = 4d$
 5. $x = 3y$
 6. $s = \frac{1}{10}a$
 7. (a) $a - 7$ (b) 25
 8. (a) \$3p (b) $q = 50 - 3p$
 (c) \$23
 9. (a) $2t - 30$ (b) 80 minutes
 10. (a) $y = \frac{1}{4}x + 51$ (b) 261
 11. (a) $v = \frac{3}{2}w - 12$ (b) \$75
 12. (a) $3x$ (b) $4x - 6$
 (c) 2nd number = 27, 3rd number = 30
 13. (a) $m = 2p + 2$ (b) $m = 28$
 $q = 3p - 2$ $q = 37$
 14. (a) $d + 0.5$ (b) $\frac{3}{2}(d + 0.5)$
 (c) Emily: 2.2 miles, Fred: 3.3 miles
 15. (a) $a = \frac{3}{4}b, c = \frac{3}{2}b$ (b) \$156
 16. (a) $r = \frac{3}{2}t$
 $s = \frac{9}{8}t + 1$
 (b) Richard: 48 hr, Simon: 37 hr
 (c) 117 hr
 17. (a) Yan: $\frac{3}{5}x + 18$
 Zoe: $2\left(\frac{3}{5}x + 18\right) - 45$
 (b) $\frac{8}{5}x + 2\left(\frac{3}{5}x + 18\right) - 27$
 (c) 219
 18. (a) $p = 4(c + 35)$ (b) $p = 256$
 $q = c + 35$ $q = 64$
 (c) \$262.80
 19. (a) (i) $3x + 5$ (ii) $\frac{4}{5}x$
 (iii) $\frac{4}{5}x + 5$
 (b) 53
 20. Let $x =$ number of adults.
 \therefore total ticket sales = $\$[(75x + 40)(1,200 - x)]$

Review Exercise 3

1. (a) $15st + u$ (b) $m - 24m^2n$
 (c) $\frac{4a - b^2}{2c}$ (d) $3x - \frac{b}{c} - 5y$
 2. (a) $5d - c^2$ (b) $\frac{x^3}{y^2}$
 (c) $\frac{3a}{b}$

3. $E = 180$

4. $y = -\frac{1}{8}$

5. $5m + 8n$

6. 16

7. (a) $(100 - a - 2b)$ cm

(b) (i) $\frac{(100 - a - 2b)}{4}$ cm

(ii) 11 cm

8. (a) (i) $x + y$ (ii) $\frac{1}{2}x + \frac{1}{3}y$

(b) 17

9. (a) (i) \$4,000 (ii) \$6,100

(b) (i) $\frac{2,500 + 300n}{g}$ (ii) 43

10. (a) (i) $(h - 3)$ years old (ii) $(h + 3)$ years old

(b) $4(h - 3)$ years old

(c) $\left[\frac{1}{3}(h + 3) + 2\right]$ years old

(d) mother: 36 years old, sister: 7 years old

11. (a) $\$(k + 80)$

(b) $\$25(k + 80)$

(c) $T = 2k + 25(k + 80) + 80$

(d) \$3,403

12. (a) $y = 30 + x$

$z = 2(30 + x) - 15$

(b) 48 dimes, 81 quarters

(c) \$25.95

Chapter 4 Algebraic Manipulation

Try It!

1. (a) $4t$ (b) $-\frac{9}{2}bz$

(c) 0

2. (a) $2c - 5d$ (b) $3ax - 9x + \frac{13}{10}$

3. (a) $2ab - 3ac$ (b) $5xy - xz$

4. $7a - 5b$

5. $2p - 5q + 9$

6. $-y + 7$

7. (a) $10x + 35y$ (b) $12a - 14b$

8. (a) $4cx + 6cy + 9cz$ (b) $-12dm + 24dn - 4dp$

9. $-8y + 3$

10. (a) $-\frac{7p}{9}$ (b) $\frac{9 - 5p}{2}$

11. (a) $\frac{8x + 11}{6}$ (b) $\frac{143x - 59}{70}$

12. $3(7a + 6b)$

13. $7b(2y - 5z + 1)$

14. (a) $(3x + 5y)(2a + b)$

(b) $(3a - 5c)(6z - 5)$

15. $(a - 3)(7x - 4)$

Exercise 4.1

1. (a) terms : 3, constant : -1

(b) terms : 4, constant : 5

2. (a) $x : 5, y : -2$

(b) $x : -1, y : 1$

3. (a) $9a$ (b) $-3b$ (c) $5c$
 (d) $-7d$ (e) $3p$ (f) $-7q$
 (g) 0 (h) $-2m$
4. (a) $-n - 1$ (b) $-k + 1$ (c) $-3x + 2y$
 (d) $5w$ (e) $\frac{5}{6}p - \frac{3}{4}q$ (f) $\frac{16}{3}t + \frac{9}{2}av$
5. (a) $1 - x$ (b) -1
6. (a) $6a + 3b - 3$ (b) -3
7. (a) $\frac{5}{8}x - \frac{1}{15}ax - y$ (b) $5\frac{3}{20}$
8. $(5x + 4y)$ units
9. (a) $10p$ units (b) 120 units
10. (a) $(12t - y)$ hr (b) 51 hr
11. $\left(\frac{11}{2}d + \frac{3}{4}\right)$ km east
12. $2p + q - 6$
13. Find the number of days in x weeks.
14. $\frac{x}{2}$ km, $\left(\frac{x}{2} - 4\right)$ km, x km, and $(x + 3)$ km

Exercise 4.2

1. (a) $2a - 7$ (b) $-4b + c + 5d$
 (c) $-2 + 7k$ (d) $-7m + 9$
2. (a) $8a + 9$ (b) $6b + c$
 (c) $-10d - 6e$ (d) $f - 11$
 (e) $-9x + 9y$ (f) $11t + 16z$
3. (a) $3p - 1$ (b) $2q$
 (c) $-6x + 2y$ (d) $2t + 5u$
 (e) $-6w$ (f) $-8n - 5s$
4. (a) $10h - 8k + 4$ (b) $-8m - 2n + 2$
 (c) $11x - 3$
5. $5x + y - 9z$
6. $4a + 4b + 6c$
7. $6b - 3c$
8. $9t + 3u - 8v$
9. $3n + 3$
10. $(8p + 17q + 16)$ g
11. (a) $(4x - 2y - 3)$ feet
 (b) 19 feet
12. $(x + y)$ cm, $\left(2x + \frac{3}{2}y\right)$ cm
 $3x$ cm, $\frac{5}{2}y$ cm
13. (a) $9 \times 15 = 135$ (b) $9n + 72$
 (c) $9m$ (d) $m = n + 8$
 (e) Sum of numbers is a multiple of 9.
 Sum of each diagonal is equal.

Exercise 4.3

1. (a) $6 + 3a$ (b) $28b + 20c$
 (c) $10d - 30e$ (d) $-6g - 8h$
 (e) $-28 + 20n$ (f) $15p - 45q$
 (g) $12r - 18s + 24t$ (h) $-5ax + 3ay - 8az$
 (i) $4a - 12b - 16c$ (j) $-10a + 20b - 30c$
2. (a) $7x + 43$ (b) $33a - 6b$
 (c) -13 (d) $-7bv - 12b$
 (e) $-3p$ (f) $-2r + 25s$
 (g) $a - 9b$ (h) $4x + 18$

3. (a) $-\frac{x}{5}$ (b) $\frac{16 - 3x}{8}$
 (c) $\frac{7x - 2}{6}$ (d) $\frac{1 - 2x}{3}$
 (e) $\frac{7x - 5}{20}$ (f) $\frac{5x + 6}{6}$
4. (a) $a + 3$ (b) $-13s - 9t$
 (c) $3m + 7n$ (d) $3a + 9b$
 (e) $10y - 20z$ (f) $4p + 8q$
5. (a) $\frac{5x - 16}{6}$ (b) $\frac{t + 56}{14}$
 (c) $\frac{6x + 17}{20}$ (d) $\frac{5x - 16}{15}$
 (e) $\frac{-28x + 1}{12}$ (f) $\frac{15x - 8}{18}$
 (g) $\frac{3}{2}$ (h) $\frac{-y - 85}{30}$
6. (a) $n + 10$ (b) $2(n + 10)$
 (c) $2(n + 10) - 4$ (d) $\frac{2(n + 10) - 4}{2}$
 (e) $\frac{2(n + 10) - 4}{2} - n$ (f) 8

7. $(4a + 2b)$ cm
8. sales: $\$n(x + y)$
9. (a) $6(2m - 3) + 5 = 12m - 13$
 (b) 71
10. (1) think of a number
 (2) add 9 to the number
 (3) multiply the sum by 3
 (4) subtract 6 from (3)
 (5) divide (4) by 3
 (6) subtract original number from (5)
11. $56 \times 101 = 56 \times (100 + 1)$
 $= 5,600 + 56$
 $= 5,656$
 $387 \times 999 = 387 \times (1,000 - 1)$
 $= 387,000 - 387$
 $= 386,613$

12. (a)

n	1	2	3	4	5
Total number of matchsticks	4	7	10	13	16

- (b) $3n + 1$
 (c) $(6n + 6)$ cm

Exercise 4.4

1. (a) $3(2a + b)$ (b) $2(5c - 6d)$
 (c) $7(4e + 3)$ (d) $6(f - 1)$
 (e) $3a(6x - 5y)$ (f) $-5m(x + 2y)$
 (g) $3a(5b - 1)$ (h) $12s(1 + 4b)$
 (i) $17c(3u + v)$ (j) $-8a(7y + 1)$
2. (a) $7(a + b + c)$ (b) $4(3a - 2b + 5c)$
 (c) $5x(a - 3b - 6)$ (d) $-6(3 + 4ay + y)$
 (e) $m(x + y + 3z)$ (f) $-7b(3 + 4t)$
 (g) $(x + y)(3a - 4b)$ (h) $(5m - 4)(a + b)$
3. (a) $389(57 + 43) = 38,900$ (b) $471(86 - 76) = 4,710$
4. $ax + ay, ax^2 + axy, -2a^2 - 2a^2y$

$$\begin{aligned}
 5. \quad 148 \times 4 - 123 \times 4 &= 4(148 - 123) \\
 &= 100 \\
 839 \times 537 + 839 \times 463 &= 839(537 + 463) \\
 &= 839,000
 \end{aligned}$$

Exercise 4.5

- $(a + 3b)(x + y)$
 - $(5 + a)(r + s)$
 - $(a + b)(x - y)$
 - $(5x - 1)(7m + n)$
 - $(5x + 4y)(2p + 3q)$
- $(8 - a)(9 - 2b)$
 - $(4q + p)(9y - 4x)$
 - $(a - 5)(u + b)$
 - $(2b + 5a)(4x - 3y)$
- $(3a + b)(7x + 2y)$
 - $AR = 2y \text{ cm}, DP = 3a \text{ cm}$
- No
 - No
 - Not all algebraic expressions can be factored.
 - $x + y + z + 1$

Review Exercise 4

- $-2a + 8b$
 - $-x + 3y + 3$
- $20m - 1$
 - $4x - 13y$
- $\frac{8-9x}{20}$
 - $\frac{8x-37}{9}$
- $c(5a - 1)$
 - $-3p(3q + 5r)$
- $-22x + 33y$
 - 187
- $3ax - ay + 6bx - 2by$
 - $(3x - y)(a + 2b)$
 - $(3x - y)$ marbles
- $(4x + 2y + 4)$ points
 - $(4x + 2y - 4)$ points
 - $2(2x + y - 2)$

8. (a)

n	1	2	3	4	5
Total number of seats	6	10	14	18	22

(b) $4n + 2$

Chapter 5 Simple Equations in One Variable

Try It!

- $x = 9$
- $x = 6$
- $x = 15$
- $x = -3\frac{1}{2}$
- $x = 1\frac{1}{2}$

- $x = 1\frac{1}{3}$
- $x = 3\frac{6}{7}$
- $x = 2\frac{8}{13}$
- $z = 6$
- $a = 7$
- $x = 1$
- $y = 8$
- 47, 48, 49
- 9 years old
- pen: \$3, book: \$7

Exercise 5.1

- $x = 1$
 - $x = 7$
 - $x = 6$
 - $x = -3$
 - $x = -12$
 - $x = 10$
 - $x = -2\frac{1}{2}$
 - $x = 7$
 - $x = -4$
- $x = -76$
 - $x = 6$
 - $x = -2\frac{1}{3}$
 - $x = 1$
 - 63
 - $x = 12$
 - $x = -2$
 - $x = -2\frac{1}{2}$
- $x = 14$
 - -20
 - $x = 5$
 - $x = 6$
 - $x = -2$
 - $x = -1$
 - $x = 35$

Exercise 5.2

- $x = -10$
 - $x = -1\frac{2}{3}$
 - $x = -1\frac{1}{2}$
 - $x = 17$
 - $x = 2\frac{1}{2}$
- $x = 8$
 - $x = 8\frac{1}{3}$
 - $x = 0$
 - $x = -6$
 - $x = -10$
 - $x = 10\frac{3}{7}$
- $x = 12$
 - $x = 42$
 - $t = 40$
 - $t = 4\frac{1}{4}$
 - $y = -4\frac{4}{7}$
 - $y = -9$
 - $z = 1$
 - $z = -2$
- $r = \frac{1}{10}$
- $f = 10.4^\circ\text{F}$
- $v = 62$
- $v = 60$
- unsolvable as $0 \neq 4$
 - always true

Exercise 5.3

- (a) $x = 5$
(c) $x = \frac{1}{4}$
(e) $x = \frac{4}{7}$
(g) $x = 2\frac{3}{4}$
 - (a) $x = -2$
(c) $y = 6$
(e) $u = -10$
 - $a = -3$
 - $r = -1\frac{1}{4}$
 - $v = 60$
 - $n = 3$
 - Not always equal. When $x = 0$, $\frac{x}{x} = \text{undefined}$.
- (b) $x = -3\frac{1}{2}$
(d) $x = \frac{2}{3}$
(f) $x = 3\frac{1}{2}$
(h) $x = 10\frac{2}{5}$
 - (b) $x = 7$
(d) $y = -8$
(f) $u = 1$

Exercise 5.4

- (a) $x + 5$
(a) $\$(2x + 50)$
(a) $3x$ hours
(a) $x + 2, x + 4$
(a) $\$14$
(a) $\$9$
(a) 8 years old
(a) three $\$10$ bills
(a) $\$750$
 - Aaron: 25, Ben: 50, Charles: 35
 - 12 children
 - $\frac{4}{7}$
 - (a) $n = 7$
(c) (i) 10 apples
(ii) $\$0.20$
 - $31\frac{1}{2}$ miles
- (b) $x = 121$
(b) $\$79$
(b) $x = 14$ hours
(b) 20, 22, 24
 - (b) $\$12$

Review Exercise 5

- (a) 4
(c) 15
(e) $1\frac{17}{22}$
(g) $7\frac{1}{3}$
 - (a) 13
 - (a) 156
 - (a) $(9x + 2)$ cm
 - 10 stamps
 - 10 years old
 - $\$49$
 - 9 hours
 - 37 students
 - 12, 48
- (b) $2\frac{1}{10}$
(d) -14
(f) $-\frac{2}{5}$
(h) 4
(b) -5
(b) 3
(b) 5

Chapter 6 Ratio, Rate, and Speed**Try It!**

- (a) 5 : 3
(b) 3 : 8
- 4 : 3
- (a) 2 : 1
(b) 7 : 24
(c) 40 : 17
- 21 : 30 : 16
- (a) 600 g
(b) 900 g
- X: 24, Y: 36, Z: 72
- May: 90 lb, Terry: 120 lb
- (a) 8 m/s
(b) $\$0.05/\text{fl. oz.}$
- $\$1,398/\text{m}^2$
- (a) $\$19/\text{hr}$
(b) $\$95$
- 69 mph
- $61\frac{5}{7}$ km/hr
- (a) $22\frac{2}{9}$ m/s
(b) 50 mi/hr
- 98.39 km/hr

Exercise 6.1

- (a) 2 : 3
(c) 1 : 3
(e) 2 : 3
(g) 8 : 15
(i) 4 : 1
- (a) 4 : 7 : 3
(c) 3 : 7
- (a) 25 : 21 : 150
(c) 1 : 6
- (a) 3 : 4 : 9
(c) 3 : 6 : 2
- (a) 5 : 9
- 5 : 2
- (a) 5 : 6, 4 : 3
(b) 10 : 12 : 9
- (a) 15 : 8, 12 : 7
(b) 60 : 32 : 35
- (a) 14 : 11
(b) 11 : 25
- (a) 3 : 4
(b) 3 : 4
(c) 9 : 16
- 3 kg
- 20
- 150 cm^3
- $\$1,750, \$2,450$
(a) 2.7 lb
(b) 1.8 lb
- (a) 75
(b) 150
- (a) 45
(b) 54
- (a) 6 : 15 : 2
(b) 18, 45, 6
(c) No, z is too short.
- $\$16$
- 6 : 8 : 10
- (a) 4 : 3 : 5
(b) (i) $-\$1,800$
(ii) $\$7,200$
(c) They made a loss in their first year.
(d) $\$2,400$

Exercise 6.2

- (a) 0.15 (b) 72
(c) 47 (d) 8
(e) 4 (f) 2.25
- (a) \$23/hr (b) \$920/week
- (a) 22 mi/gal (b) \$2.80/gal
- (a) 87.5 g/cube (b) 0.7g/cm³
- (a) \$15/ticket (b) \$150
- (a) \$22.50/m² (b) \$450
- (a) 27 L/min (b) 3 min
- (a) \$26/kg (b) 25 g/m²
(c) 3 kg, \$78
- (a) \$624 (b) \$0.65/sq ft
- (a) 19.3 g/cm³
(b) No, as its density is 15 g/cm³, which is lesser than pure gold.

Exercise 6.3

- (a) 32 km/hr (b) 8m/s
(c) 57.5 mph (d) 66 km
(e) 35 m (f) 310 mi
(g) 1.5 hr (h) 13 s
(i) 2.5 hr
- (a) $6\frac{2}{3}$ m/s, 14.88 mph (b) $13\frac{8}{9}$ m/s, 31 mph
(c) $22\frac{2}{9}$ m/s, 49.6 mph (d) 35 m/s, 78.12 mph
- (a) 7.2 km/hr, 4.464 mph (b) 18 km/hr, 11.16 mph
(c) 46.8 km/hr, 29.016 mph (d) 72 km/hr, 44.64 mph
- (a) 35.42 km/hr (b) 77.28 km/hr
(c) 104.65 km/hr (d) 128.8 km/hr
- (a) 40 miles (b) $33\frac{1}{3}$ min
- (a) 3 m/s (b) 75 min
- (a) $38\frac{2}{3}$ mph
- (a) $6\frac{2}{3}$ mph
- (a) $1\frac{1}{3}$ m/s (b) $\frac{8}{9}$ m/s
- (a) 2.4 km (b) 510 m
- (a) 500 mph (b) 3:59 P.M.
- (a) 10 mins (b) 400 m
- 25 mph and 50 mph; 40 mph and 40 mph
- (a) 45 mph
(b) The distance between the cars A and B is decreasing.
(c) Yes, 8 min later

Review Exercise 6

- (a) 3 : 4 (b) 9 : 16
(c) 27 : 64
- (a) 80 mph (b) 54 mph
(c) 40 : 27
- (a) 144 (b) 96
(c) 3 : 4
- (a) 120 gallons (b) 480 gallons
(c) 40 gallons
- (a) 75 cm (b) 120 cm
(c) 3 kg/m (d) 1.35 kg
- (a) (i) 5 : 8 (ii) 3 : 10
(b) 15 : 24 : 80 (c) \$63.03

- Stock A: \$48; Stock B: \$72
- (a) \$7.50/L (b) \$12/L
(c) 5 : 8 (d) Canola oil
(e) $\frac{1}{8}$ L/day (f) 20 days
- (a) 78 km/hr (b) 9.75 km/L
(c) $64\frac{2}{7}$ km/hr
- (a) 90 km/hr (b) 12.5 m/s
(c) $15\frac{5}{6}$ m/s (d) 20 m/s
- (a) 63 mph
(b) (i) $55\frac{5}{13}$ mph (ii) 57.6 mph

Chapter 7 Percentage

Try It!

- (a) 75% (b) $266\frac{2}{3}\%$
(c) 87.1%
- (a) 0.0034 (b) 1.26
- (a) 68% (b) 32%
- Group A
- (a) 156 (b) 208
(c) 286
- 90%
- 32
- \$170
- 6.25%
- 290
- 125cm
- 15%
- 28°C
- 67 kg
- 20%
- (a) \$95 (b) \$285
- (a) \$750 (b) \$10.13 more
- (a) \$1.40 (b) \$21.40
- (a) \$200 (b) \$10

Exercise 7.1

- (a) 25% (b) $83\frac{1}{3}\%$
(c) $207\frac{1}{2}\%$
- (a) 67% (b) 4.56%
(c) 381%
- (a) $\frac{4}{75}$ (b) $\frac{661}{800}$
(c) $1\frac{1}{11}$
- (a) 0.03 (b) 0.44
(c) 6.85
- (a) 66% (b) 62.5%
- (a) 36 gal (b) 16.2 lb
- (a) 84% (b) 16%
- (a) 35% (b) 40%
(c) 25%
- 27
- (a) 164 (b) 130
(c) 106

11. (a) 112.5% (b) 88.9%
 12. Cliff
 13. Line 2
 14. (a) 4.2 kJ/kcal (b) 9%
 (c) No
 15. (a) impossible
 (b) In year 2011, labor force: 64%,
 unemployment rate: 8.9%

Exercise 7.2

1. (a) 60 (b) \$288
 (c) 198 kg (d) 84 cm²
 (e) 1,400°C (f) 3,600 hr
 2. 80
 3. (a) 160 (b) 88
 4. (a) 2,800 (b) 420
 5. (a) 40 km (b) 22 km
 (c) $2\frac{5}{6}$ hr (d) $14\frac{2}{17}$ km/h
 6. (a) bottled juice, 187 (b) bottled water, 87.5%
 (c) bottled Soda, 225
 7. (a) 250 (b) 95
 (c) 66
 8. (a) $x\%$ of y and $y\%$ of x are equal.
 (b) $x \neq y$

Exercise 7.3

1.

	Original value	Increased value	Increase	Percentage increase
(a)	\$25	\$28	\$3	12%
(b)	16 s	20 s	4 s	25%
(c)	40 oz	52 oz	12 oz	30%
(d)	20 ft	23 ft	3 ft	15%
(e)	50 °C	55 °C	5 °C	10%
(f)	60 copies	69 copies	9 copies	15%

2.

	Original value	Decreased value	Decrease	Percentage increase
(a)	36 lb	30 lb	6 lb	$16\frac{2}{3}\%$
(b)	2 hr	1.5 hr	0.5 hr	25%
(c)	80 miles	64.8 miles	15.2 miles	19%
(d)	15 cm ³	12 cm ³	3 cm ³	20%
(e)	\$70	\$49	\$21	30%
(f)	55 pint	44 pint	11 pint	30%

3. \$3,180

4. \$720
 5. 16%
 6. \$2,800
 7. (a) $177\frac{7}{9}$ (b) $38\frac{8}{9}\%$
 8. (a) \$1,248 (b) 22%
 9. (a) 30 inches (b) 34.5 inches
 10. (a) 7.5% (b) 3,771,960
 11. (a) (i) \$4,600 (ii) \$5,400 (iii) \$2,700 (iv) \$12,700
 (b) 1.6%
 12. (a) 2,000 cm²
 (b) 1,980 cm²
 (c) 1,980 cm²
 (d) The result in (b) and (c) are the same. Both of them are 20 cm² less than original rectangle.
 (e) 1,920 cm²
 (f) 1,920 cm²
 (g) The result in (e) and (f) are the same. Both of them are 80 cm² less than the original rectangle. Hence, a similar change in percentage of the width and length will both result in less area than the original.
 (h) No. $A = 2,000 \times \left(1 - \frac{x^2}{10,000}\right)$

Exercise 7.4

1.

	Marked price	Selling price	Discount	Discount %
(a)	\$125	\$100	\$25	20%
(b)	\$70	\$49	\$21	30%
(c)	\$240	\$204	\$36	15%
(d)	\$320	\$256	\$64	20%
(e)	\$450	\$351	\$99	22%
(f)	\$500	\$345	\$155	31%

2. \$784
 3. (a) \$160 (b) \$136
 4. (a) \$90 (b) \$11.25

5.

	Marked price	Price before Sale Tax	Amount of Sales Tax
(a)	\$210	\$200	\$10
(b)	\$378	\$360	\$18
(c)	\$105	\$100	\$5
(d)	\$493.50	\$470	\$23.50
(e)	\$420	\$400	\$20
(f)	\$546	\$520	\$26

6. (a) \$15 (b) \$315
 7. (a) \$800 (b) \$40
 8. \$1,026
 9. (a) 0% (b) $33\frac{1}{3}\%$
 10. (a) \$3,850 (b) \$3,465
 (c) 1%
 11. (a) \$1,600 (b) \$80
 (c) \$1,512 (d) \$72
 (e) 10%
 12. (a) \$47.50 (b) \$150
 (c) \$62.50 (d) $17\frac{6}{7}\%$
 13. (a) \$1.80 (b) 375
 (c) 10% decrease (d) $16\frac{2}{3}\%$
 14. (a) \$271.60 (b) 258.70
 (c) option 3

Review Exercise 7

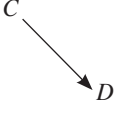
1. (a) \$3,000 (b) \$360
 2. (a) (i) 15 kg (ii) 10 kg
 (b) 3 : 2 : 1
 3. (a) 150 (b) 54
 (c) 41.875%
 4. (a) 150 (b) 500
 (c) 60
 5. (a) 8% (b) \$40,000
 6. (a) \$2,500 (b) \$3,125
 7. (a) 110 lb (b) 112.2 lb
 (c) 102%
 8. (a) (i) \$240 (ii) \$360
 (b) 6%
 9. (a) \$8 (b) \$4.80
 (c) 32%
 10. (a) 400 cm³ (b) 60 cm³
 11. (a) \$240 (b) \$45
 (c) \$237 (d) $35\frac{10}{11}\%$
 (e) \$25.38
 12. (a) (i) 14 (b) \$20 (c) \$20
 (ii) 28 (d) (i) \$420 (ii) $33\frac{1}{3}\%$
 (iii) 42
 (e) $23\frac{7}{11}\%$

Chapter 8 Angles, Triangles, and Quadrilaterals

Try It!

1. $w = 20$
 2. $x = 34$
 3. $m\angle x = 38^\circ$; $m\angle y = 142^\circ$
 4. $z = 55$
 5. $LN = 2$ cm
 6. (b) $EG = 6.2$ cm
 7. (b) $m\angle XTZ = 64^\circ$

Exercise 8.1

1. (a) infinite (b) 1
 2. C

 3. (a) 3 (b) 6
 4. (a) $AC = BD$
 (b) $AB = CD$ (given)
 $AB + BC = BC + CD$
 $AC = BD$
 5. (a) (i) infinite (ii) infinite
 (b) No

Exercise 8.2

1. (a) not complementary (b) complementary
 2. (a) 70° (b) 48°
 3. (a) not supplementary (b) supplementary
 4. (a) 137° (b) 104°
 5. (a) 50° (b) 70°
 6. (a) 81° (b) 79°
 7. (a) $x = 33^\circ$, $y = 147^\circ$ (b) $p = 52^\circ$, $q = 52^\circ$
 8. $x = 30$
 9. $y = 36$
 10. (a) $x = 90$ (b) right-angle
 11. (a) $y = 23$ (ii) straight angle
 (b) (i) acute angle (b) obtuse angle
 12. (a) $x = 22.5$
 13. $x = 30$
 14. (a) $x = 48$ (b) $x = 36$
 15. $a = 87$, $b = 55$, $c = 87$
 16. $x = 45$
 17. $y = 120$
 18. $x = 20$, $y = 40$
 19. (a) $\angle ABF$, $\angle FBE$, $\angle ABE$, $\angle CBD$
 (b) $\angle ABD$, $\angle FBD$, $\angle FBC$, $\angle EBC$
 (c) $\angle ABE$ and $\angle CBD$
 (d) $\angle ABF$ and $\angle CBF$, $\angle ABE$ and $\angle CBE$,
 $\angle ABD$ and $\angle CBD$
 20. (a) $x = 30$, $y = 100$; $x = 40$, $y = 90$
 (b) $x = 32.5$, $y = 97.5$

Exercise 8.3

5. (c) $PM \parallel QN$ (d) $MN = \frac{1}{2}AC$
 6. (b) $m\angle SBT = 90^\circ$
 $\frac{1}{2}(110^\circ) + \frac{1}{2}(70^\circ) = 90^\circ$
 7. (b) The 3 perpendicular bisectors meet at a point O . If we draw a circle with centre O and radius $OA/OB/OC$, the circle will touch vertices A , B and C .
 8. (b) The 3 angle bisectors meet at a point I . If we draw a circle with center I and the perpendicular distance from I to $XY/XZ/YZ$ as its radius, the circle will touch the 3 sides of $\triangle XYZ$.
 10. The hospital should be located at the point of intersection of the perpendicular bisectors of $\triangle ABC$, where A , B , and C are locations of towns A , B , and C respectively.

Exercise 8.4

- (a) sufficient, isosceles
(b) sufficient, equilateral
(c) not sufficient
(d) sufficient, isosceles
- (a) no unique triangle
(b) no unique triangle
(c) no unique triangle
(d) (i) obtuse-angled
(ii) isosceles, $m\angle R = 34^\circ$
(e) no unique triangle
(f) (i) obtuse-angled
(ii) scalene, $m\angle R = 100^\circ$
- (b) right-angled isosceles
(c) 45°
- (b) $m\angle D = 57^\circ$, $m\angle E = 44^\circ$, $m\angle F = 79^\circ$
(c) acute-angled
(d) $\angle DFE$
(e) DF
- (b) $HK = 7.4$ cm
(c) scalene
- (b) $m\angle LMN = 90^\circ$
(c) $LN = MN = 2.8$ cm
(d) right-angled isosceles
- (b) $XY = 6.0$ cm
(c) scalene
- (b) $m\angle BAC = 120^\circ$, $m\angle ACB = 30^\circ$
(c) isosceles
- (b) 55°
(c) 4 cm
(d) acute-angled isosceles
- (b) 100°
(c) obtuse-angled scalene
- (b) $m\angle ABC = 25^\circ$, $m\angle ACB = 25^\circ$
(d) $BD = 4.1$ cm, $CD = 4.1$ cm
(e) When $AB = AC$, the perpendicular AD from A to BC bisects BC .
- (d) equilateral triangle
(e) 0.5
- No

Exercise 8.5

- (b) 5.8 cm
- (b) 6.8 cm
- (d) 3.4 cm
- (b) $m\angle YZT = 89^\circ$, $m\angle XTZ = 121^\circ$
- (b) $QR = 3.35$ cm, $m\angle PQR = 116.6^\circ$
- (b) 3.9 cm
- (b) $m\angle A = 93^\circ$, $m\angle D = 77^\circ$
- (b) $AB = 5.2$ cm
- (a) $m\angle SPQ = 120^\circ$
(d) 4.3 cm
(e) PT . Because T is a point on the perpendicular bisector of PR .
- (b) 800 m
- (b) rectangle or parallelogram

Review Exercise 8

- (a) $p = 25$ (b) $q = 26$
- (a) $x = 62^\circ$, $y = 23^\circ$ (b) $x = 23^\circ$, $y = 18^\circ$
- (a) 22.5 (b) 30
- (a) 19 (b) 25
- (a) $a = 4$, $b = 6$ (b) $a = 9$, $b = 3$
(c) $a = 4.5$, $b = 3$
- (a) $\triangle ABC$ cannot be constructed. $\triangle PQR$ can be constructed.
(c) Scalene right-angled triangle
- (b) They meet at a point E outside $\triangle ABC$.
A circle with center E and radius EA will pass through the points B and C .
- (b) Yes, because $m\angle AOX = m\angle BOY$ and $m\angle COX = m\angle DOY$
(c) 90°
- (a) 3.9 cm (b) 80°
- (b) 3.1 cm
- (c) 4.3 cm

