

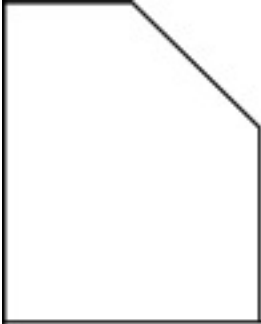
Year End Review

Math 10C

MEASUREMENT

1. Jennifer is 9 in. taller than her sister. If Jennifer is 115 cm tall, how tall is her sister, to the nearest centimetre?
2. The weather forecast calls for 11 cm of snow. How many inches can you expect, to the nearest tenth?
3. You have a $\frac{5}{16}$ in. drill bit. Will it drill a hole large enough to fit a 5 mm bolt? Show two different ways to answer this question. Explain your thinking.
4. Sam has to remove some dead branches from a tree. The tree's branches start approximately 5 m from the ground. Sam stands 1.8 m tall. He has a ladder 2.6 m long. Will Sam be able to use his ladder to trim the branches? Explain your thinking, including any assumptions that you make.
5. Habib wants to visit his grandfather, who lives 275 mi away. How far does Habib have to travel to see his grandfather, to the nearest kilometre?
6. Erin jogs 12 times around the block each morning to stay fit. The block measures 648 ft by 324 ft.
 - a) What is the perimeter of the block?
 - b) How many yards does Erin jog each morning?
7. Ellie wants to build a fence around her rectangular garden. The garden measures 100 ft by 50 ft.
 - a) What is the perimeter of the garden in feet? in yards?
 - b) If fencing costs \$10.50/yd, determine the cost of the fence.
8. A computer game disk with the handbook needs a box 19 cm by 14 cm by 1.5 cm in size. What is the total amount of plastic wrapping needed to cover the entire box if 66 cm² is needed to allow for the overlapping at the edges?
9. Use an SI ruler. Measure the perimeter of each figure as precisely as possible.

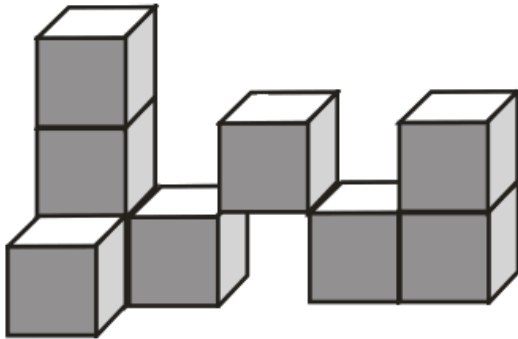
a)



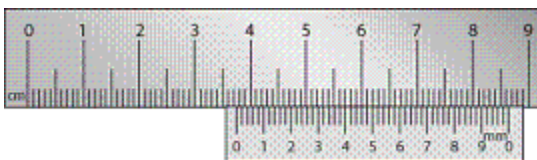
b)



10. In the figure shown below, each box is a cube that measures 0.5 m on each side. Two boxes are completely hidden. One is hidden under the pile on the left and one is directly behind that one, to give a total of 10 boxes. If the arrangement of boxes sits on the floor, what surface area is exposed to view?

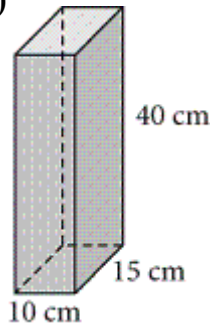


11. Lori wants to laminate a rectangular poster that measures 9 ft by 6 ft.
- What is the area of the poster in square feet?
 - What is the area of the poster in square yards?
 - The store charges \$1.65/yd² for lamination. How much will it cost to laminate the poster?
12. Examine the visual below.
- What length is this caliper measuring?
 - Explain how you made your reading.

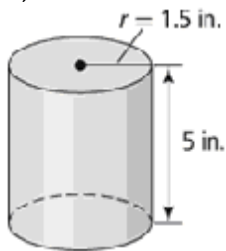


13. What is the volume of each object? Express the answer to the nearest tenth of a cubic unit where necessary.

a)



b)



14. a) Determine the area of a rectangle that measures 1.5 cm by 2.5 cm, in square millimetres.
b) Determine the area of a rectangle that measures 35 mm by 20 mm, in square metres.
15. Calculate the following areas in the indicated unit. Express your answers to the nearest hundredth of a square unit.

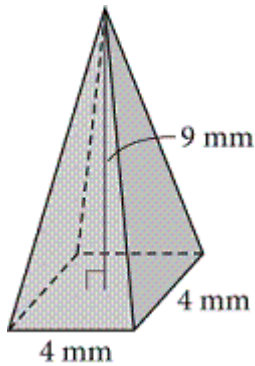
Use the table of conversion factors.

Imperial Unit	SI Unit
1 in.	2.54 cm
1 ft	0.3048 m
1 yd	0.9144 m
1 mi	1.609 km

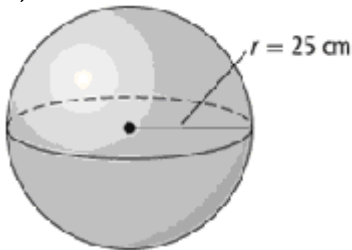
- a) What is the area of a rectangle that measures 15 mi by 13 mi., in square kilometres?
b) What is the area of a rectangle that measures 5 ft by 6 ft, in square metres?

16. Calculate the volume of each object. Express the answer to the nearest tenth of a cubic unit where necessary.

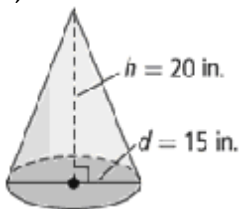
a)



b)

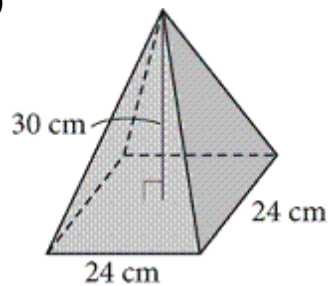


c)

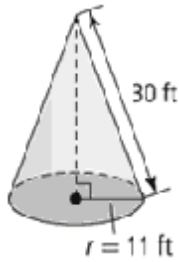


17. Which of the following objects has a greater volume?
- a right rectangular prism with length 2 in., width 4 in., and height 6 in.
 - a cube with edge lengths 4 in.
18. Determine the surface area of each solid, to the nearest tenth of a square unit.

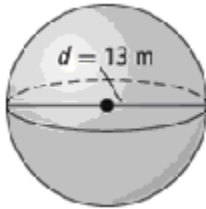
a)



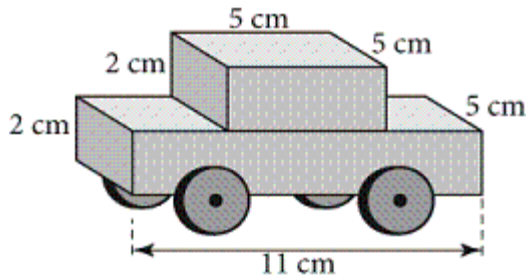
b)



c)



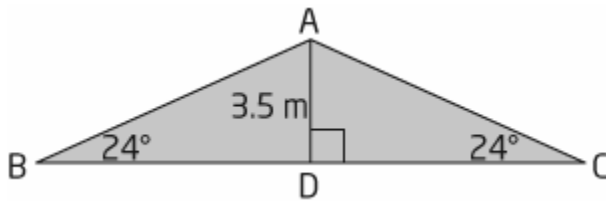
19. What are the surface area and volume of each right cylinder, to the nearest tenth of a unit?
- a cylinder with radius 1 m and height 3.4 m
 - a cylinder with radius 7.8 yd and height 2 yd
20. Determine the volume of each object, to the nearest tenth of a cubic unit.
- a right cone with radius 2.2 cm and height 6.4 cm
 - a sphere with radius 5.8 ft
21. A sphere has the same volume as that of a right cone. The cone has a radius of 8 cm and a height of 12 cm. What is the radius of the sphere, to the nearest tenth of a centimetre?
22. Complete the table. Express the answers to the nearest tenth of a unit.
- | Object | Radius | Height | Volume |
|-------------------|----------|----------|-----------------------|
| a) right cylinder | | 18.1 mm | 778.5 mm ³ |
| b) right cylinder | 4.9 yd | | 37.7 yd ³ |
| c) right cone | 10.8 in. | 26.2 in. | |
| d) right cone | | 14.4 cm | 598.2 cm ³ |
| e) sphere | 2.7 m | | |
| f) sphere | | | 6535 ft ³ |
23. A sphere has a radius two times greater than the radius of a smaller sphere. How many times greater is the volume of the larger sphere than the volume of the smaller sphere?
24. A toy car is made by gluing two wooden blocks together and adding four plastic wheels. Determine the area that needs to be painted before the wheels are added.



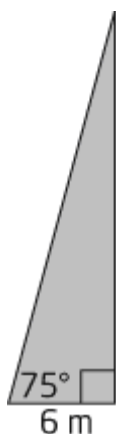
25. Which object has the greatest surface area? Justify your answer mathematically.
- A right prism is 2 m long, 2 m wide, and 4 m tall.
 - A cube has edge lengths of 4 m.
 - A right pyramid with a 3-m by 3-m base has a slant height of 5 m.
 - An equilateral triangular right prism has a height of 6 m. The side lengths of the triangles are 2 m.

TRIGONOMETRY

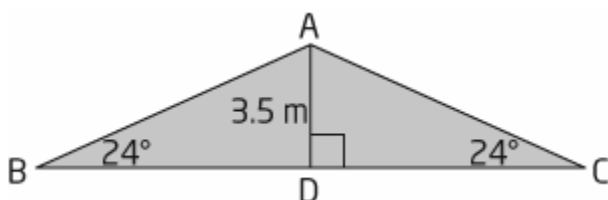
26. A roof is shaped like an isosceles triangle. The slope of the roof makes an angle of 24° with the horizontal, and has an altitude of 3.5 m. Determine the width of the roof, to the nearest tenth of a metre.



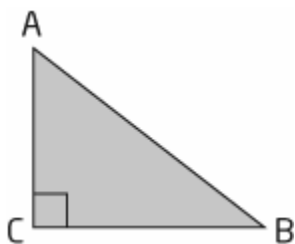
27. A flight of stairs has a ratio of vertical distance to horizontal distance of 3 to 5. What angle does the flight of stairs make with the ground, to the nearest degree?
28. Juanita is helping build a wheelchair ramp at her community centre. The ramp must reach a vertical distance of 1.5 m. If the ramp must make an angle of 6° with the ground, how long will the ramp be? Answer to the nearest tenth of a metre.
29. A telephone pole is secured with a guy wire as shown in the diagram. The guy wire makes an angle of 75° with the ground and is secured to the ground 6 m from the bottom of the pole. Determine the height of the telephone pole, to the nearest tenth of a metre.



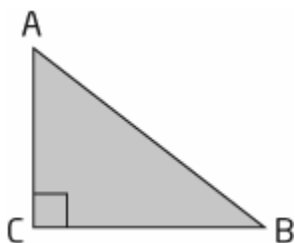
30. Denis is building a playhouse for his younger brother. The roof of the playhouse is shaped like an isosceles triangle. The diagonal trusses of the roof make an angle of 24° with the horizontal. The height of the roof is 3.5 m. How long are the diagonal trusses AB and AC, to the nearest tenth of a metre?



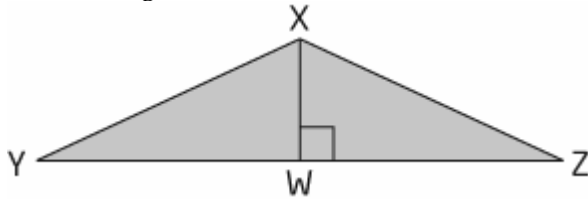
31. Laura is flying a kite at a local park. She lets out 60 m of her kite string, which makes an angle of 68° with the ground. Determine the height of the kite above the ground, to the nearest tenth of a metre.
32. In $\triangle ABC$, the hypotenuse AB is 15 cm, and $\angle B$ is 25° . How long is BC, to the nearest centimetre?



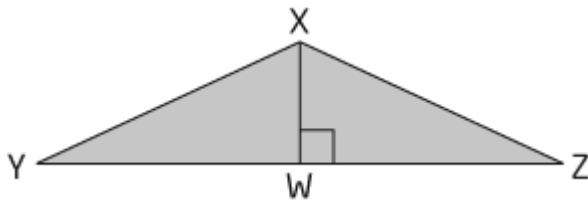
33. In right triangle ABC, the hypotenuse, AB, is 15 cm and $\angle B$ is 25° . How long is AC, to the nearest centimetre?



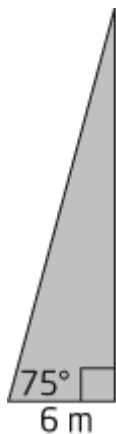
34. In $\triangle XYZ$, XY and XZ have equal lengths of 6 cm. YZ is 10 cm. Determine the measure of $\angle X$, to the nearest degree.



35. In $\triangle XYZ$, XY and XZ have equal lengths of 7 cm. The base of the triangle, YZ , is 12 cm. Using trigonometry, determine the height of the triangle, XW , to the nearest tenth of a centimetre.

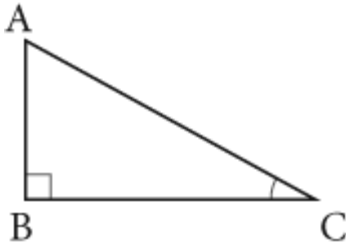


36. In $\triangle ABC$, AB is 16 cm, AC is 18 cm, and $\angle B$ is 90° . Determine the measure of $\angle C$, to the nearest degree.
37. Triangle ABC is a right triangle. Side AB is 16 cm, and side AC is 18 cm. Using trigonometry, determine the length of BC , to the nearest tenth of a centimetre.
38. A telephone pole is secured with a guy-wire as shown in the diagram. The guy-wire makes an angle of 75° with the ground and is secured to the ground 6 m from the bottom of the pole. Determine the length of the wire, to the nearest tenth of a metre.



39. A ski jumper begins at the top of a ski jump hill that is 90 m high. The hill makes an angle of 30° with the horizontal. Determine the length of the hill, to the nearest metre.

40. Khalil decides to go parasailing while on vacation. The flyer advertises that the maximum height reached during the trip will be 68 m. If the parasailing cable is 91 m long, what angle will the cable make with the horizontal when Khalil reaches the maximum height? Answer to the nearest degree.
41. In the diagram, label the hypotenuse, the opposite side, and the adjacent side relative to $\angle C$.



ROOTS AND POWERS

42. Evaluate $\sqrt{9604}$ using prime factorization.
43. State whether each number is a perfect square or a perfect cube. Show your work.
 a) 1024
 b) 10 648
44. Determine the area of a square with each side length.
 a) 10 km
 b) 20 mm
45. Determine the volume of a cube with each edge length.
 a) 17 yd
 b) 11 ft
46. Write and evaluate an expression using exponents for the total area of each pair of squares.
 a) Square A has side lengths of 5.1 m and square B has side lengths of 3.5 m.
 b) Square C has side lengths of 4.3 yd and square D has side lengths of 9.3 yd.
47. Write and evaluate an expression using exponents for the total volume of each pair of cubes.
 a) Cube A has edges 2.1 km long and cube B has edges 9.2 km long.
 b) Cube C has edges 6.1 cm long and cube D has edges 5.3 cm long.
48. Express 333 as a sum of powers of 3.
49. Determine the smallest non-zero values of x and y such that $\left(\frac{3}{2}\right)^x = \left(\frac{8}{27}\right)^y$
50. Simplify $\frac{[(a^2bc^4)(ab^3c^2)]^2}{(b^2c^5)^3}$.

51. Simplify each expression. Write the answer using positive exponents. Do not evaluate.

a) $\frac{(-2.5)^8}{(-2.5)^{-2}}$

b) $(3^3)(3^{-6})$

c) $\frac{s^2 t^{-1}}{(s^4 t^4)^{\frac{1}{2}}}$

52. Simplify, then evaluate. Express the answer to four decimal places, where necessary.

a) $\left[\left(\frac{2}{3} \right)^2 \right]^{-8}$

b) $\left[\left(\frac{1}{4} \right)^{-8} \div \left(\frac{1}{4} \right)^2 \right]^{-2}$

53. Evaluate using a calculator. Express the answer to four decimal places, where necessary.

a) $(6^2)(6^{2.3})$

b) $\frac{9^{1.6}}{27^{0.3}}$

c) $\frac{(3^{\frac{1}{2}})^8}{9}$

54. Order the following numbers from greatest to least. Describe the method you used.

$2^3\sqrt{5}, \sqrt{30}, 4\sqrt{4}, 3\sqrt{6}$

55. Express each entire radical as a mixed radical in simplest form.

a) $\sqrt{45}$

b) $\sqrt[3]{40}$

c) $\sqrt{243}$

56. What is $4^{\frac{-5}{2}}$ expressed as a radical with positive exponents?

57. Express each radical as a power.

a) $\sqrt[4]{3^5}$

b) $\sqrt{\frac{x^4}{y^3}}$

c) $\sqrt[3]{64n^4}$

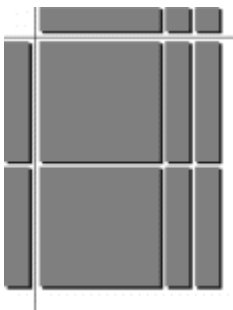
58. Is the statement $\sqrt[5]{(-x)^5} = x$ always, sometimes, or never true? Explain your reasoning.

59. Express $\sqrt[7]{\sqrt[3]{351^{\frac{10}{3}}}}$ as a power with a rational exponent. Do not evaluate.

POLYNOMIALS

60. Use algebra tiles or a diagram to model the binomial multiplication $(2x + 3)(x + 1)$.

61. What product does the following diagram represent?



62. Apply the distributive property to simplify $(5x^2 + 10y^2)^2$.

63. What is the simplified form of the product $(5x^2 + 2x + 7)^2$?

64. Determine the greatest common factor of the numbers 12, 54, and 72.

65. Factor $16x(a + b + c) + 7y(a + b + c) + 8w(a + b + c)$.

66. Factor $15x^2 + 9x + 5x + 3$.

67. Use algebra tiles to factor $2x^2 + 6x$.

68. Use algebra tiles or a diagram to factor the trinomial $x^2 + 7x + 6$.

69. Factor the trinomial $10x^2 - 43x + 28$.

70. What is the factored form of the trinomial $30x^2 - 25xy - 30y^2$?

71. Factor $x^2 - 4x + 4$.

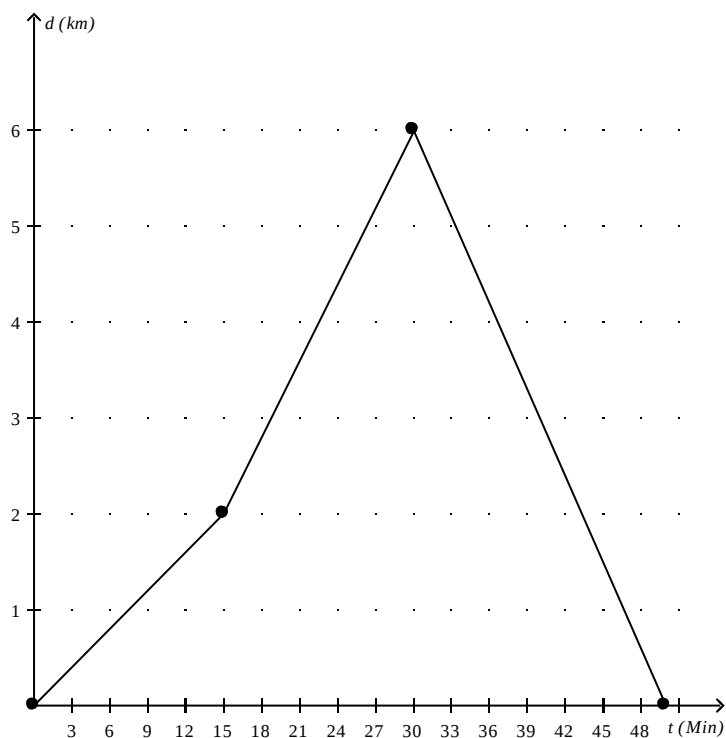
72. Factor $25x^2 - 70x + 49$.

73. What is special about the expression $n^2 - 81$?

74. OMIT Factor $3x^3 + 9x^2 - 3x - 9$.

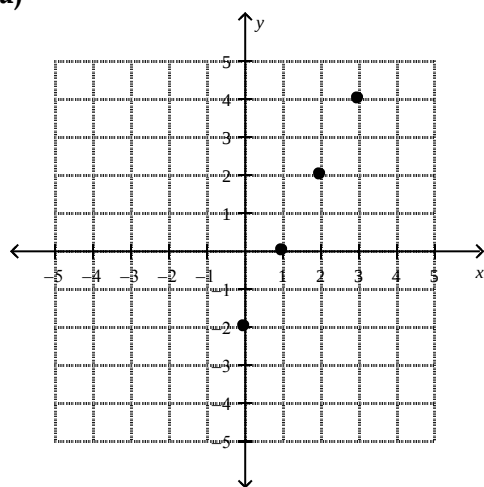
RELATIONS AND FUNCTIONS

75. The following distance-time graph represents the distance (in kilometres) a person bicycled during a 50-min period. Describe a possible scenario.



76. Determine whether each relation is linear or non-linear. Explain your decision.

a)

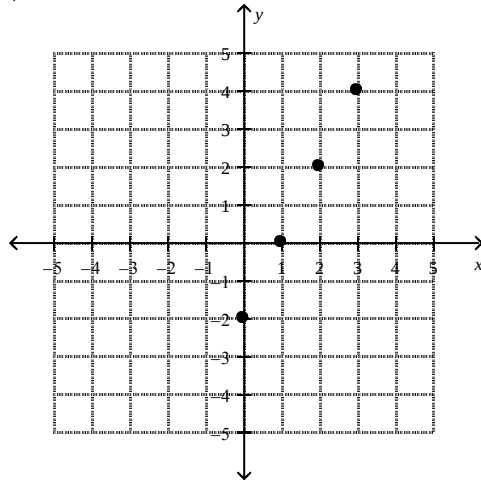


b) $A = \pi r^2$

c) $\{(-2, 5), (1, 3), (4, 1), (10, -3)\}$

77. Determine the domain and range for each relation. Express your answers using the method identified.

a) Number line:



b) Set notation: $y = \pi r^2$

c) List: $\{(-2, 5), (1, 3), (4, 1), (10, -3)\}$

78. At the bowling alley Angela rented shoes for \$3. It cost her \$2.50 to bowl each game.

a) Develop an equation that represents the cost of bowling. Use the form $C(x) = mx + b$, where $C(x)$ is the total cost, and x , is the number of games bowled. Show your thinking.

b) Is this relation a function? Explain.

c) How much did it cost Angela to bowl four games?

LINEAR RELATIONS

79. Determine the slope given the rise and the run.

a) rise = 1, run = 2

b) rise = 4, run = -1

c) rise = -3, run = -4

d) rise = -10, run = -2

80. Determine the rise and the run from the first point to the second point.

a) P(2, 0) and Q(-2, 4)

b) R(-8, -5) and S(-3, -15)

c) T(1, 1) and U(-5, -11)

d) V(10, -20) and W(-30, 50)

81. Determine the slope of the line containing each pair of points.

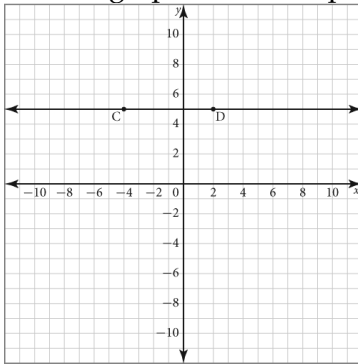
a) A(0, 5) and B(-3, 2)

b) C(-2, -3) and D(-6, -11)

c) E(12, 4) and F(9, 16)

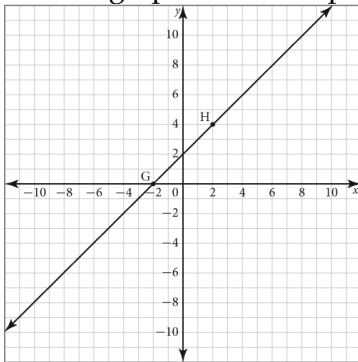
d) G(-100, 50) and H(-200, 100)

82. Use the graph to answer parts a) to d).



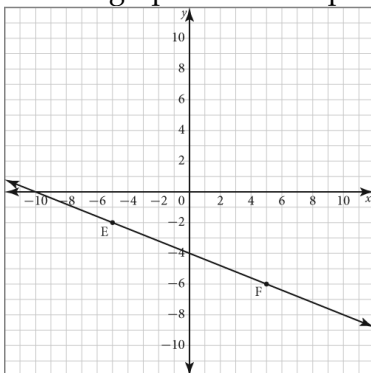
- a) Identify the coordinates of points C and D.
- b) Identify the rise from point C to point D.
- c) Identify the run from point C to point D.
- d) Identify the slope of the line through points C and D.

83. Use the graph to answer parts a) to d).



- a) Identify the coordinates of points G and H.
- b) Identify the rise of the line through points G and H.
- c) Identify the run of the line through points G and H.
- d) Identify the slope of the line through points G and H.

84. Use the graph to answer parts a) to f).



- a) State the coordinates of points E and F.
- b) Determine the rise between points E and F.
- c) Determine the run between points E and F.
- d) Determine the slope of the line containing points E and F.

- e) State the y -intercept of the line containing points E and F.
 f) State the equation of the line containing points E and F.
85. Write the slope-intercept form of the equation of the line with slope 3 and y -intercept 2.
86. Determine the x -intercept and y -intercept of the line $y = 1 - x$. Then, graph the line.
87. a) What is the equation of the vertical line that passes through the point (3, 4)?
 b) What is the equation of the horizontal line that passes through the point (3, 4)?
88. Write each equation in the form $y = mx + b$.
 a) $3x + 2y - 4 = 0$
 b) $x - 4y - 8 = 0$
89. Determine the slope and draw the graph of a line with x -intercept 5 and y -intercept -3.
90. The slopes of each pair of lines are provided. Decide whether the lines in each pair are parallel, perpendicular, or neither. Justify your answers.
 a) $m = \frac{3}{4}$ and $m = \frac{12}{16}$
 b) $m = 100$ and $m = 0.01$
 c) $m = 10$ and $m = -0.1$
91. a) Determine an equation for the line with slope 3 and passing through the origin.
 b) What is an equation for the line perpendicular to the line in part a) that also passes through the origin?
92. What is an equation for the line that passes through points (-1, -2) and (3, 4)?
93. Jamie's grandmother gave her \$40 when she started high school. Jamie decided to add \$5 a week toward the cost of a digital music player. Write an equation in the form $Ax + By + C = 0$ to represent Jamie's savings.

SYSTEMS OF LINEAR EQUATIONS

94. Graph the equations $y = x - 2$ and $x + y = 6$. Then identify the point of intersection.
95. a) Explain how graphing can be used to solve a linear system of two equations.
 b) Explain how you could check your solution.
96. Translate each phrase into an algebraic expression.
 a) seven less than twice a number
 b) four more than half a number
 c) a number decreased by six, times another number
 d) a value increased by the fraction two thirds

97. Express each statement as an algebraic equation.
- One fifth of a number, decreased by 17, is 41.
 - Twice a number, subtracted from five, is three more than seven times the number.
 - When tickets to a play cost \$5 each, the revenue at the box office is \$825.
 - The sum of the length and width of a backyard pool is 96 m.
98. Graph the equations $y = x - 2$ and $x + y = 6$ and determine the point of intersection.
99. Solve the following linear system graphically.
- $$y = 5$$
- $$3x + y = 3$$
100. **OMIT** Solve the following system of equations graphically.
- $$y = 3x + 4$$
- $$y = 5x^2 - 4$$
101. Determine the point of intersection of the lines $y = -\frac{5}{2}x$ and $y = -x + 3$ by graphing.
102. Using a graph, determine the number of solutions for the following linear system.
- $$y = 3x - 2$$
- $$12x - 4y - 8 = 0$$
103. **OMIT** Use a graph to determine the number of solutions for the following linear system.
- $$y = (3|x|) - 2$$
- $$12x - 4y - 8 = 0$$
104. Determine the number of solutions for the following linear system by using a graph.
- $$3x - 2y = -6$$
- $$y = \frac{3}{2}x - 3$$
105. Determine the equation of a line in the form $y = mx + b$ that together with the equation $x + 3y = 9$ forms a linear system that has no solution.
106. Identify the equation of a line in the form $y = mx + b$ that together with the equation $2x + 2y = 12$ forms a linear system with an infinite number of solutions.
107. Explain how the substitution method is used to solve a linear system of two equations.
108. Use the substitution method to solve each linear system.
- $x - 2y = 7$
 $y = -x + 1$
 - $x + 3y = 5$

$$-2x + y = 4$$

c) $-x + 3y + 1 = 0$

$$3x - y + 1 = 0$$

d) $4x - 3y = -13$

$$-2x + y = 4$$

- 109.** Solve this linear system using the method of substitution, then check the solution.

$$2(x - 4) + y = 6$$

$$3x - 2(y - 3) = 13$$

- 110.** Solve the following linear system using the method of substitution. Check your solution.

$$x + 3(3y + 2) = 2$$

$$2(x - 1) - 4(2y + 1) = -1$$

- 111.** The three lines $y = x + 1$, $y = 4 - 2x$, and $y = -x - 5$ intersect to form a triangle. Determine the coordinates of the vertices of the triangle.

- 112.** For what values of the coefficients a and b is the ordered pair $(2, -1)$ the solution to the linear system $ax + by = -7$ and $2ax - 3by = 1$?

ANSWERS

MEASUREMENT

1. Jennifer's sister is approximately 92 cm tall.
2. You can expect approximately 4.3 in. of snow.
3. The 5 mm bolt is smaller than the $\frac{5}{16}$ in. drill bit, so it will fit in the hole.
4. No, Sam cannot trim the tree with a ladder this length.
5. Habib has to travel approximately 443 km.
6. a) The perimeter of the block is 1944 ft.
b) Erin jogs 7776 yd each morning.
7. a) The perimeter of the garden is 300 ft or 100 yd.
b) The fence will cost \$1050.00.
8. The total amount of plastic wrapping needed is 697 cm².
9. a) The perimeter totals 14.4 cm.
b) The perimeter totals 12.8 cm.
10. The total exposed surface area is 10 m².
11. a) The area of the poster is 216 ft².
b) The area of the poster is 24 yd².
c) The cost to laminate the poster is \$36.00.
12. a) 3.746 cm or 37.46 mm
b) Read the value on the fixed scale exactly at or just to the left of the zero on the moving scale (3.7 cm or 37 mm). Identify the first line on the moving scale that aligns with a line on the fixed scale (0.046 cm or 0.46 mm). Add the two figures.
13. a) The volume of the prism is 6000 cm³.
b) The volume of the right cylinder is approximately 35.3 in.³.
14. a) The area is 375 mm².
b) The area is 0.0007 m².
15. a) The area is approximately 504.83 km².
b) The area is approximately 2.79 m².
16. a) The volume of the right pyramid is 48 mm³.
b) The volume of the sphere is approximately 65 449.8 cm³.
c) The volume of the right cone is approximately 1178.1 in.³.
17. The volume of the rectangular prism is 48 in.³.
The volume of the cube is 64 in.³.
The cube has a greater volume than the right rectangular prism.
18. a) Determine the slant height.
The surface area of the right pyramid is approximately 2126.9 cm².
b) The surface area of the right cone is approximately 1416.9 ft².
c) The surface area of the sphere is approximately 530.9 m².
19. a) The surface area of the cylinder is approximately 27.6 m².
The volume of the cylinder is approximately 10.7 m³.
b) The surface area of the cylinder is approximately 480.3 yd².
The volume of the cylinder is approximately 382.3 yd³.

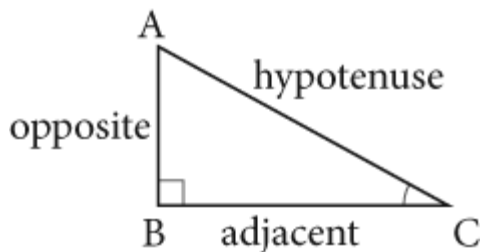
20. a) The volume of the cone is approximately 32.4 cm^3 .
 b) The volume of the sphere is approximately 816.9 ft^3 .
 21. The radius of the sphere is approximately 5.8 cm .
 22. *Answers are in italics.*

Object	Radius	Height	Volume
a) right cylinder	<i>3.7 mm</i>	18.1 mm	778.5 mm^3
b) right cylinder	4.9 yd	<i>0.5 yd</i>	37.7 yd^3
c) right cone	10.8 in.	26.2 in.	3200.2 in.^3
d) right cone	<i>6.3 cm</i>	14.4 cm	598.2 cm^3
e) sphere	2.7 m		82.4 m^3
f) sphere	<i>11.6 ft</i>		6535 ft^3

23. The volume of the larger sphere is 8 times the volume of the smaller sphere.
 24. The total surface area to paint is 214 cm^2 .
 25. a) The surface area of the right prism is 40 m^2 .
 b) The surface area of the cube is 96 m^2 .
 c) The surface area of the pyramid is 39 m^2 .
 d) The height of each triangle is approximately 1.73 m .
 The surface area of the equilateral triangular prism is approximately 39.5 m^2 .
 The cube has the greatest surface area.

TRIGONOMETRY

26. The roof is approximately 15.7 m wide.
 27. The stairs make an angle of approximately 31° with the stairs.
 28. The wheelchair ramp must be approximately 14.4 m long.
 29. The pole is approximately 22.4 m tall.
 30. The trusses are each approximately 8.6 m long.
 31. The kite is approximately 55.6 m above the ground.
 32. BC is approximately 14 cm long.
 33. AC is approximately 6 cm long.
 34. $\angle Z$ measures approximately 34° . $\angle Y$ is equal to $\angle Z$.
 $\angle X$ measures approximately 112° .
 35. XW measures approximately 3.6 cm .
 36. $\angle C$ measures approximately 63° .
 37. BC is approximately 8.2 cm .
 38. The length of the wire is approximately 23.2 m .
 39. The length of the ski jump hill is 180 m .
 40. When Khalil is at the maximum height, the cable makes an angle of approximately 48° .
 41.



ROOTS AND POWERS

42. $\sqrt{9604} = 98$
43. a) perfect square: $32^2 = 1024$
b) perfect cube: $22^3 = 10\,648$
44. a) 100 km^2
b) 400 mm^2
45. a) 4913 yd^3
b) 1331 ft^3
46. a) $5.1^2\text{ m}^2 + 3.5^2\text{ m}^2 = 38.26\text{ m}^2$
b) $4.3^2\text{ yd}^2 + 9.3^2\text{ yd}^2 = 104.98\text{ yd}^2$
47. a) $2.1^3\text{ km}^3 + 9.2^3\text{ km}^3 = 787.95\text{ km}^3$
b) $6.1^3\text{ cm}^3 + 5.3^3\text{ cm}^3 = 375.86\text{ cm}^3$
48. $3^5 + 3^4 + 3^2$
49. The two solutions are $x = 1$ and $y = -\frac{1}{3}$ and $x = -1$ and $y = \frac{1}{3}$.
50.
$$\frac{[(a^2bc^4)(ab^3c^2)]^2}{(b^2c^5)^3} = \frac{[a^3b^4c^6]^2}{b^6c^{15}}$$
$$= \frac{a^6b^8c^{12}}{b^6c^{15}}$$
$$= a^6b^2c^{-3} \text{ or } \frac{a^6b^2}{c^3}$$
51. a) $(-2.5)^5$
b) $\frac{1}{3^3}$
c) $\frac{1}{t^3}$
52. a) $\left(\frac{3}{2}\right)^6 \doteq 11.3906$
b) $\left(\frac{1}{4}\right)^{10} \doteq 9.5367 \times 10^{-7}$
53. a) 2218.4537
b) 12.5135
c) 0.5774
54. $4\sqrt{4}, 3\sqrt{6}, \sqrt{30}, 2^3\sqrt{5}$
Convert each mixed radical to an entire radical.
The entire radicals are $\sqrt{64}, \sqrt{54}, \sqrt{30}, \sqrt[3]{40}$.
55. a) $3\sqrt{5}$
b) $2^3\sqrt{5}$
c) $9\sqrt{3}$

56. $\frac{1}{\sqrt[4]{4^5}}$

57. a) $3^{\frac{5}{4}}$

b) $\frac{x^2}{y^{\frac{8}{2}}}$

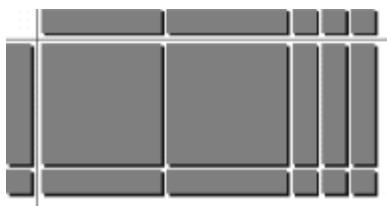
c) $4n^{\frac{4}{3}}$

58. Sometimes true. It is not true when $x < 0$.

59. $351^{\frac{5}{21}}$

POLYNOMIALS

60.



61. $2x(x + 2)$

62. $25x^4 + 100x^2y^2 + 100y^4$

63.

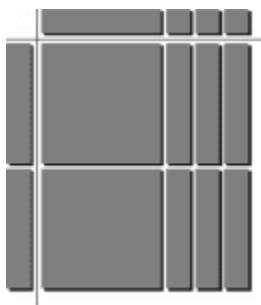
$$\begin{aligned}(5x^2 + 2x + 7)^2 &= 25x^4 + 4x^2 + 49 + 20x^3 + \\ &\quad 70x^2 + 28x \\ &= 25x^4 + 20x^3 + 74x^2 + 28x \\ &\quad + 49\end{aligned}$$

64. The greatest common factor is $2 \cdot 3 = 6$.

65. $(a + b + c)(16x + 7y + 8w)$

66. $(5x + 3)(3x + 1)$

67.



$$2x^2 + 6x = 2x(x + 3)$$

68.



$$(x + 6)(x + 1)$$

69. $(5x - 4)(2x - 7)$

70. $30x^2 - 25xy - 30y^2 = 5(6x^2 - 5xy - 6y^2)$
 $= 5(3x + 2y)(2x - 3y)$

71. $(x - 2)^2$

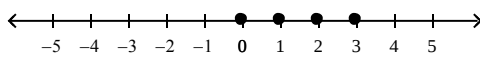
72. $(5x - 7)^2$

73. It is a difference of squares.

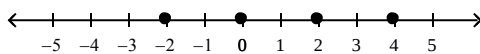
74. $3x^3 + 9x^2 - 3x - 9 = 3(x^3 + 3x^2 - x - 3)$
 $= 3(x^3 - x + 3x^2 - 3)$
 $= 3[x(x^2 - 1) + 3(x^2 - 1)]$
 $= 3(x + 3)(x^2 - 1)$
 $= 3(x + 3)(x + 1)(x - 1)$

RELATIONS AND FUNCTIONS

75. A cyclist biked away from the starting point at a constant rate for the first 15 min. For the next 15 min, the cyclist pedaled at an increased constant rate. The cyclist then turned around and travelled at a constant speed, returning to the starting point.
76. a) This is a linear relation. With each increase of 1 in the independent variable, x , the dependent variable, y , increases by 2.
 b) This is a non-linear relation. With each increase of 1 in the independent variable, r , the dependent variable, A , does not increase by the same amount. It increases by the square of the increase in r^2 .
 c) This is a linear relation. With each increase of 3 in the independent variable, x , the dependent variable, y , decreases by 2.
77. a) Domain:



Range:



b) Domain: $\{r \mid r \in \mathbb{R}\}$

Range: $\{y \mid y > 0, y \in \mathbb{R}\}$

c) Domain: $\{-2, 1, 4, 10\}$

Range: $\{5, 3, 1, -3\}$

78. a) $C(x) = 2.5x + 3$

- b) Yes, this is a function because for every value of x there is only one corresponding value for $C(x)$.
 c) The cost to bowl four games is \$13.

LINEAR RELATIONS

79. a) $m = \frac{\text{rise}}{\text{run}}$

$$m = \frac{1}{2}$$

b) $m = \frac{\text{rise}}{\text{run}}$

$$m = \frac{4}{-1}$$

$$m = -4$$

c) $m = \frac{\text{rise}}{\text{run}}$

$$m = \frac{-3}{-4}$$

$$m = \frac{3}{4}$$

d) $m = \frac{\text{rise}}{\text{run}}$

$$m = \frac{-10}{-2}$$

$$m = 5$$

80. a) rise = 4

run = -4

b) rise = -10

run = 5

c) rise = -12

run = -6

d) rise = 70

run = -40

81. a) The slope is 1.

b) The slope is 2.

c) The slope is -4.

d) The slope is $-\frac{1}{2}$.

82. a) C(-4, 5), D(2, 5)

b) The rise is 0.

c) The run is 6.

d) The slope is 0.

83. a) G(-2, 0), H(2, 4)

b) The rise is 4.

c) The run is 4.

d) The slope is 1.

84. a) E(-5, -2), F(5, -6)

b) The rise is -4.

c) The run is 10.

d) The slope is $-\frac{2}{5}$.

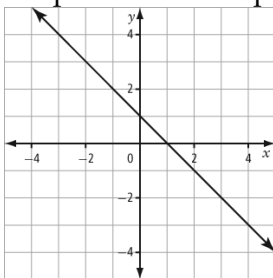
e) On the graph, the line with E and F crosses the y -axis at -4, so the y -intercept is -4.

f) The equation of the line is $y = -\frac{2}{5}x - 4$.

85. $y = 3x + 2$

86. The x -intercept is 1 and the y -intercept is 1.

Graph the ordered pairs $(1, 0)$ and $(0, 1)$. Then, draw the line that passes through these points:



87. a) $x = 3$

b) $y = 4$

88. a) $3x + 2y - 4 = 0$

$$3x + 2y - 4 - 3x + 4 = 0 - 3x + 4$$

$$2y = -3x + 4$$

$$\frac{2y}{2} = \frac{-3x + 4}{2}$$

$$y = -\frac{3}{2}x + \frac{4}{2}$$

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

- b) $x - 4y - 8 = 0$

$$x - 4y - 8 - x + 8 = 0 - x + 8$$

$$-4y = -x + 8$$

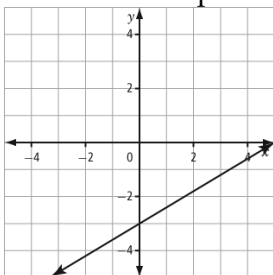
$$\frac{-4y}{-4} = \frac{-x + 8}{-4}$$

$$y = \frac{1}{4}x + \frac{8}{-4}$$

$$y = \frac{1}{4}x - 2$$

89. The slope is $\frac{3}{5}$.

Use the intercepts to draw the graph:



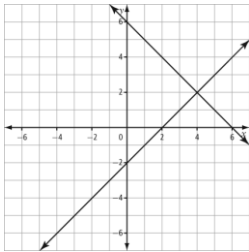
90. a) The lines are parallel because they have the same slope.
 b) The lines are neither perpendicular nor parallel because their slopes are not equal and their product is not -1 .
 c) The lines are perpendicular because their slopes are negative reciprocals. The product of the slopes is $10(-0.1) = -1$.
91. a) $y = 3x$
 b) The slope of this line is the negative reciprocal of 3, or $-\frac{1}{3}$: $y = -\frac{1}{3}x$
92. The equation of the line is $y = \frac{3}{2}x - \frac{1}{2}$ or $y = 1.5x - 0.5$ or $3x - 2y - 1 = 0$.
93. Let the equation $y = mx + b$ represent Jamie's savings, where x represents the number of weeks, and y represents the amount of money, in dollars, Jamie has saved.. When $x = 0$, $y = 40$. Her weekly savings rate is the slope, so $m = 5$.

$$y = 5x + 40$$

$$5x - y + 40 = 0$$

SYSTEMS OF LINEAR EQUATIONS

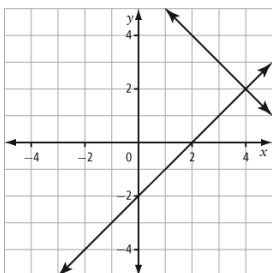
94.



From the graph, the point of intersection is $(4, 2)$.

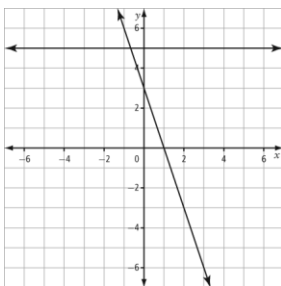
95. a) A linear system can be solved by graphing the lines and then reading the point of intersection from the graph.
 b) To check the solution to a linear system, substitute the coordinates of the point of intersection into the original equations. The solution is correct if the value of the left side of the equation is equal to the value of the right side for both equations.
96. a) $2x - 7$
 b) $\frac{1}{2}x + 4$
 c) $(x - 6)y$
 d) $x + \frac{2}{3}$
97. a) $\frac{1}{5}x - 17 = 41$
 b) $5 - 2x = 3 + 7x$
 c) $5t = 825$
 d) $l + w = 96$

98.



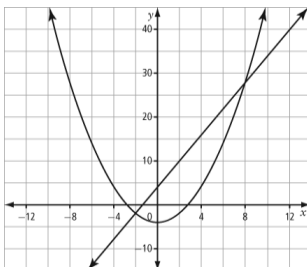
Point of intersection: (4, 2)

99.



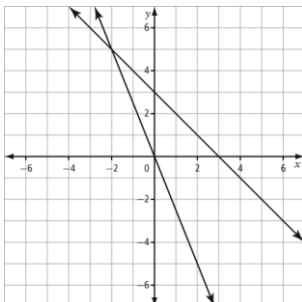
Solution: $\left(-\frac{2}{3}, 5\right)$

100.



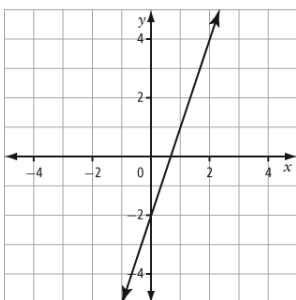
Solutions: (-2, -2) and (8, 28)

101.



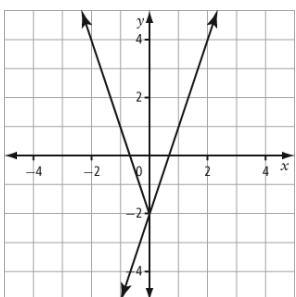
Point of intersection: (-2, 5)

102.



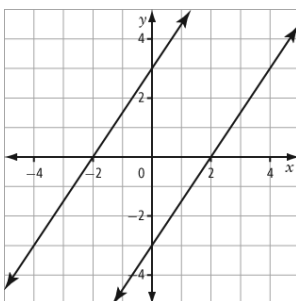
Because both equations have the same graph, there are an infinite number of solutions.

103.



Even though the first graph involves an absolute value, there are an infinite number of solutions.

104.



Because the lines are parallel, the linear system has no solution.

105. A parallel line is needed, so the other equation must be $y = -\frac{x}{3} + b$ where b can be any value except 3.
106. An equivalent equation of the same line is needed. Example: $y = 6 - x$
107. To solve a linear system by substitution, solve the first equation for one variable, and then substitute that expression into the second equation and solve for the second variable. Substitute the value of the second variable into one of the equations and solve for the value of the first variable.
108. a) The solution to the linear system is $(3, -2)$.
 b) The solution to the linear system is $(-1, 2)$.
 c) The solution to the linear system is $\left(-\frac{1}{2}, -\frac{1}{2}\right)$.

d) The solution to the linear system is $\left(\frac{1}{2}, 5\right)$.

109. The solution to the linear system is $(5, 4)$.

110. The solution is $\left(\frac{1}{2}, -\frac{1}{2}\right)$.

111. The coordinates of the first vertex are $(1, 2)$.
The coordinates of the second vertex are $(-3, -2)$.
The coordinates of the third vertex are $(9, -14)$.

112. The ordered pair $(2, -1)$ is the solution for the linear system when $a = -2$ and $b = 3$.