

9 Academic Final Exam Review

1.16 REVIEW EXERCISE

1. Perform the indicated operation.

(a) $52\ 426$
 $\times\ 625$

(b) $378\ 475$
 $-156\ 847$

(c) $347\ 674$
 $258\ 125$
 $+847\ 888$

(d) $87\overline{)22\ 272}$

(e) $36.265 - 12.87$

(f) $534.26 + 45.926$

(g) 36.5×11.7

(h) $57.436 \div 9.92$

2. Round off the following numbers as indicated.

- (a) 32 205 to the nearest hundred
- (b) 525 876 to the nearest thousand
- (c) 16 450 to the nearest hundred
- (d) 0.625 to the nearest tenth
- (e) 12.8356 to the nearest hundredth
- (f) 5.75 to the nearest tenth
- (g) 34.845 to the nearest hundredth

3. Estimate the following.

(a) 36.25×17.895 (b) $628.35 \div 28.8$
 $\frac{28.7 \times 53.9}{41.6}$ (d) $\frac{475}{63.25 \times 18.65}$

4. Estimate the cost of the following.

- (a) 12 photo albums at \$6.95 each
- (b) 18 purses at \$18.95 each
- (c) 48 cookies at \$0.12 each
- (d) 96 ride tickets at \$4.75 each
- (e) 8 radios at \$49.95 each

5. Simplify.

(a) $8 \times 3 - 10$ (b) $8 + 6 - 5$
 $(c) 21 \div 7 - 1$ (d) $7 + 6 \div 2$
 $(e) (8 - 4) + 5$ (f) $8(5 - 3)$
 $(g) 5 + 3 \times 2$ (h) $10 - 12 \div 6$

6. If $E(x) = 5x$, find

- (a) $E(1)$ (b) $E(4)$ (c) $E(12)$ (d) $E(20)$

7. If $x = 3$, $y = 4$, and $z = 2$ evaluate the following algebraic expressions.

(a) $x + y$ (b) $7z$
 $(c) 3x - 4$ (d) $5xy$
 $(e) 10z + 5$ (f) $2x + 3z - 2y$

8. If $y = 2$, state the value of each of the following.

(a) y^2 (b) $3y^3$
 $(c) y^2 - 1$ (d) $(y + 3)^2$
 $(e) y^4 - 1$ (f) $5y^2$
 $(g) (5y)^2$ (h) $(7 - y)^3$

9. Simplify.

(a) $6x + 4x$ (b) $3y + y + 7y$
 $(c) 12x - 7x$ (d) $7x + 3x - 2x$
 $(e) 10x - x - 4x$ (f) $11y - 3y - 4y$
 $(g) 9z + 3z - 4z$ (h) $20y + 5y - 11y$

10. Simplify.

(a) $56 + (7 \times 13)$
 $(b) 77 - (48 \div 2)$
 $(c) 56 \div 4 \times 13$
 $(d) (41 + 5)(63 - 4)$
 $(e) (51 - 11) \div (16 \div 2)$
 $(f) [5 \times 3 - (6 + 1)] \times 9$

11. Simplify the following.

(a) $3.6^2 \div 1.2 + 2.5 \times 5.58$
 $(b) 4.8(16.2 - 12.3) \div 1.8 + 5.7 - 4.6$
 $(c) (4.5^2 - 2.6 \times 3.2) \times 2.1 - 4.65$
 $(d) 8.5^2 - (3.75 + 2.13) \times 4.5$
 $(e) 3.5(4.6 + 2.7) - 3.2^2 + 2.25$

12. If $x = 4$, $y = 5$, and $z = 3$, find the value of each of the following.

(a) $(x + y)(y + z)$ (b) $2x(3y + 5)$
 $(c) (2x - 3)(3z + 4)$ (d) $7xy - 3yz$
 $(e) \frac{9x + 2y + 2}{z}$ (f) $(7x - 2y)(8z + x)$

13. If $r = 4$, $s = 3$, and $t = 2$, find the value of each of the following.

(a) $5r^2 - 7s$ (b) $r^2 + s^2 + t^2$
 $(c) 3r^2s - 6t$ (d) $(5s^2) - 4st$
 $(e) \frac{2r^2 - 3s + 1}{t}$ (f) $\frac{2s^3 - 6rt}{2s}$
 $(g) \frac{5t - 6}{r + s}$ (h) $\frac{3r^2 + (3r)^2}{6t}$
 $(i) \frac{7s^2t^3 + 45}{3s}$ (j) $5r^2 - 3s^2 + 4t^2$
 $(k) (r + s + t)(r - s + t)$
 $(l) r^3 - s^2 + t^4$

14. Simplify.

- (a) $97x + 13y - 14x + 15y$
- (b) $15x^2 + 43x^2 + 7x + 3x$
- (c) $5x + 6y + 4 + 11x + 9y$
- (d) $73x^2 + 15x^2 + 8x^3 - x^3$
- (e) $24xy + 4yz + 17xy$
- (f) $9r + 7s + 12s + 15r$

15. Evaluate for $x = 2, y = 3$.

- (a) $15x + 5y - 11x + 3y$
- (b) $14x + 9y + 8y - y$
- (c) $9xy + 8x + 9x - 6xy$
- (d) $3x^2 + 5x + 2x + 7x^2$
- (e) $9x + 8xy - 7x + 5xy$
- (f) $7x^2 + 3y^2 - y^2 + 4x^2$

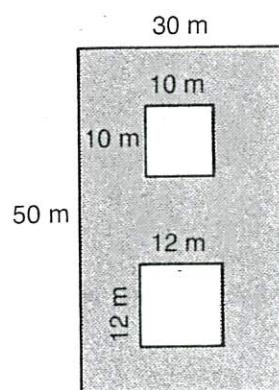
16. Substitute and find the value of the indicated variable.

- (a) If $A = \ell \times w$, find A when $\ell = 27$ cm and $w = 22$ cm.
- (b) If $P = 2(\ell + w)$, find P when $\ell = 53$ cm and $w = 47$ cm.
- (c) If $A = \frac{1}{2}bh$, find A when $b = 406$ cm and $h = 168$ cm.
- (d) If $A = \frac{1}{2}(a + b)h$, find A when $h = 194$ cm, $a = 64$ cm, and $b = 78$ cm.
- (e) If $V = \ell wh$, find V when $\ell = 34$ cm, $w = 16$ cm, and $h = 9$ cm.
- (f) If $P = 2(\ell + w)$, find P when $\ell = 3.7$ cm and $w = 2.8$ cm.
- (g) If $A = \frac{1}{2}(a + b)h$, find A when $a = 3.8$ cm, $b = 4.7$ cm, and $h = 4.5$ cm.

17. For $C = \pi d$, and $A = \pi r^2$, find the circumference and area for each of the following circles.

- (a) $r = 76$ cm
- (b) $d = 84$ cm
- (c) $r = 2.5$ m
- (d) $d = 3.7$ m

18. Find the area of the shaded figure.



19. An Air Canada jet takes off every two minutes for eighteen hours every day, seven days per week. How many take offs are there for Air Canada in one year?



20. Boris earns \$5.50/h and Debbie earns \$6.25/h. Together in one weekend, they earned \$88.50 for 15 h of work. How many hours did they each work?

21. The length of a rectangle is 3.2 cm longer than the width. The perimeter of the rectangle is 25 cm. What is the length of the rectangle?

MIND BENDER

Put the numbers from 1 to 9 in the spaces to make the statements true.

$$\begin{array}{l} \blacksquare - \blacksquare + \blacksquare = 8 \\ \blacksquare \div \blacksquare + \blacksquare = 8 \\ \blacksquare \times \blacksquare + \blacksquare = 8 \end{array}$$

2. (a) $15xyz$ (b) $12x^2wt$ (c) $8xyz$ (d) $35m^2n$
 3. (a) $8y$ (b) $7s$ (c) 5 (d) $6r$
 (e) 3 (f) $2s$ (g) $3y$ (h) $5x^3$
 4. (a) $153xyw$ (b) $216xyw$ (c) $405x^2yt$ (d) $561rst$
 (e) $297xyw$ (f) $817x^2yw^3$ (g) $551pqrs$ (h) $1075x^3y^2w^6$
 (i) $18564xyz$ (j) $1224p^2q^2s^2$
 (a) $6z$ (b) 20 (c) $15y$ (d) $123y$ (e) $45s$
 (f) $21z$ (g) 19 (h) $14st$ (i) $25t$
 6. (a) $2y$ (b) $6x^2$ (c) $2y$ (d) $3x$ (e) xy
 (f) 12 (g) 12 (h) $15w^2$ (i) 4 (j) 10
 7. (a) $24wxy; 576$ (b) $0; 0$ (c) $4w^2xy; 192$
 (d) $50wxy; 1200$ (e) $12w^2x^2y; 1728$ (f) $24wxy; 576$
 8. (a) 1367.5 (b) 2168.3 (c) 18.7 (d) 0.2 (e) 33.6
 (f) 7.9 (g) 8.4 (h) 65.1 (i) 601.7 (j) 14.8

EXERCISE 1.12

1. (a) 42 cm (b) 706 m 2. (a) 128 cm (b) 572 m
 3. (a) 36 cm (b) 474 m 4. (a) 298 cm (b) 1046 m
 5. (a) 76 cm (b) 461 m 6. (a) 1984 cm^2 (b) $14\ 847 \text{ m}^2$
 7. (a) 1521 cm^2 (b) 3844 m^2 8. (a) 168 cm^2 (b) 4061 m^2
 9. (a) 532 cm^2 (b) 3333 m^2 10. (a) 92 cm^2 (b) 738 m^2
 11. (a) 96 cm^2 (b) 418 m^2 12. (a) 30 cm^3 (b) 1001 m^3
 13. (a) 343 cm^3 (b) 2197 m^3

EXERCISE 1.13

1. (a) 94.2 cm (b) 879.2 m 2. (a) 314 cm^2 (b) 1808.64 m^2
 3. (a) 4710 cm^3 (b) 4019.2 m^3 4. (a) 735.25 cm^3 (b) 65.42 cm^3

EXERCISE 1.14

1. 222 m 2. 270.04 m 3. 2620 cm 4. $680\ 724 \text{ m}^2$
 5. $413\ 449 \text{ cm}^2$ 6. $64\ 209.86 \text{ cm}^2$ 7. 1.729 m^3 8. $14\ 921.28 \text{ cm}^3$
 9. 7234.56 cm^3 10. $523\frac{1}{3} \text{ cm}^3$ 11. (a) 96 m^2 (b) 208 m^2
 12. (a) $P = 52 \text{ m}, A = 102 \text{ m}^2$ (b) $P = 31.12 \text{ m}, A = 74.24 \text{ m}^2$ (c) $P = 51.4 \text{ cm}, A = 157 \text{ cm}^2$
 (d) $P = 28.71 \text{ m}, A = 34.06 \text{ m}^2$ (e) $P = 42 \text{ m}, A = 74 \text{ m}^2$ (f) $P = 57.84 \text{ m}, A = 132.39 \text{ m}^2$

1.16 REVIEW EXERCISE

1. (a) $32\ 766\ 250$ (b) $221\ 628$ (c) $1\ 453\ 660$ (d) 256
 (e) 23.395 (f) 580.186 (g) 427.05 (h) $5.789\ 919\ 355$
 2. (a) $32\ 200$ (b) $526\ 000$ (c) $16\ 400$ (d) 0.6
 (e) 12.84 (f) 5.8 (g) 34.84
 3. (a) 700 (b) 21 (c) 37.5 (d) 0.4
 4. (a) $\$70$ (b) $\$380$ (c) $\$5$ (d) $\$480$ (e) $\$400$
 5. (a) 14 (b) 9 (c) 2 (d) 10
 (e) 9 (f) 16 (g) 11 (h) 8
 6. (a) 5 (b) 20 (c) 60 (d) 100
 7. (a) 7 (b) 14 (c) 5 (d) 25 (f) 4
 8. (a) 4 (b) 24 (c) 3 (d) 25
 (e) 15 (f) 20 (g) 100 (h) 125
 9. (a) $10x$ (b) $11y$ (c) $5x$ (d) $8x$
 (e) $5x$ (f) $4y$ (g) $8z$ (h) $14y$
 10. (a) 147 (b) 53 (c) 182 (d) 2714 (e) 5 (f) 72
 11. (a) 24.75 (b) 11.5 (c) 20.403 (d) 45.79 (e) 17.56
 12. (a) 72 (b) 160 (c) 65 (d) 95 (e) 16 (f) 504

13. (a) 59 (b) 29 (c) 132 (d) 21 (e) 12 (f) 1
 (g) $\frac{4}{7}$ (h) 16 (i) 61 (j) 69 (k) 27 (l) 71
 14. (a) $83x + 28y$ (b) $58x^2 + 10x$ (c) $16x + 15y + 4$
 (d) $88x^2 + 7x^3$ (e) $41xy + 4yz$ (f) $24r + 19s$
 15. (a) 32 (b) 72 (c) 52 (d) 54 (e) 82 (f) 62
 16. (a) 594 cm^2 (b) 200 cm (c) 34104 cm^2 (d) 13774 cm^2
 (e) 4896 cm^3 (f) 13 cm (g) 19.125 cm^2
 17. (a) $C = 447.28 \text{ cm}$, $A = 18136.64 \text{ cm}^2$ (b) $C = 263.76 \text{ cm}$, $A = 5538.96 \text{ cm}^2$
 (c) $C = 15.7 \text{ m}$, $A = 19.62 \text{ m}^2$ (d) $C = 11.62 \text{ m}$, $A = 10.75 \text{ m}^2$
 18. 1256 m^2 19. 197 100 20. Boris: 7 h; Debbie: 8 h 21. 7.85 cm

1.17 CHAPTER 1 TEST

1. (a) 38 884 (b) 260.791 (c) 7666.9 (d) 32.8
 2. (a) 2.658 (b) 34.4 (c) 63 500 3. 48
 4. (a) 62 (b) 0.5 (c) 21.1 5. (a) 14 (b) 98 (c) 2
 6. (a) 25 (b) 1 7. (a) 10.26 (b) 20
 8. (a) $6xyz$ (b) $x + 7y + 5xy$ (c) $3x^2 + 8x$ (d) $10x + 5y$
 9. 11.34 cm^2 10. 4415.625 cm^3

REVIEW AND PREVIEW TO CHAPTER 2

PERCENT

1. (a) 0.5 (b) 0.25 (c) 0.75 (d) 0.1 (e) 0.15 (f) 0.2
 (g) 0.21 (h) 0.37 (i) 0.42 (j) 0.81 (k) 0.93 (l) 0.62
 (m) 0.08 (n) 0.05 (o) 0.242 (p) 0.157 (q) 0.604 (r) 0.823
 (s) 0.915 (t) 0.366
 2. (a) 24 (b) 144 (c) 55.2 (d) 78 (e) 47.52 (f) 1.6
 (g) 5.39 (h) 2480
 3. (a) 297.5 (b) 5742 (c) 386.1 (d) 6.6 (e) 100.8 (f) 130
 (g) 105 (h) 100

PROBLEMS

1. \$1125 2. 525 km 3. \$66 635 4. \$628 125 5. 11 h 6. 125
 7. 18 870 000 kg 8. 117 m 9. 2958 kg 10. 13

PERIMETER, AREA, AND VOLUME

1. (a) 30 m (b) 532 cm (c) 47 m (d) 644 m
 2. (a) 966 cm^2 (b) 225 m^2 (c) 45.24 m^2 (d) 7623 cm^2
 3. (a) 198 m^3 (b) 729 cm^3

EXERCISE 2.1

1. 50 337 2. 01 : 23
 1. Possibilities: 15 cm by 7 cm, 10.5 cm by 10 cm, 21 cm by 5 cm, 30 cm by 3.5 cm
 4. \$4.35 5. 36 6. 24 ways
 7. 143.5 cm and 206.5 cm 8. \$20.15 and \$26.65 9. 81, 82, and 83
 10. 450 000 000 11. \$940.62 12. 176 13. 120
 14. (a) 15:00 (b) 11:00 15. 1134 16. 30 min and 57 s
 17. 11 574 d 1 h 46 min 40 s 18. 20
 20. January 1, December 31 21. \$6500
 22. 47, 78, 128 23. 40 24. 7 25. \$161.87
 26. 1273 km (to the nearest kilometre) 27. 1.5 cm
 28. 25.2 m 29. 217 30. \$341.60 31. Answers will vary.
 32. 237 33. 6 34. 11 250 35. 30 cm
 36. one thousand 37. Answers will vary.

7.19 REVIEW EXERCISE

1. Write the degree of each polynomial.

- $5a^2b + 6ab^3c - 12$
- $7xyz - 3x^2 + 2y$
- $9r^2s^2t^3 - 4r^2t^2 + 3r^2s^3t$

2. Simplify.

- $(2x^2 + 3x - 7) + (4x^2 - 2x - 5)$
- $(2y^2 + 3y - 6) + (6y^2 - 4y - 9)$
- $(1 - 2m - 3m^2) + (5m^2 - 2m - 8)$
- $(4t - 3t^2 + 13) + (1 - 5t - t^2)$

3. Simplify.

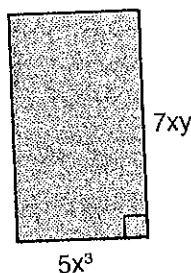
- $(2x^2 + 3x + 7) - (x^2 - 5x - 9)$
- $(3t^2 - 6t - 9) - (7t^2 + 6t + 6)$
- $(1 - 3m - 2m^2) - (4m + 6 - 5m^2)$
- $(4y^2 - 4y - 1) - (5 - 3y - 6y^2)$

4. Simplify.

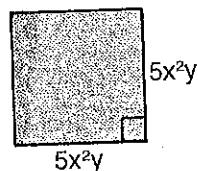
- $(4x^2y^3)(5x^3y^2)$
- $(-3m^2nt)(2m^3)$
- $(-11r^2st)(-9r^3s^2t^3)$
- $(12x^2y)(-4x^3)(-x^2)$

5. Calculate the area of each figure.

(a)



(b)



6. Simplify.

- $(4x^2yz)^3$
- $(3r^3st^4)^5$
- $(-2mn^2p)^4$
- $(-d^3e^2f^4)^3$
- $(-5x^3y^2)^2(-3x^2y^4)^3$
- $(2x^2y^3z)^3(-xy^3z^4)^2$

7. Expand and simplify.

- $2(x + 3) - 5(x + 1) + 2(x - 5)$
- $3(2y + 5) + 2(y + 3) - 4(y - 4)$
- $-(x^2 - 1) + 2x(x + 3) - (3x - 1)$
- $2(2x - 3y) - 4(3x + 2y)$

8. Expand and simplify.

- $2x(4x - 3) - 5x(x + 1)$
- $5t(3t - 4s) - 2t(5t - 6s)$
- $3xy(2x - 5y) + 2xy(x - 3y)$
- $3mn(m - 5n) - mn(3m + 2n)$
- $x^2y(x + y) - xy^2(x - y)$

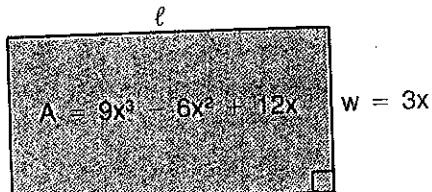
9. Simplify. Assume no denominator is equal to zero.

- $\frac{8t^4}{2t^3}$
- $\frac{-15m^4n^6}{-3mn}$
- $\frac{18a^3b^2}{9a^4b^6}$
- $\frac{60x^{-3}y^{-1}z^4}{-25xy^{-3}z^{-2}}$
- $\frac{20x^6y^3}{-4x^2y}$
- $\frac{-80r^3t^2}{5rt}$
- $\frac{9a^{-1}b^2c^{-3}}{-3a^2b^2c^{-1}}$
- $\frac{-4r^{-2}s^3t^4}{-2r^2s^{-3}t^{-2}}$

10. Divide. Assume no denominator is equal to zero.

- $\frac{6x^3y^2 - 4x^2y^3}{2xy}$
- $\frac{15m^3n^3 - 5m^2n}{-5m^2n}$
- $\frac{21a^3b^2c - 14ab^2c^2 - 35a^2b^2c^2}{-7ab^2c}$
- $\frac{x^7 - x^6 + x^5 - x^4 + x^3 - x^2}{-x}$

11. Find an expression for ℓ .



12. Find the GCF of the following.

- $14xyz, 7xy, 21yz$
- $10a^2b, 15ab^2, 25a^2b^2$
- $24r^2st, 28rs^2t, 32rst^2$

13. Find the missing factor.

- (a) $2xy(\square) = 4x^3y^2$
(b) $5mn(\square) = 20m^2n^2p$
(c) $-3xy(\square) = 12x^4y^2$
(d) $8a^2b(\square) = -24a^2b^4c$

14. Factor.

- (a) $3m^2n + 6mn$
(b) $8xy + 4xz + 2x$
(c) $20x^3y^2 + 15x^2y^2 - 5xy^3$
(d) $14rt - 7r + 21rs$

15. Expand and simplify.

- (a) $(x - 3)(x + 5)$ (b) $(x + 2)(x - 3)$
(c) $(2y - 1)(3y - 2)$ (d) $(2x + 1)(2x - 1)$
(e) $(3z - 2)(3z - 2)$ (f) $(2t + 1)(5t + 3)$

16. Factor.

- (a) $x^2 - x - 6$ (b) $x^2 - 13x + 42$
(c) $m^2 + 6m - 27$ (d) $t^2 + 18t + 80$
(e) $s^2 - 14s + 33$ (f) $x^2 + 2x - 35$
(g) $m^2 - 13m + 12$ (h) $t^2 - 2t - 24$
(i) $t^2 - 20t + 99$ (j) $r^2 + 6r - 16$

17. Factor.

- (a) $2x^2 + 5x - 3$ (b) $20t^2 + 11t - 3$
(c) $9r^2 + 24r + 7$ (d) $10m^2 - 29m + 10$
(e) $40s^2 + 17s - 12$ (f) $21y^2 + 25y - 4$
(g) $25x^2 + 20x + 4$ (h) $14b^2 - 11b + 2$
(i) $6m^2 - 23m + 15$ (j) $4y^2 + 5y - 9$

18. Expand.

- (a) $(x - 7)(x + 7)$ (b) $(m + 5)(m - 5)$
(c) $(2x - 3)(2x + 3)$ (d) $(4t + 5)(4t - 5)$
(e) $(2m - 1)(2m + 1)$ (f) $(x - y)(x + y)$

19. Factor.

- (a) $x^2 - 100$ (b) $a^2 - 81$
(c) $m^2n^2 - 64$ (d) $1 - 36t^4$
(e) $25x^2 - 4y^2$ (f) $16a^2 - 9b^2$

20. Expand.

- (a) $(2x - 1)^2$ (b) $(3m + 4)^2$
(c) $(5m + 7)^2$ (d) $(4t - 3)^2$
(e) $(6x - y)^2$ (f) $(9b - 2w)^2$

21. Expand and simplify.

- (a) $(x^2 - 2x - 2)(2x - 1)$
(b) $(3z^2 - 2z + 1)(2z - 1)$
(c) $(2y^2 - 3y - 4)(y + 2)$

22. Simplify.

- (a) $(x - 7)(x - 2) - (x - 4)(x + 1)$
(b) $3(y - 2)(y - 3) - (y - 5)(y + 2) + 7$
(c) $2(x - 3)(2x + 1) - 2(3x - 1)(x + 1)$
(d) $4(z^2 - 2z - 2) + 2(z^2 - 9z + 2)$

23. Expand and simplify.

- (a) $(x^2 - 3x - 2)(2x - 1)$
(b) $(y^2 + y + 1)(y - 2)$
(c) $2(z - 3)(2z - 1) - 3(3z - 1)(z + 2)$
(d) $(3x^2 - 2x - 2)(x + 1)$

24. There are 24 fence posts spaced evenly around a rectangular field. The posts are 2 m apart. Eight posts form the length.

- (a) How many posts form the width?
(b) What is the area of the field?

25. What number times itself is 65 536?

26. What is the maximum number of times four straight lines can intersect?

MIND BENDER

A sports store has a number of bicycles, tricycles, and wagons for sale. There are an equal number of tricycles and wagons. There is a total of 60 pedals and 180 wheels. How many bicycles, tricycles, and wagons are there in the store?

2. (a) $4x^2 + 12x + 9$ (b) $25x^2 - 20x + 4$ (c) $50x^2 + 60x + 18$
 (d) $4y^2 - 20y + 25$ (e) $16 - 8y + y^2$ (f) $12 - 60y + 75y^2$
 (g) $9z^2 + 42z + 49$ (h) $4z^2 - 20z + 25$ (i) $100 - 40z + 16z^2$
 (j) $9t^2 + 48t + 64$ (k) $49 + 56s + 16s^2$ (l) $-8r^2 + 72r - 162$
 3. (a) $x^2y^2 + 2xy + 1$ (b) $s^2t^2 - 6st + 9$ (c) $5p^2q^2 + 20pq + 20$
 (d) $9x^2y^2 + 6xy + 1$ (e) $y^2z^2 + 14yz + 49$ (f) $75y^2 - 30xyz + 3x^2z^2$
 (g) $4x^2y^2 - 12xy + 9$ (h) $25x^2z^2 + 80xz + 64$ (i) $36x^2y^2 + 96xy + 64$
 (j) $25x^2 + 70xyz + 49y^2z^2$ (k) $4x^2y^2 - 36xy + 81$ (l) $-25r^2s^2 - 20rst - 4t^2$
 4. (a) $(x + 9)^2$ (b) $(x - 7)^2$ (c) $(3t + 2)^2$
 (d) $(5m - 7)^2$ (e) $(10t - 1)^2$ (f) $(8m + 7)^2$

EXERCISE 7.17

1. (a) $2x^2 + x - 3$ (b) $x^2 + 5x - 14$ (c) $6x^2 + x - 35$ (d) $12x^2 + 29x + 15$
 2. (a) $x^3 - 7x^2 + 12x - 4$ (b) $3x^3 + 5x^2 - 27x + 4$
 (c) $6x^3 - 7x^2 - 11x + 10$ (d) $2x^3 - 5x^2 - 19x + 15$
 (e) $x^4 - 4x^3 - 4x^2 + 13x - 6$ (f) $x^4 + 2x^3 + 17x - 10$
 (g) $6x^4 - 19x^3 + 4x^2 + 19x - 10$ (h) $6x^4 - 16x^3 - 13x^2 + 40x - 5$
 3. (a) $x^3 + 4x^2 + 4x + 1$ (b) $2x^3 - 9x^2 + 13x - 6$
 (c) $3x^3 + 7x^2 + x + 21$ (d) $2y^3 + y^2 - 12y + 9$
 (e) $3y^3 - 14y^2 + 18y - 9$ (f) $6x^3 + 9x^2 + 10x + 15$
 4. (a) $6s^3 - 19s^2 + 19s - 6$ (b) $10t^3 - 21t^2 + 5t + 6$
 (c) $5x^3 + 17x^2 - 12x$ (d) $8 - 18t + 11t^2 - 3t^3$
 (e) $2v^3 - 13v^2 + 31v - 35$ (f) $6r^3 - r^2 - r + 21$
 (g) $6x^3 + 3x^2 - 2x - 1$
 5. (a) $6x^3 + 5x^2 - 17x + 20$ (b) $2 - 7x + 8x^2 - 3x^3$
 6. (a) $5x - y$ (b) $5y - 16$ (c) $3x^2 - 5x$ (d) $3x^2 + x + 12$
 (e) $2x^2 + 11x + 6$ (f) $2y^2 + 5y - 1$
 7. (a) $2x^2 + 10x + 44$ (b) $-x^2 + 32x - 12$ (c) $-y^2 - 3y + 8$ (d) $2x^2 + 13x + 51$
 8. (a) $-x^2 + 28x + 23$ (b) $-8x^2 + 18x - 23$ (c) $-30x + 55$ (d) $8x^2 - 25x - 73$
 9. (a) $3x^2 - 20x + 46$ (b) $x^2 - 10x + 19$ (c) $x^2 - 3$ (d) $-7x + 13$
 (e) $18x^2 - 76x + 13$ (f) $144x + 72$
 10. (a) $x^3 + 3x^2 + 3x + 1$ (b) $x^3 + 6x^2 + 12x + 8$ (c) $x^3 + 9x^2 + 27x + 27$
 (d) $3x^3 - 6x^2 - 39x + 18$ (e) $-4x^3 + 4x^2 + 20x - 24$
 11. (a) $5x^2 - 5y^2$ (b) $3x^2 + 50x - 5$ (c) $5x^2 - 36x + 7$
 (d) $5x^2 - 26x + 179$ (e) $-3x^2 + 2xy + 8y^2$ (f) $5x^2 + 8xy + 14y^2$
 (g) $-21x^2 + 21$ (h) $x^2 - 38x + 41$ (i) $-6x - 27$
 (j) $-6x^2 - 48x + 25$
 12. (a) $x^3 - 9x^2 + 24x - 9$ (b) $2y^3 + 13y^2 + 25y - 10$

EXERCISE 7.18

1. approximately 11.6 d
 5. $x^2 - y^2$
 6. Caroline's transportation budget will be exhausted after the 24th week. She will need \$266.67 to complete the year.
 8. 8
 9. 83
 10. (a) 10
 11. 602 070
 13. 506.5 m^3
 14. Sam walked 16 km, Cory walked 27 km.
 15. (a) 380 games
 16. 120 posts
 17. 15
 18. 15
 19. \$1.76
 21. 61 m^2
 22. 40 squares
 23. 1 and 4
 20. 16 m and 24 m

7.19 REVIEW EXERCISE

1. (a) 5
 2. (a) $6x^2 + x - 12$
 3. (a) $x^2 + 8x + 16$
 4. (a) $20x^5y^6$
 5. (a) $35x^4y$
 (b) 3
 (b) $8y^2 - y - 15$
 (b) $-4t^2 - 12t - 15$
 (b) $-6m^5nt$
 (b) $25x^4y^2$
 (c) 7
 (c) $2m^2 - 4m - 7$
 (c) $3m^2 - 7m - 5$
 (c) $99r^5s^3t^4$
 (d) $-4t^2 - t + 14$
 (d) $10y^2 - y - 6$
 (d) $48x^7y$

6. (a) $64x^6y^3z^3$
 (e) $-675x^{12}y^{16}$
 7. (a) $-x - 9$
 8. (a) $3x^2 - 11x$
 (e) $x^3y + xy^3$
 9. (a) $4t$
 (e) $\frac{2}{ab^4}$
 10. (a) $3x^2y - 2xy^2$
 (c) $-3a^2 + 2c + 5ac$
 11. $3x^2 - 2x + 4$
 13. (a) $2x^2y$
 14. (a) $3mn(m + 2)$
 (c) $5xy^2(4x^2 + 3x - y)$
 15. (a) $x^2 + 2x - 15$
 (d) $4x^2 - 1$
 16. (a) $(x + 2)(x - 3)$
 (e) $(s - 3)(s - 11)$
 (i) $(t - 9)(t - 11)$
 17. (a) $(x + 3)(2x - 1)$
 (d) $(2m - 5)(5m - 2)$
 (g) $(5x + 2)(5x + 2)$
 (j) $(y - 1)(4y + 9)$
 18. (a) $x^2 - 49$
 (d) $16t^2 - 25$
 19. (a) $(x + 10)(x - 10)$
 (d) $(1 + 6t^2)(1 - 6t^2)$
 20. (a) $4x^2 - 4x + 1$
 (d) $16t^2 - 24t + 9$
 21. (a) $2x^3 - 5x^2 - 2x + 2$
 22. (a) $-6x + 18$
 (c) $-2x^2 - 14x - 4$
 23. (a) $2x^3 - 7x^2 - x + 2$
 (c) $-5z^2 - 29z + 12$
 24. (a) 6
 (b) $140 m^2$
- (b) $243r^{15}s^5t^{20}$
 (f) $8x^8y^{15}z^{11}$
 (b) $4y + 37$
 (b) $5t^2 - 8st$
 (b) $-5x^4y^2$
 (f) $\frac{-3}{a^3c^2}$
 (b) $x^2 - x - 6$
 (e) $9z^2 - 12z + 4$
 (b) $(x - 6)(x - 7)$
 (f) $(x - 5)(x + 7)$
 (j) $(r - 2)(r + 8)$
 (b) $(4t + 3)(5t - 1)$
 (e) $(5s + 4)(8s - 3)$
 (h) $(2b - 1)(7b - 2)$
 (b) $m^2 - 25$
 (e) $4m^2 - 1$
 (b) $(a + 9)(a - 9)$
 (e) $(5x + 2y)(5x - 2y)$
 (b) $9m^2 + 24m + 16$
 (e) $36x^2 - 12xy + y^2$
 (b) $6z^3 - 7z^2 + 4z - 1$
 (b) $7t^2 - t + 4$
 (b) $x^2y + 4xy^2$
 (b) $(3x + 4)(3x - 4)$
 (b) $2y^2 - 12y + 35$
 (d) $6z^2 - 26z - 4$
 (b) $y^3 - y^2 - y - 2$
 (d) $3x^3 + x^2 - 4x - 2$
 (c) $16m^4n^8p^4$
 (c) $x^2 + 3x + 2$
 (c) $8x^2y - 21xy^2$
 (c) $5m^3n^5$
 (g) $\frac{-12y^2z^6}{5x^4}$
 (b) $-3mn^2 + 1$
 (d) $-x^6 + x^5 - x^4 + x^3 - x^2 + x$
 12. (a) $7y$
 (b) $4mnp$
 (b) $x^2 - x - 6$
 (e) $9z^2 - 12z + 4$
 (c) $(m - 3)(m + 9)$
 (g) $(m - 1)(m - 12)$
 (j) $(r - 2)(r + 8)$
 (b) $(4t + 3)(5t - 1)$
 (e) $(5s + 4)(8s - 3)$
 (h) $(2b - 1)(7b - 2)$
 (b) $6y^2 - 7y + 2$
 (f) $10t^2 + 11t + 3$
 (c) $(m - 3)(m + 9)$
 (d) $(t + 8)(t + 10)$
 (h) $(t - 6)(t + 4)$
 (c) $4x^2 - 9$
 (f) $x^2 - y^2$
 (c) $(mn + 8)(mn - 8)$
 (f) $(4a + 3b)(4a - 3b)$
 (c) $25m^2 + 70m + 49$
 (f) $81b^2 - 36bw + 4w^2$
 (c) $2y^3 + y^2 - 10y - 8$
 25. 256
 26. 6

7.20 CHAPTER 7 TEST

1. (a) $9x^2 - 2x - 11$
 2. (a) -11
 4. (a) $2y(x - 3z + 4)$
 5. (a) $6x^2 + 13x - 5$
 6. (a) $(x - 4)(x + 5)$
 7. (a) $2x^3 + x^2 - 7x - 2$
 (b) $7t^2 - t + 4$
 (b) $x^2y + 4xy^2$
 (b) $(3x + 4)(3x - 4)$
 (c) $-20x^3y^9$
 3. $2x^2y - 3xy^2 + 2xy$
 (b) $5mn^2(4m^2 - mn + 2)$
 (b) $25t^2 - 10t + 1$
 (c) $(t + 5)(2t - 1)$
 (b) $-16x^2 - 39x + 13$
 (d) $6x^2$
 (i) $8x^2 + 32x + 3$
 (l) $58 - 107z + 62z^2$
 (o) $-2xy + 101x - 49y$
 (r) $-52.8x - 24.1y$
 (c) $43y$
 (f) $39t$
 (i) $8x^2 + 32x + 3$
 (l) $58 - 107z + 62z^2$
 (o) $-2xy + 101x - 49y$
 (r) $-52.8x - 24.1y$
 (c) $-12x^3 + 46.6x$
 (f) $-2.45x$
 (i) $6.43y^2 - 2.19y$

REVIEW AND PREVIEW TO CHAPTER 8

ALGEBRA, EQUATIONS, AND INEQUALITIES

1. (a) $45x$
 (d) $42xy$
 (g) $25x + 97y$
 (j) $101 - 53s + 48t$
 (m) $43xy - 74x^2$
 (p) $158x - 112y + 2$
 (s) $-32.3x^2 + 47.3y$
 2. (a) $130.3t - 95.2s$
 (d) $9.48x + 0.87y$
 (g) $-42.3x^2 + 115.9x$
 (j) $1.07x^2 + 6.39x$
 (b) $60x$
 (e) $-19x^2$
 (h) $86x^2 - 34x$
 (k) $107 - 59x + 81y$
 (n) $41x^3 - 53x^2 - 9x + 114$
 (q) $238x + 381y$
 (b) $-376.3 - 91.3t$
 (e) $-41.6 + 136x$
 (h) $6.37x^3 + 6.84x^2 + 1.16x$
 (k) $2x$

EXERCISE 1.12

A 1. Simplify.

- | | |
|--------------------------|------------------------|
| (a) $(x^3)(x^5)$ | (b) $(a^2)(a^{10})$ |
| (c) $(b)(b)(b)$ | (d) $(m^2)(m^3)(m)$ |
| (e) $(a^2)(a^3)(b)(b^4)$ | (f) $(a)(b)(a^2)(b^3)$ |

2. Simplify.

- | | | |
|--------------------|--------------------|-----------------------|
| (a) $a^7 \div a^3$ | (b) $b^3 \div b^2$ | (c) $n^{12} \div n^3$ |
| (d) $x^8 \div x^5$ | (e) $a^5 \div a$ | (f) $x^{10} \div x^9$ |

3. Simplify.

- | | | |
|-----------------|------------------|------------------|
| (a) $(x^4)^2$ | (b) $(a^3)^3$ | (c) $(a^2b)^3$ |
| (d) $(xy^3)^5$ | (e) $(abc)^5$ | (f) $(b^8)^3$ |
| (g) $(2x^3)^3$ | (h) $(a^5b^2)^3$ | (i) $(3a^5)^2$ |
| (j) $(3xy^2)^3$ | (k) $(5a^8)^3$ | (l) $(4x^2yz)^3$ |

4. Simplify.

- | | | | |
|-----------------------------------|-------------------------------------|--|-------------------------------------|
| (a) $\left(\frac{x}{y}\right)^5$ | (b) $\left(\frac{a^2}{3}\right)^2$ | (c) $\left(\frac{x^2}{y}\right)^3$ | (d) $\left(\frac{a}{b^5}\right)^4$ |
| (e) $\left(\frac{3x}{y}\right)^2$ | (f) $\left(\frac{2x^2}{w}\right)^3$ | (g) $\left(\frac{5a^2}{2b^3}\right)^2$ | (h) $\left(\frac{3a}{b^3}\right)^2$ |

B 5. Simplify.

- | | |
|----------------------------|------------------------|
| (a) $(5a^3)(3a^6)$ | (b) $(4x^2)(-2x^3)$ |
| (c) $(3a^2b^3)(2ab^2)$ | (d) $(2x)(5x^3)$ |
| (e) $(5mn)(3m)$ | (f) $(-4x^3)(-3x^2)$ |
| (g) $(3y)(5y)(2y^2)$ | (h) $(a)(2a^2)(-3a^5)$ |
| (i) $(-7x^3)(-2x^3)(-x^2)$ | |

6. Simplify.

- | | |
|----------------------------------|-------------------------|
| (a) $12a^5 \div 3a^3$ | (b) $21x^2y^5 \div 7xy$ |
| (c) $8a^2 \div 8a$ | (d) $48m^2n \div 6mn$ |
| (e) $30m^2 \div (-6m^2)$ | |
| (f) $(-18ab^3) \div (-2ab)$ | |
| (g) $56pqr \div 8pr$ | |
| (h) $(-24a^2b^2) \div (8a^2b^2)$ | |
| (i) $(15x^{10}y^2) \div (-5xy)$ | |

7. Simplify.

- | | |
|---|--|
| (a) $(-2a^3)^3$ | (b) $[(3x)(x^2)]^2$ |
| (c) $\left(\frac{12x^5}{4x^3}\right)^2$ | (d) $[(2a^3b)(3a^4)]^2$ |
| (e) $\left(\frac{a^5b}{c^4}\right)^3$ | (f) $\left(\frac{-32a^5b}{-16ab}\right)^3$ |
| (g) $\left(\frac{48x^3y^7}{-12xy}\right)^3$ | (h) $\left(\frac{5a^2x}{15a^2}\right)^3$ |

8. Simplify.

- | | |
|--|---|
| (a) $(2x^2)^3(2x^5)$ | (b) $\frac{(8ab^2)(3a^2b)}{12a^3}$ |
| (c) $\frac{(3x^2y^5)^3}{9xy^2}$ | (d) $\frac{(12m^2n^5)(-5mn^3)}{15m^3n^2}$ |
| (e) $\frac{(-12x^2)(-4x^2y)}{(-6x^3)}$ | (f) $\frac{-32m^{10}n^3}{(8m^5)(mn)}$ |

MICRO MATH

Pythagoras discovered that the square of a number can be obtained by adding a corresponding number of consecutive odd numbers.

$$1^2 = 1 = 1$$

$$2^2 = 1 + 3 = 4$$

$$3^2 = 1 + 3 + 5 = 9$$

$$4^2 = 1 + 3 + 5 + 7 = 16$$

$$5^2 = 1 + 3 + 5 + 7 + 9 = 25$$

The following BASIC program illustrates this fact.

NEW

```

100 REM PERFECT SQUARES BY ADDING
101 REM CONSECUTIVE ODD NUMBERS
110 PRINT "HOW MANY ODD NUMBERS";
120 INPUT N
130 PRINT N; "↑2 =" ;
140 FOR I= 1 TO 2*N-1 STEP 2
150 S = S + I
160 PRINT I;
170 IF I < 2*N-1 THEN PRINT "+";
180 NEXT I
190 PRINT "="; S
200 END

```

RUN

EXAMPLE 2. Simplify.

(a) $\left(\frac{-2}{3}\right)^0$

(b) $\left(\frac{3}{5}\right)^{-2}$

(c) $3^{-1} + 2^{-2}$

SOLUTION:

(a) $\left(-\frac{2}{3}\right)^0 = 1$

(b) $\left(\frac{3}{5}\right)^{-2} = \frac{1}{\left(\frac{3}{5}\right)^2}$
= $\frac{1}{\frac{9}{25}}$
= $\frac{25}{9}$

(c) $3^{-1} + 2^{-2} = \frac{1}{3} + \frac{1}{2^2}$
= $\frac{1}{3} + \frac{1}{4}$
= $\frac{4+3}{12}$
= $\frac{7}{12}$

EXAMPLE 3. Simplify. $\frac{(x^2y^3)^2}{(xy^2)(x^3y^6)}$

SOLUTION:

$$\begin{aligned}\frac{(x^2y^3)^2}{(xy^2)(x^3y^6)} &= \frac{x^4y^6}{x^4y^8} \\ &= x^0y^{-2} \\ &= y^{-2} \quad \text{or} \quad \frac{1}{y^2}\end{aligned}$$

EXERCISE 1.13

A 1. Simplify.

- (a) $(x^3)(x^{-5})$
 (b) $(a^{-1})(a^8)$
 (c) $(y^0)(y^4)$
 (d) $(b^{-1})(b^{-3})$
 (e) $(a^{10})(a^3)(a^{-5})$
 (f) $(x)(x^0)$
 (g) $(b^{-5})(b^5)$
 (h) $(m)(m^{-1})(m^0)$

2. Simplify.

- (a) $x^{10} \div x^5$
 (b) $b^9 \div b^{12}$
 (c) $a^0 \div a^3$
 (d) $x^{-3} \div x^2$
 (e) $m^{-5} \div m^0$
 (f) $n^4 \div n^{-3}$
 (g) $0 \div y^5$
 (h) $m^{-8} \div m^{-4}$

3. Evaluate.

- (a) 4^0
 (b) 2^{-1}
 (c) $(-3)^0$
 (d) 10^{-1}
 (e) 3^{-2}
 (f) 10^0
 (g) 4^{-2}
 (h) 2^{-3}

B 4. Simplify.

- (a) $(3x^5)(5x^{-2})$
 (b) $(a^2b^5)(a^3b^{-8})$
 (c) $(2y^5)(3y^{-5})$
 (d) $(x^{10})(x^{-3})(x^{-5})$
 (e) $(3m^{-1})^2$
 (f) $(3a^2)(5a^{-8})$

(g) $(m^2n)(m^5n^{-1})$

(i) $(x^{-5}y^{-2})^{-1}$
 (k) $(7m^3)(m^{-5}n^{-2})$

(h) $(2a^5b^{-3})^3$

(j) $(5xy^{-1})(7x^3y^{-1})$
 (l) $(5a^{-3})(3a^3)$

5. Simplify.

- (a) $(a^{-3}) \div (a^{-5})$
 (b) $(12x^5) \div (4x^{10})$
 (c) $(24b^{-5}) \div (6b^5)$
 (d) $(m^2n) \div (m^5n^0)$
 (e) $(a^{12}) \div (a^{15}) \times (a^3)$
 (f) $(15a^4b^5) \div (5a^2b^7)$
 (g) $(b^0) \div (b^{-4})$
 (h) $(y^4y^2) \div y^{10}$
 (i) $(4x^{-2})^2$
 (j) $(3x^{-5})^{-1}(3x^2)$
 (k) $\frac{(12b^2)(8b^{-4})}{6b^{-10}}$
 (l) $(2a^3)^{-3}(4a^{-5})$

6. Evaluate.

- (a) $5^0 + 5^{-1}$
 (b) $3^{-1} + 4^{-1}$
 (c) $(5^{-1})^2$
 (d) $[(4^{-3})(4^2)]^2$
 (e) $(2^{-1})^{-1}$
 (f) $\left(\frac{1}{4}\right)^{-1}$
 (g) $\left(\frac{2}{3}\right)^0$
 (h) $5^{-1} + 2^{-2}$
 (i) $\left(\frac{1}{10}\right)^{-1}$
 (j) 10^{-2}
 (k) $\left(\frac{1}{3}\right)^{-2}$
 (l) $(10^3)(10^{-5})$

1. (a) $30 \text{ km} = 300 \text{ hm} = 3000 \text{ dam} = 30\,000 \text{ m}$
 1. (a) $2^4, 4^2$ (b) $5^4, 25^2$ (c) $2^6, 8^2, 4^3$
 1. (a) 8 (b) 9 (c) -24
 1. (g) 1 (h) 7 (i) -35
 1. (a) 16.0 m^2 (b) 28.3 m^2 (c) 84.8 cm^2
 1. (a) $384 \text{ cm}^2, 512 \text{ cm}^3$
 1. (b) $352 \text{ cm}^2, 503 \text{ cm}^3$
 1. 3 800 000 km^2
 1. 8.4 cm^3
9. (a) 21.5 cm^2
 11. 50.3 cm^2

- (b) $200 \text{ kg} = 2000 \text{ hg} = 20\,000 \text{ dag} = 200\,000 \text{ g}$
 (d) $6^4, 36^2$ (e) $4^4, 16^2, 2^8$ (f) $2^9, 8^3$
 (d) -54 (e) 27 (f) 1
 (j) 0
 (b) $5024 \text{ cm}^2, 33\,493 \text{ cm}^3$
 (d) $417 \text{ cm}^2, 565 \text{ cm}^3$
 (b) 30.9 mm^2
 (c) 16.0 cm^2

EXERCISE 1.12

- | | | | | | |
|--------------------------------|------------------------|------------------|--------------------------|--------------------------|-------------------|
| 1. (a) x^8 | (b) a^{12} | (c) b^3 | (d) m^6 | (e) a^5b^5 | (f) a^3b^4 |
| 2. (a) a^4 | (b) b | (c) n^9 | (d) x^3 | (e) a^4 | (f) x |
| 3. (a) x^8 | (b) a^9 | (c) a^6b^3 | (d) x^5y^{15} | (e) $a^5b^5c^5$ | (f) b^{24} |
| (g) $8x^9$ | (h) $a^{15}b^6$ | (i) $9a^{10}$ | (j) $27x^3y^6$ | (k) $125a^{24}$ | (l) $64x^6y^3z^3$ |
| 4. (a) $\frac{x^5}{y^5}$ | (b) $\frac{a^4}{9}$ | | (c) $\frac{x^6}{y^3}$ | (d) $\frac{a^4}{b^{20}}$ | |
| (e) $\frac{9x^2}{y^2}$ | (f) $\frac{8x^6}{w^3}$ | | (g) $\frac{25a^4}{4b^6}$ | (h) $\frac{9a^2}{b^6}$ | |
| 5. (a) $15a^9$ | (b) $-8x^5$ | (c) $6a^3b^5$ | (d) $10x^4$ | (e) $15m^2n$ | (f) $12x^6$ |
| (g) $30y^4$ | (h) $-6a^8$ | (i) $-14x^8$ | (d) $8m$ | (e) -5 | (f) $9b^2$ |
| 6. (a) $4a^2$ | (b) $3xy^4$ | (c) a | (c) $9x^4$ | (d) $36a^{14}b^2$ | |
| (g) $7q$ | (h) -3 | (i) $-3x^9y$ | (g) $-64x^6y^{18}$ | (h) $\frac{x^3}{27}$ | |
| 7. (a) $-8a^9$ | (b) $9x^6$ | | (d) $-4m^6$ | (e) $-8xy$ | (f) $-4m^4n^2$ |
| (e) $\frac{a^{15}b^3}{c^{12}}$ | (f) $2a^4$ | | | | |
| 8. (a) $16x^{11}$ | (b) $2b^3$ | (c) $3x^5y^{13}$ | | | |

EXERCISE 1.13

- | | | | |
|-----------------------|---------------------|--------------------|---------------------|
| 1. (a) x^{-2} | (b) a^7 | (c) y^4 | (d) b^{-4} |
| (e) a^8 | (f) x | (g) 1 | (h) 1 |
| 2. (a) x^5 | (b) b^{-3} | (c) a^{-3} | (d) x^{-5} |
| (e) m^{-5} | (f) n^7 | (g) 0 | (h) m^{-4} |
| 3. (a) 1 | (b) $\frac{1}{2}$ | (c) 1 | (d) $\frac{1}{10}$ |
| (e) $\frac{1}{9}$ | (f) 1 | (g) $\frac{1}{16}$ | (h) $\frac{1}{8}$ |
| 4. (a) $15x^3$ | (b) a^5b^{-3} | (c) 6 | (d) x^2 |
| (g) m^7 | (h) $8a^{15}b^{-9}$ | (i) x^5y^2 | (j) $35x^4y^{-2}$ |
| 5. (a) a^2 | (b) $3x^{-5}$ | (c) $4b^{-10}$ | (d) $m^{-3}n$ |
| (g) b^4 | (h) y^{-4} | (i) $16x^{-4}$ | (j) x^7 |
| 6. (a) $1\frac{1}{5}$ | (b) $\frac{7}{12}$ | (c) $\frac{1}{25}$ | (d) $\frac{1}{4}$ |
| (g) 1 | (h) $\frac{9}{20}$ | (i) 10 | (j) $\frac{1}{100}$ |
| | | | (e) 2 |
| | | | (f) 4 |
| | | | (k) 9 |
| | | | (l) $\frac{1}{100}$ |

EXERCISE 1.14

- | | | | | |
|----------------|--------|---------|--------|-------|
| 3. 2^6 or 64 | 4. 6 | 5. 1024 | | |
| 6. (a) 26 | (b) 6 | (c) 12 | (d) 8 | (e) 0 |
| 7. (b) 8 | (b) 10 | | | |
| 8. (c) 12 | (b) 8 | (c) 3 | (d) 11 | (e) 4 |
| 9. 20 m | 10. 19 | 11. 3 | | |

2.21 REVIEW EXERCISE

1. Simplify.

- $(x + 3xy - y) + (2x - xy - 3y)$
- $(-3x^2 + 5x - 4) + (-4x^2 - 7x + 3)$
- $(3x^2 - 2x + 4) - (5x^2 - 7x + 3)$
- $(-2 + 3x - 6x^2) - (3 - 4x - 5x^2)$
- $(x^2y + 3x^3) + (x^3 - 2xy^2) - (2x^2y + 3xy^2)$
- $(2x^3 - 3x^2 + 7x - 2) - (x^3 - 7x) + (4x^2 - 3)$

2. Expand and simplify.

- $2(x - 5) - 3(x + 2)$
- $(x + 3)(2x - 4)$
- $(x + 2)^2 - 3$
- $(x - 2y)(x + 2y) + 3y^2$
- $2(x - 3) + 3(x - 5) - 4(x + 2)$
- $(x - 4)(x - 7) - 2(x - 6)$
- $(m + 2)^2 + (m - 7)(m + 7) + (m - 3)^2$
- $2(w - 3)(w + 4) - (w - 7)(w - 6) - 16$
- $(2x - 3)(3x - 1) - (x - 4)(2x - 5)$
- $5(3x + 2)(x + 4) - (2x - 1)^2 + 3(3x - 5)$
- $5(2t - 1)(t + 3) - (t - 7)(2t + 7) - 6$
- $6 - (5x - 1)(4x - 3) - 2(3x - 5)^2$

3. Factor.

- $3mn - 9m^2n - 12mn^2$
- $x^2 - x - 30$
- $x^2 - 81$
- $x^2 + 8x + 16$
- $36t^2 - 49$
- $5x(m - 7) - 3(m - 7)$
- $2x^2 + 8x - 120$
- $x^2 - 14x + 49$
- $9x^2y - 3x + 12xy^2$
- $100m^2 - 121$
- $4m^2 + 28m + 49$
- $25x^2 - 20x + 4$
- $5x^2(m - n) - 2x(m - n)$
- $3x^2 - 48$

4. Simplify the following rational expressions and state the restrictions on the variables.

- $\frac{3x}{6x^2 - 9x}$
- $\frac{5xy - 25y}{15y}$
- $\frac{6x - 30}{x - 5}$
- $\frac{x - 7}{x^2 - 49}$
- $\frac{x + 3}{x^2 + 5x + 6}$
- $\frac{x^2 - 25}{x^2 + 10x + 25}$

5. Express each of the following as rational expressions in lowest terms. Assume that all variables are restricted so that no denominator or divisor is equal to zero.

- $\frac{25m^3n^2}{16xy} \times \frac{32x^3y^2}{5m^2n}$
- $\frac{21t^4w^2}{8xy} \div \frac{14tw}{12x^2y^3}$
- $\frac{x + 4}{4x^2} \times \frac{16x}{x + 4}$
- $\frac{x^2 - 4}{x + 1} \div \frac{x + 2}{x + 1}$
- $\frac{x^2 + 2x}{x + 3} \times \frac{x^2 - 9}{x^2 - x - 6}$
- $\frac{2x + 4}{x - 3} \div (x^2 - 4)$

6. Perform the indicated operations and simplify. Assume that all variables are restricted so that no denominator is equal to zero.

- $\frac{2}{7} + \frac{1}{3} - \frac{4}{21}$
- $\frac{3x}{5} - \frac{x}{6} + \frac{7x}{10}$
- $\frac{3x + 1}{2} - \frac{x + 1}{3} + \frac{x}{4}$
- $\frac{m - 3}{9} - \frac{m + 4}{2} - \frac{m - 7}{6}$
- $\frac{5}{2x^2} - \frac{1}{3x} + \frac{5}{6x^3}$
- $\frac{3}{x + 1} + \frac{4}{x - 1}$

7. Solve the following equations whose variables have domain R.

- $3x - 5(x + 2) = 4$
- $3(a + 2) - 2(a + 1) = 5$
- $3(a - 1) + 2a + 3 = 25$
- $\frac{1}{2}x + 2 = 3$
- $\frac{2}{3}x + \frac{3}{4} = \frac{1}{2}$
- $3.5(x - 1) = 1.5x - 1$
- $7(1 - 0.6x) = 1 - 5.2x$
- $\frac{3x - 4}{2} = \frac{7x - 12}{5}$
- $\frac{2}{3x} = \frac{1}{x + 1}, x \neq 0, -1$

- (e) $x = \frac{5}{a+b+c}$, $a+b+c \neq 0$
- (g) $x = \frac{a+b}{c}$, $c \neq 0$, $x \neq 0$
3. (a) $\ell = \frac{A}{w}$, $w = \frac{A}{\ell}$
- (c) $r = \frac{C}{2\pi}$
- (e) $\ell = \frac{V}{wh}$, $w = \frac{V}{\ell h}$, $h = \frac{V}{\ell w}$
- (g) $a = \frac{2s}{t^2}$
4. (a) $a = \frac{2A}{h} - b$
- (b) $n = \frac{t-a}{d} + 1$
- (f) $x = c - b$, $x = -b$, $c \neq 0$
- (h) $x = \frac{2c}{a+b}$, $a \neq -b$
- (b) $\ell = \frac{P}{2} - w$, $w = \frac{P}{2} - \ell$
- (d) $h = \frac{V}{\pi r^2}$
- (f) $u = v - at$, $a = \frac{v-u}{t}$, $t = \frac{v-u}{a}$
- (h) $p = \frac{l}{rt}$, $r = \frac{l}{pt}$, $t = \frac{l}{pr}$
- (c) $r = \frac{s-a}{s}$

EXERCISE 2.19

- | | | | |
|---------------------|-----------------|-----------------------|-------------------|
| 1. (a) $x > 2$ | (b) $a < 11$ | (c) $x < 4$ | (d) $x \geq 5$ |
| (e) $x \leq 4$ | (f) $x \leq 4$ | (g) $x < -2$ | (h) $x \geq -2$ |
| 2. (a) $x < 6$ | (b) $x \leq 9$ | (c) $x \leq -6$ | (d) $x > 8$ |
| (e) $x > 7$ | (f) $m \geq 40$ | (g) $b \geq -4$ | (h) $x \leq 11$ |
| 3. (a) $x < -3$ | (b) $x \geq 7$ | (c) $m \leq -3$ | (d) $x > -7$ |
| (e) $a \leq -11$ | (f) $x \leq 2$ | (g) $x \geq 5$ | |
| 4. (a) $c \leq 6$ | (b) $x > 1$ | (c) $a \geq 12$ | (d) $b \geq 6$ |
| (e) $x \leq 11$ | (f) $a < -4$ | (g) $x > \frac{5}{4}$ | (h) $x \geq -3$ |
| 5. (a) $a \leq 2.5$ | (b) $x > -2$ | (c) $x \leq 2.5$ | (d) $x > 2$ |
| | | | (e) $x \leq 4.5$ |
| | | | (f) $x \geq -2.5$ |

EXERCISE 2.20

- | | | | |
|---------------------|------------------------|-----------------------|------------------------|
| 1. 24 cm | 2. 1250 cm^3 | 3. 676 cm^2 | 4. 320 m |
| 5. 77.5 m by 77.5 m | 6. 2 cans | 7. 411 cm | 8. 80 m^2 |
| 9. $2\pi \text{ m}$ | 10. 10 tubes | 11. 23 km | 12. 10 m |
| | | | 13. 1160 m^3 |
| | | | 14. 130 m^2 |

2.21 REVIEW EXERCISE

- | | | |
|---|---|---|
| 1. (a) $3x + 2xy - 4y$ | (b) $-7x^2 - 2x - 1$ | (c) $-2x^2 + 5x + 1$ |
| (d) $-5 + 7x - x^2$ | (e) $-x^2y + 4x^3 - 5xy^2$ | (f) $x^3 + x^2 + 14x - 5$ |
| 2. (a) $-x - 16$ | (b) $2x^2 + 2x - 12$ | (c) $x^2 + 4x + 1$ |
| (e) $x - 29$ | (f) $x^2 - 13x + 40$ | (g) $3m^2 - 2m - 36$ |
| (i) $4x^2 + 2x - 17$ | (j) $11x^2 + 83x + 24$ | (h) $w^2 + 15w - 82$ |
| 3. (a) $3mn(1 - 3m - 4n)$ | | (k) $8t^2 + 32t + 28$ |
| (c) $(x - 9)(x + 9)$ | | (l) $-38x^2 + 79x - 47$ |
| (e) $(6t - 7)(6t + 7)$ | | (b) $(x - 6)(x + 5)$ |
| (g) $2(x - 6)(x + 10)$ | | (d) $(x + 4)^2$ |
| (i) $3x(3xy - 1 + 4y^2)$ | | (f) $(m - 7)(5x - 3)$ |
| (k) $(2m + 7)^2$ | | (h) $(x - 7)^2$ |
| (m) $x(m - n)(5x - 2)$ | | (j) $(10m - 11)(10m + 11)$ |
| 4. (a) $\frac{1}{2x - 3}$, $x \neq \frac{3}{2}, 0$ | (b) $\frac{x - 5}{3}$, $y \neq 0$ | (c) 6 , $x \neq 5$ |
| (d) $\frac{1}{x + 7}$, $x \neq -7, 7$ | (e) $\frac{1}{x + 2}$, $x \neq -2, -3$ | (f) $\frac{x - 5}{x + 5}$, $x \neq -5$ |
| 5. (a) $10mnx^2y$ | (b) $\frac{9t^3xy^2w}{4}$ | (c) $\frac{4}{x}$ |
| (d) $x - 2$ | (e) x | (f) $\frac{2}{(x - 3)(x - 2)}$ |

- i. (a) $\frac{3}{7}$
 (d) $\frac{-10m - 21}{18}$
- ii. (a) -7
 (b) 1
 (c) 5
 (d) 2
 (e) $-\frac{3}{8}$
- iii. 1.25
 (g) -6
 (h) -4
 (i) 2
- iv. (a) $\ell = \frac{A}{w}$
 (b) $r = \frac{l}{pt}$
 (c) $I = \frac{V}{R}$
 (d) $h = \frac{3V}{\pi r^2}$
 (e) $t = \frac{d}{v}$
 (f) $h = \frac{2A}{a+b}$
- v. 31, 32, 33
 (b) $x \geq -1$
 (c) $x \leq -4$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$
- vi. 36.6 cm
 (b) $x \geq -1$
 (c) $x \leq -4$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$
- vii. 10, 462, 498
 (b) $x \geq -1$
 (c) $x < \frac{2}{7}$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$
- viii. 11. 21 quarters, 42 dimes
 (b) $x \leq -4$
 (c) $x \geq 1$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$
- ix. 15. 112 cm
 (b) $x \geq -1$
 (c) $x \leq -4$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$
- x. 16. 368 cm
 (b) $x \geq -1$
 (c) $x \leq -4$
 (d) $x \geq 1$
 (e) $x \leq 1$
 (f) $x < \frac{2}{7}$
 (g) $x > 2.5$
 (h) $x \leq 1$

22 CHAPTER 2 TEST

1. (a) $-x^2 + 4x - 10$
 (b) $-xy + 2y^2$
 (c) $(2x - 3)(2x + 3)$
 (d) $(2x - 5)^2$
3. (a) $2ab(2a - 1 + 4b^2)$
 (b) $(x + 3)(2x - 3)$
4. (a) $\frac{1}{3 - 4x}, x \neq \frac{3}{4}, 0$
 (b) $\frac{2x}{x - 2}, x \neq 2, 8$
 (c) $\frac{3}{2x - 3}, x \neq \frac{3}{2}, 5, -5$
5. (a) $74x - 15$
 (b) $21x + 16$
 (c) 9
 (d) 4
 (e) $-\frac{35}{12}$
6. (a) 2
 (b) 9
 (c) 4
 (d) $x \leq \frac{1}{2}$
 (e) $x \geq -5$
 (f) $x < 5$
 (g) $x \leq 3$
 (h) $x \leq \frac{1}{2}$
 (i) $x \geq -5$
 (j) $x < 5$
 (k) $x \leq 3$
 (l) $x \leq \frac{1}{2}$
7. (a) 7.1 cm
 (b) $21x + 16$
 (c) 9
 (d) 4
 (e) $-\frac{35}{12}$

VIEW AND PREVIEW TO CHAPTER 3

ABLES OF VALUES

- | | | | |
|--|---|--|---|
| 1. (a) $y = 2$
$x = 3.7$
$x = 13$
$x = 8.6$
$(e) y = 16$
$y = -11.9$
$y = -29$
$y = 13.6$ | 2. (b) $y = 5$
$x = 5.4$
$x = 1$
$x = 1.7$
$(f) y = -17$
$y = -31.8$
$y = 17$
$y = -8.4$ | 3. (c) $n = -11$
$m = -8.6$
$n = 2$
$m = -2.5$
$(g) y = 7$
$y = 6.5$
$y = 9$
$y = 15$ | 4. (d) $n = 6$
$m = 4.9$
$n = -3$
$m = -4.9$
$(h) y = 4$
$y = -12$
$y = -16$
$y = -38$ |
|--|---|--|---|

UBSTITUTION

- | | | | |
|--|---|--|---|
| 1. (a) $x = 4$
$s = 93.6$
$m = 630$
$x = -3.6$
$c = -1008$
$a = 10.5$ | 2. (b) $y = -9$
$t = 1.1$
$n = 0.11$
$y = 0.06$
$d = -0.42$
$b = 16.8$ | 3. (c) $x = 1800$
$s = -52.6$
$m = 2.21$
$x = -0.24$
$c = 32.256$
$a = 4.0$ | 4. (d) $y = -300$
$t = -0.5$
$n = 142.86$
$y = -40$
$d = 0.08$
$b = 6.0$ |
|--|---|--|---|

EXERCISE 3.2

1. (b) {1, 2, 3, 4, ... 50}
 (d) 25 teams need 150 players
2. (a) Domain: {5, 7, 8}, Range: {6, 12, 41}
 (b) Domain: {2, 5}, Range: {7}
 (c) Domain: {a, c, e, g}, Range: {b, d, f, h}
- (c) {6, 12, 18, 24, ... 300}
 (d) {6, 12, 18, 24, ... 300}
 (e) {20, 120}, (31, 186), (40, 240)
 (f) {20, 120}, (31, 186), (40, 240)
 (g) Domain: {-3, 0, 3, 5}, Range: {-7, 6, 11, 20}
 (h) Domain: {-3, 0, 3, 5}, Range: {-7, 6, 11, 20}
 (i) Domain: {3, 8, 14}, Range: {11}
 (j) Domain: {3, 8, 14}, Range: {11}

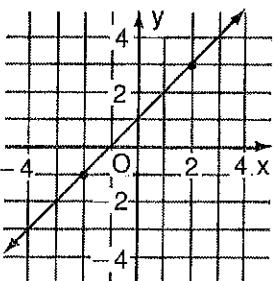
Given two points on a line, the slope of the line may be found using

$$m = \frac{y_2 - y_1}{x_2 - x_1}, \quad x_2 \neq x_1$$

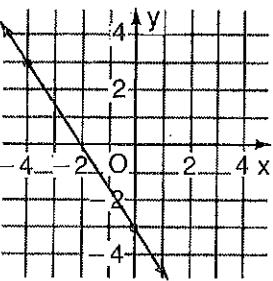
EXERCISE 4.1

- A** 1. (a) Without calculating, determine whether the slope of each line is positive, negative, or zero, or whether the slope is undefined.
 (b) State the rise.
 (c) State the run.
 (d) Determine the slope of the line, where possible.

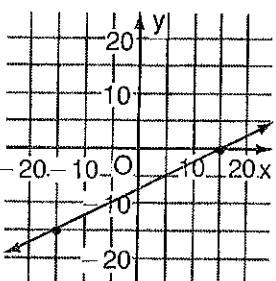
(i)



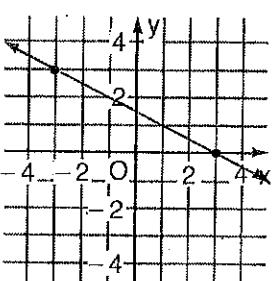
(ii)



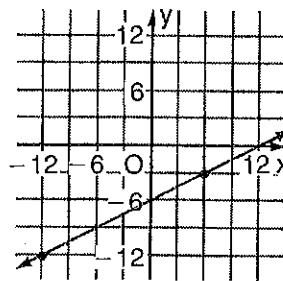
(iii)



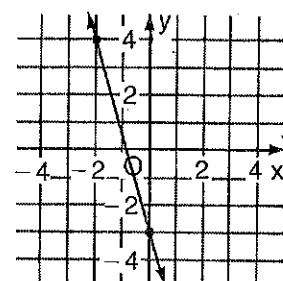
(iv)



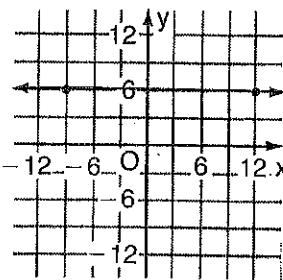
(v)



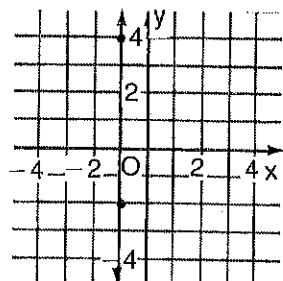
(vi)



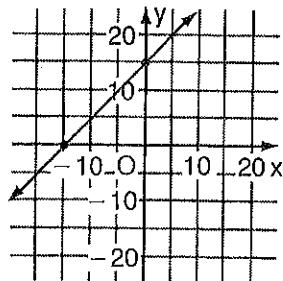
(vii)



(viii)



(ix)



2. Determine the slopes of the lines through the following points.

- (a) A(1, 1), B(4, 3)
- (b) C(0, 2), D(4, 6)
- (c) E(5, 7), F(9, 11)
- (d) G(0, 0), H(5, 6)
- (e) K(5, 3), L(7, 3)
- (f) M(-3, 4), N(5, -2)
- (g) P(-3, -1), Q(-5, 7)
- (h) R(2, -3), S(0, 4)

3. Determine the slopes of the line segments joining the following pairs of points.

- (a) A(6, -8), B(-3, 2)
- (b) C(7, -3), D(8, -3)
- (c) E(5, 7), F(5, -2)
- (d) G(-2, -1), H(-5, -4)
- (e) K(-6, 7), L(-6, -5)
- (f) M(8, 0), N(0, 8)
- (g) R($\frac{1}{2}$, 3), S(2, -3)
- (h) P($\frac{1}{3}$, $\frac{1}{2}$), Q(2, $2\frac{1}{2}$)
- (i) W($2\frac{1}{5}$, -3), R($-3\frac{1}{2}$, $\frac{1}{2}$)
- (j) B($-\frac{1}{2}$, 3), A($-\frac{1}{2}$, -4)
- (k) A(3.2, -4.6), B(-2.4, 8.8)
- (l) C(1.75, -0.3), D(-2.25, -1.7)
- (m) E(-1.86, -2.14), F(3.58, -0.72)
- (n) G(11.9, -9.3), H(15.4, 6.7)

4. Sketch the graph of each of the following and then determine the slope of each line where $x, y \in \mathbb{R}$.

- (a) $y = 3x - 2$
- (b) $y = 4 - x$
- (c) $2x + 3y = 6$
- (d) $5x - 3y = 15$
- (e) $y = \frac{x - 1}{3}$
- (f) $2x - y - 4 = 0$
- (g) $f(x) = 2x - 7$
- (h) $f:x \rightarrow 2 - 3x$

5. (a) A line through (3, 1) and (4, y) has a slope $m = 7$.

Find y .

(b) A line through (6, -2) and (3, y) has a slope $m = 2$.

Find y .

(c) A line through (4, -7) and (-2, y) has a slope $m = -\frac{2}{3}$.

Find y .

(d) A line through (-2, -3) and (x, 5) has a slope $m = 2$.

Find x .

6. Find x such that

A(1, -2), B(x, 3), and C(-3, -4) are collinear.

7. A line contains the points A(2, 5) and B(300, -450). Find another point on the line.

CALCULATOR MATH

We know that division by zero is not defined in the set of real numbers.
How does your calculator respond to a division by zero?

Press **C 8 ÷ 0 =**

MICRO MATH

How does your computer respond to division by zero?

In BASIC, type

PRINT 8/0

In BASIC, the PRINT statement can also be written as

? 8/0

In LOGO, type

PRINT 8/0

0. (b) \$3000

(c) $c = 7m + 3000$

(d) \$40 100

3.10 CHAPTER 3 TEST

1. $\{(1, 8), (2, 16), (3, 24), (4, 32)\}$
 4. (d) $k = 2.8, c = 2.8a$

- (b) Domain: $\{1, 2, 3, 4\}$,
 (b) \$26.60

- (c) Range: $\{8, 16, 24, 32\}$
 (c) 13 kg

REVIEW AND PREVIEW TO CHAPTER 4

THE PYTHAGOREAN THEOREM

1. (a) $a = 10$
 (e) $b = 6.9$
 2. (a) $x = 16.9$
- (b) $a = 17$
 (f) $a = 9.2$
 (b) $x = 4.9$
- (c) $c = 12$
 (g) $b = 32$
 (c) $x = 5$

- (d) $b = 12$
 (h) $c = 48$
 (d) $x = 2$

FORMULAS AND EQUATIONS

1. (a) $\ell = \frac{A}{w}, w = \frac{A}{\ell}$
 (d) $\ell = \frac{V}{wh}, w = \frac{V}{\ell h}$
 (g) $\ell = \frac{P - 2w}{2}, w = \frac{P - 2\ell}{2}$
2. (a) $y = 7 - x$
 (d) $y = \frac{-2x + 8}{3}$

- (b) $p = \frac{l}{rt}, t = \frac{l}{pr}$
 (e) $S = \frac{D}{T}, T = \frac{D}{S}$
 (h) $h = \frac{2A}{(a+b)}, b = \frac{2A - ha}{h}$
- (b) $y = x - 9$
 (e) $y = \frac{2x}{5} - 2$

- (c) $r = \frac{C}{2\pi}$
 (f) $h = \frac{2A}{b}, b = \frac{2A}{h}$
- (c) $y = \frac{-x}{2} + 3$
 (f) $y = \frac{-4x}{5} + 4$

EXERCISE 4.1

2. (a) $\frac{2}{3}$
 (e) 0
 3. (a) $-\frac{10}{9}$
 (e) no slope
 (i) $-\frac{35}{57}$
 (m) 0.26
4. (a) 3
 (e) $\frac{1}{3}$
 5. (a) $y = 8$
 6. $x = 1$
- (b) 1
 (f) $-\frac{3}{4}$
 (b) 0
 (f) -1
 (j) no slope
 (n) 4.6
 (b) -1
 (f) 2
 (b) $y = -8$
 7. Answers vary
- (c) 1
 (g) -4
 (c) no slope
 (g) -4
 (k) -2.4
 (c) $-\frac{2}{3}$
 (g) 2
 (c) $y = -3$

- (d) $\frac{6}{5}$
 (h) $-\frac{7}{2}$
 (d) 1
 (h) $\frac{6}{5}$
 (l) 0.35
 (d) $\frac{5}{3}$
 (h) -3
 (d) $x = 2$

EXERCISE 4.2

1. (a) $5x + 3y - 7 = 0$
 (d) $7x + 3y + 2 = 0$
 (g) $4x - 3y + 5 = 0$
 (j) $-4y + 3 = 0$
 2. (a) $4x - y - 10 = 0$
 (d) $x + y + 5 = 0$
 (g) $x - 2y + 10 = 0$
 (j) $20x - 30y - 11 = 0$
 3. (a) $2x - y = 0$

- (b) $3x - 2y + 4 = 0$
 (e) $3x + 5y - 2 = 0$
 (h) $3x - 4y = 0$
 (k) $4x - 3y + 2 = 0$
 (b) $2x - y - 3 = 0$
 (e) $3x - y + 14 = 0$
 (h) $x + 3y - 12 = 0$
 (b) $6x - y + 3 = 0$

- (c) $4x + 5y - 3 = 0$
 (f) $7x - 2y + 3 = 0$
 (i) $2x + 7 = 0$
 (l) $2x - y - 7 = 0$
 (c) $3x + y + 13 = 0$
 (f) $6x + y - 22 = 0$
 (i) $2x + 4y + 7 = 0$
 (c) $2x + y - 2 = 0$

EXERCISE 4.6

1. Given the slopes of two lines, determine whether the lines are

- (a) parallel.
- (b) perpendicular.
- (c) neither perpendicular nor parallel.

(i) $m_1 = \frac{2}{3}, m_2 = \frac{3}{2}$

(ii) $m_1 = \frac{7}{2}, m_2 = -\frac{2}{7}$

(iii) $m_1 = \frac{1}{2}, m_2 = \frac{5}{10}$

(iv) $m_1 = 2, m_2 = -\frac{4}{8}$

(v) $m_1 = -\frac{3}{2}, m_2 = \frac{3}{2}$

(vi) $m_1 = -1, m_2 = 1$

(vii) $m_1 = \frac{4}{5}, m_2 = \frac{16}{20}$

(viii) $m_1 = \frac{1}{3}, m_2 = -\frac{3}{9}$

(ix) $m_1 = -\frac{2}{7}, m_2 = \frac{21}{6}$

(x) $m_1 = \frac{4}{20}, m_2 = \frac{10}{50}$

(xi) $m_1 = 1\frac{1}{3}, m_2 = -\frac{8}{6}$

(xii) $m_1 = 0, m_2 = -1$

(xiii) $m_1 = 0.5, m_2 = -2$

(xiv) $m_1 = 0.25, m_2 = 4$

(xv) $m_1 = 0.1, m_2 = 1$

(xvi) $m_1 = -0.8, m_2 = 1.25$

B 2. State the slope of a line

(a) parallel to the following lines.

(b) perpendicular to the following lines.

(i) $y = 2x + 5$

(ii) $y = 3x - 2$

(iii) $y = -3x + 1$

(iv) $y = -x + 4$

(v) $y = \frac{1}{2}x + 7$

(vi) $y = -\frac{2}{3}x - 4$

(vii) $y = -\frac{3}{4}x$

(viii) $y = \frac{5}{4}x + 3$

(ix) $y + 7x = 4$

(x) $y - 3x + 6 = 0$

(xi) $3x + y - 4 = 0$

(xii) $5x + 2y = 7$

(xiii) $5x - 4y + 3 = 0$

(xiv) $3x - y = 4$

(xv) $5x - 4 = 7y$

(xvi) $2y - 4 = -3x$

3. Determine an equation of the line through $(-2, 4)$ and parallel to $2x - y - 4 = 0$.

4. Determine an equation of the line through $(-3, -1)$ and parallel to $4x + 2y = 5$.

5. Find an equation of the line perpendicular to $2x - y + 4 = 0$ and through $(-5, 6)$.

6. Find an equation of the line through $(-6, 0)$ and perpendicular to $4x + 3y - 7 = 0$.

7. (a) Plot the points $A(4, 2)$, $B(-2, 1)$, and $C(2, -2)$.

(b) Determine an equation of the line through A and parallel to BC .

(c) Determine an equation of the line through B and perpendicular to AC .

8. Prove that the following points are the vertices of a right angled triangle.

(a) $A(-2, 5), B(6, 8), C(1, -3)$

(b) $P(-6, 1), Q(-2, -7), R(-4, -8)$

9. Prove that the following points are the vertices of a parallelogram.

(a) $A(2, 1), B(14, 11), C(6, 5), D(-6, -5)$

(b) $P(-5, -2), Q(1, -1), R(4, 4), S(-2, 3)$

MICRO MATH

The following program will calculate the slope of a line segment.

NEW

```

10 REM SLOPE CALCULATOR
20 PRINT "(X1,Y1)";
30 INPUT X1,Y1
40 PRINT "(X2,Y2)";
50 INPUT X2,Y2
60 IF X1=X2 THEN PRINT "VERTICAL
SEGMENT; IT HAS NO SLOPE": GOTO 90
70 M=(Y2-Y1)/(X2-X1)
80 PRINT "THE SLOPE IS"; M
90 END

```

RUN

- (g) $y = 0.2x + 1.7$ (h) $y = -1.5x - 4.6$ (i) $y = -\frac{4}{5}x$
 (j) $y = -\frac{1}{5}$ (k) $y = 15.3x - 45.6$ (f) (ii)
 (a) (iv) (b) (v) (c) (vi) (d) (iii) (e) (i) (f) (ii)
 (a) $m = -\frac{2}{3}$, $b = \frac{8}{3}$ (b) $m = \frac{3}{2}$, $b = -\frac{5}{2}$ (c) $m = -\frac{5}{2}$, $b = -2$
 (l) $m = -\frac{2}{5}$, $b = 0$ (e) $m = \frac{7}{3}$, $b = \frac{2}{3}$ (f) $m = \frac{7}{2}$, $b = 2$
 (g) $m = 0$, $b = \frac{7}{2}$ (h) no slope, no y-intercept (i) $m = -6$, $b = 8$
 (j) $m = 4$, $b = -0.4$ (k) $m = -0.8$, $b = 0.4$ (l) $m = -12$, $b = 0$
 (i) parallel lines (ii) $m = 2$ (iii) Parallel lines have equal slopes.
 (b) 90° (c) (i) -1 (ii) -1 (iii) -1
 (d) The product of the slope of perpendicular lines is -1.

XERCISE 4.6

- | | | | |
|------------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| 1. (i) (c) | (ii) (b) | (iii) (a) | (iv) (b) |
| (v) (c) | (vi) (b) | (vii) (a) | (viii) (c) |
| (ix) (b) | (x) (a) | (xi) (c) | (xii) (c) |
| (xiii) (b) | (xiv) (c) | (xv) (c) | (xvi) (b) |
| 2. (i) $2, -\frac{1}{2}$ | (ii) $3, -\frac{1}{3}$ | (iii) $-3, \frac{1}{3}$ | (iv) -1, 1 |
| (v) $\frac{1}{2}, -2$ | (vi) $-\frac{2}{3}, \frac{3}{2}$ | (vii) $-\frac{3}{4}, \frac{4}{3}$ | (viii) $\frac{5}{4}, -\frac{4}{5}$ |
| (ix) $-7, \frac{1}{7}$ | (x) $3, -\frac{1}{3}$ | (xi) $-3, \frac{1}{3}$ | (xii) $-\frac{5}{2}, \frac{2}{5}$ |
| (xiii) $\frac{5}{4}, -\frac{4}{5}$ | (xiv) $3, -\frac{1}{3}$ | (xv) $\frac{5}{7}, -\frac{7}{5}$ | (xvi) $-\frac{3}{2}, \frac{2}{3}$ |
| 3. $2x - y + 8 = 0$ | 4. $2x + y + 7 = 0$ | 5. $x + 2y - 7 = 0$ | |
| 6. $3x - 4y + 18 = 0$ | 7. (b) $3x + 4y - 20 = 0$ | (c) $x + 2y = 0$ | |

XERCISE 4.7

- | | | |
|--------------------------------------|--------------------------|-----------------------------------|
| 1. (a) \$2150 | (b) \$1700 | (c) 220 |
| (d) the cost per meal | (e) 350, room rent | |
| 2. (a) 22.5°C | (b) 3.2 h | (c) 10, initial water temperature |
| 3. (a) \$2200 | (b) 450 | (c) \$2500 |
| (d) the cost of the lunch per person | (e) 1000, cost of band | |
| 4. (a) 20 L | (b) 100 L | (c) 500 km |
| (d) 70 L | (e) litres per kilometre | |
| 5. (a) 2046 m | (b) 4 s | 6. (a) 69.0 m/s (b) 3.5 s |

XERCISE 4.9

- | | | | | |
|---|--------------------------------------|-------------------|---------------------------------------|----------------------------|
| 1. (a) m | (b) b | (c) m | (d) a | (e) b |
| 2. (a) $y = mx + 5$ | | (b) $y = b$ | | (c) $y = m(x - 4) + 5$ |
| (d) $y = -3x + b$ | | (e) $x = a$ | | (f) $y = mx$ |
| 3. (a) $y = \frac{3}{2}x + \frac{5}{2}$ | (b) $y = \frac{1}{2}x + \frac{3}{2}$ | (c) $y = -x + 16$ | (d) $y = -\frac{2}{5}x + \frac{4}{5}$ | (e) $y = \frac{2}{3}x - 6$ |

XERCISE 4.10

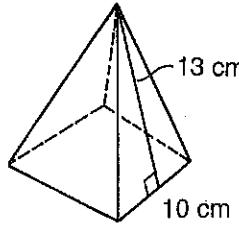
- | | | | | | |
|--|--------------------|-----------------|------------------|--|-----------------|
| 1. (a) 5 | (b) 6 | (c) 11 | (d) 11 | (e) 7 | (f) 17 |
| (g) 15 | (h) 10 | (i) 8 | (j) 1 | (k) 4 | (l) 3.2 |
| 2. (a) $\sqrt{58}$ | (b) $\sqrt{89}$ | (c) $\sqrt{34}$ | (d) $\sqrt{234}$ | (e) $\sqrt{265}$ | (f) $\sqrt{85}$ |
| (g) $5\sqrt{10}$ | (h) $\sqrt{113}$ | (i) $\sqrt{17}$ | (j) $\sqrt{8}$ | (k) $\sqrt{5}$ | (l) $\sqrt{89}$ |
| (m) 2.6 | (n) $\sqrt{49.46}$ | | | | |
| 3. $AB = 2\sqrt{13}$, $BC = \sqrt{29}$, $AC = \sqrt{97}$ | | | | 4. $AC = \sqrt{202}$, $BD = 3\sqrt{10}$ | |
| 5. $AC = \sqrt{41}$, $BC = \sqrt{41}$ | | | 6. 5 | | |

9.10 REVIEW EXERCISE

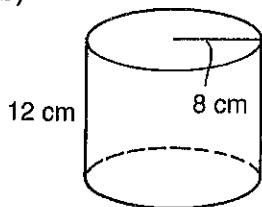
For each of the following, use $\pi \approx 3.14$.

1. Find the surface area of each of the following to the nearest whole number.

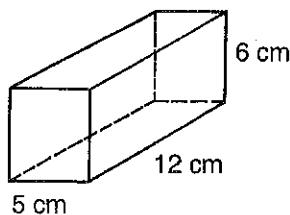
(a)



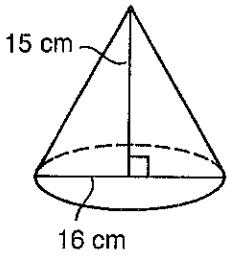
(b)



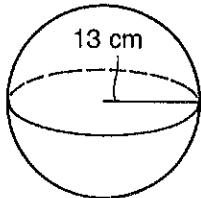
(c)



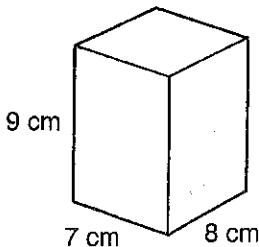
(d)



(e)

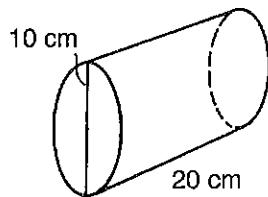


(f)

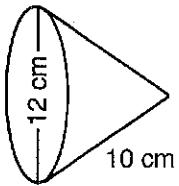


2. Find the volume of each of the following to the nearest whole number.

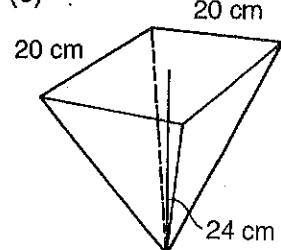
(a)



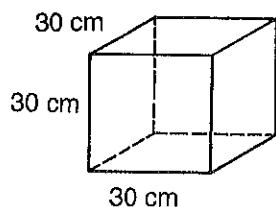
(b)



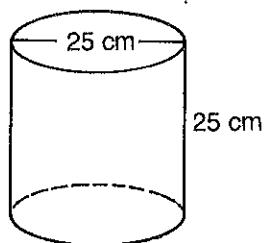
(c)



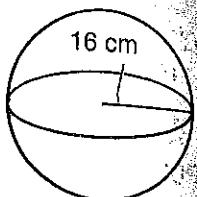
(d)



(e)

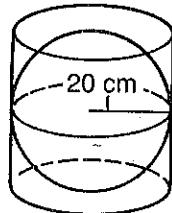


(f)

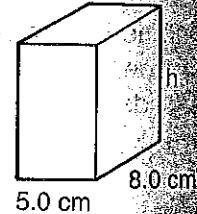
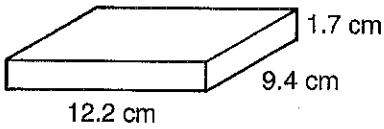


3. A sphere has a radius of 4 cm and a hemisphere has a radius of 8 cm. Compare the volume of the sphere to the volume of the hemisphere using a ratio.

4. A sphere with a radius of 20 cm is inscribed in a cylinder. Find the volume of the cylinder to the nearest cubic centimetre.



5. The following two boxes have the same volume. Calculate the height of the taller box to the nearest tenth.

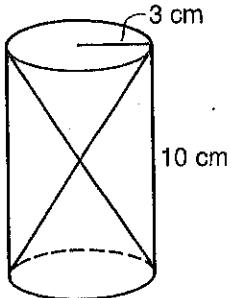


6. Find the surface area of each of the following to the nearest whole number.

- a sphere with a diameter of 24 cm
- a cone with a radius of 8 cm and a slant height of 10 cm
- a cylinder with a diameter of 50 cm and a height of 40 cm
- a square based pyramid with a slant height of 10 cm and each side of the base measuring 8 cm

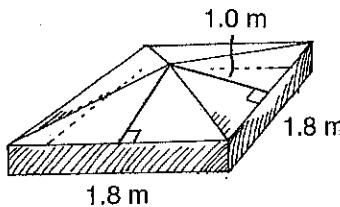
7. A hollow rubber ball has an outside diameter of 5.6 cm. The thickness of the rubber in the ball is 0.3 cm. Find the amount of rubber in the ball to the nearest tenth.

A double cone is inscribed inside a cylinder as shown.

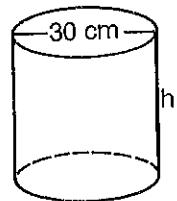
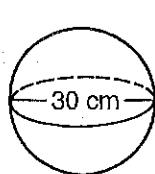


Calculate the amount of space in the cylinder that is not occupied by the cone to the nearest tenth.

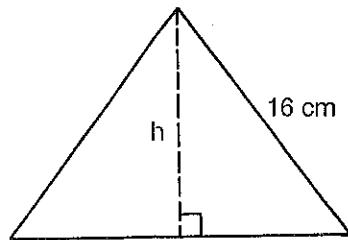
A skylight is in the shape of a regular pyramid with a square base 1.8 m to a side and a slant height of 1.0 m. Find the area of glass required to make the skylight to the nearest tenth.



10. A sphere has a diameter of 30 cm. Find the height of a cylinder having the same diameter and the same volume to the nearest tenth.

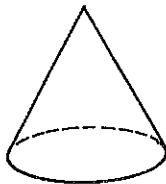


11. In a right circular cone, the slant height is 16 cm. Find the height, h , of the cone that will produce the cone with the greatest volume to the nearest tenth.

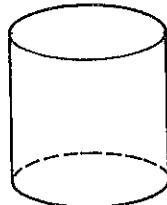


12. Draw top, front, and side views for each of the following.

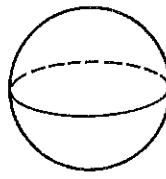
(a)



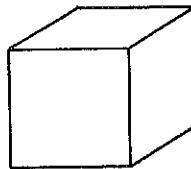
(b)



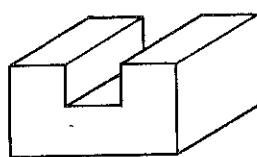
(c)



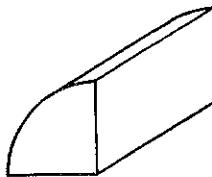
(d)



(e)



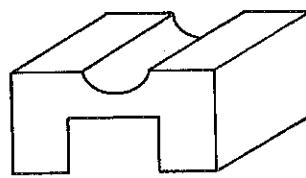
(f)



(g)



(h)

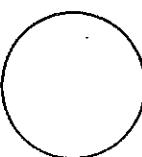


EXTRA

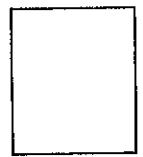
TOP, FRONT, AND SIDE VIEWS

Using clay, wood, Plasticine, or any other suitable material, construct a solid having the following views.

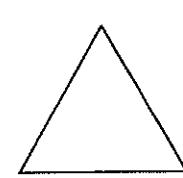
Top



Front



Side



EXERCISE 9.5

1. (a) 209 m^3 (b) 513 m^3 (c) 314 cm^3 (d) 104 cm^3 (e) 314 m^3
 (f) 3215 m^3 (g) 2010 m^3 (h) 314 m^3 (i) 2826 cm^3
 2. 471 m^3 3. 16.9 mm^3 4. 1225 cm^3 5. 5191 cm^3

EXERCISE 9.6

1. (a) 2123 cm^2 (b) 7235 cm^2 (c) 4069 cm^2 (d) 1256 cm^2
 2. (a) 7235 cm^3 (b) 4187 cm^3 (c) $11\,488 \text{ cm}^3$ (d) $91\,906 \text{ cm}^3$
 3. (a) $A = 7850 \text{ cm}^2$, $V = 65\,417 \text{ cm}^3$ (b) $A = 31\,400 \text{ cm}^2$, $V = 523\,333 \text{ cm}^3$
 (c) $A = 15\,386 \text{ cm}^2$, $V = 179\,503 \text{ cm}^3$ (d) $A = 125\,600 \text{ cm}^2$, $V = 4\,186\,667 \text{ cm}^3$
 4. $12\,661 \text{ cm}^3$ 5. (a) 91.9 cm^3 (b) 275.7 cm^3 (c) 91.9 cm^3
 6. 3 : 2 7. 9 : 8

EXERCISE 9.7

1. 864 cm^2 2. 237.5 cm^2 3. 3.1 m^3
 4. 25 cm by 25 cm by 15 cm, $A = 2750 \text{ cm}^2$
 5. (a) x by 10 — $2x$ by 10 — $2x$
 6. (a) 1620.7 cm^3 (b) $19\,488 \text{ cm}^3$ (c) $24\,774 \text{ cm}^3$ (d) 5326 cm^3 (e) 5476 cm^2
 7. (a) 705 m^3 (b) 17

EXERCISE 9.8

1. (a) 6 (b) 3
 3. (a) 6 (b) 4
 5. (a) rotational and reflectional
 (c) rotational and reflectional 2. (a) infinite (b) infinite
 (c) 3 4. (d) 4
 (b) rotational and reflectional
 (d) rotational and reflectional

EXERCISE 9.9

1. 90 2. Mr. White — brown, Ms. Brown — black, Mr. Black — white
 3. 90° 4. 424.3 cm 5. 16 6. 25 min 7. 16, 18, 20
 8. $\boxed{5} \boxed{\frac{1}{x}} \boxed{+} \boxed{4} \boxed{=} \boxed{\frac{1}{x}} \boxed{+} \boxed{3} \boxed{=} \boxed{\frac{1}{x}} \boxed{+} \boxed{2} \boxed{=} \boxed{\frac{1}{x}} \boxed{+} \boxed{1} \boxed{=}$
 9. 6 km/h
 11. 18 monochrome monitors, 6 colour monitors
 13. 75 mL 14. 12 h
 16. frontage — 1000 m, depth — 500 m 17. (a)

9.10 REVIEW EXERCISE

1. (a) 360 cm^2 (b) 1005 cm^2 (c) 324 cm^2 (d) 628 cm^2 (e) 2123 cm^2 (f) 382 cm^2
 2. (a) 1570 cm^3 (b) 301 cm^3 (c) 3200 cm^3 (d) $27\,000 \text{ cm}^3$ (e) $12\,266 \text{ cm}^3$ (f) $17\,149 \text{ cm}^3$
 3. 1 to 4
 4. $50\,240 \text{ cm}^3$
 6. (a) 1809 cm^2 (b) 452 cm^2 (c) $10\,205 \text{ cm}^2$ (d) 224 cm^2
 7. 26.5 cm^3 8. 188.4 cm^3 9. 2.6 m^2 10. 20.0 cm 11. 9.2 cm

9.11 CHAPTER 9 TEST

1. (a) 1570 cm^2 (b) 1512 cm^2 (c) 1809 cm^2 (d) 825 cm^2 (e) 7536 cm^2 (f) 105 cm^2
 2. (a) 300 cm^3 (b) $65\,417 \text{ cm}^3$ (c) 98 cm^3 (d) 262 cm^3 (e) 400 cm^3 (f) 603 cm^3
 3. 785 cm^3 4. 800 cm^3