ADLC

Mathematics 10C
Unit 9: Course Review Booklet

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Course Review

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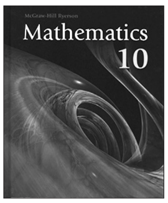

Mathematics 10
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Mathematics 10C Course Review

You have now learned all the concepts for Math 10C. This course review includes a summary table of topics and review problems for each *Unit*. All the problems include a full solution located in the *Appendix* section of the *Review Workbook*. Your task is to solve all the problems in each of the *Unit* sections, ensuring to show all steps and necessary work; then, compare your solutions to the full solutions in the *Appendix*.

Unit 1: Measurement

Concepts	**I know how to do that**	**I'm going to review that topic**
Provide referents for linear measurements using SI and imperial units		
Estimate a length using a referent		
Choose an appropriate unit for solving a measurement problem		
Use various tools for measuring lengths and distances		
Describe how to measure the length or perimeter of an oddly shaped object		
Convert between SI units		
Convert between Imperial units		
Convert between SI and Imperial units		
Explain how units are eliminated in a unit conversion		
Use mental mathematics to justify the reasonableness of a conversion		

Unit 1: Measurement Review Questions

1. What unit(s) of linear measurement would be most appropriate for making each of the following linear measurements?

   a. ________________________________ the diameter of a whole pizza

   b. ________________________________ the length of a dinner fork

   c. ________________________________ the length of an adult's stride

   d. ________________________________ the width of a school classroom

   e. ________________________________ the width of a toothpick

   f. ________________________________ the length of a submarine-style sandwich

2. Jude estimates that his index finger is 3 inches long. He calculates the circumference of one of his bongo drums to be 27 inches. Suppose Jude used his finger as a referent to measure the circumference of the drum. How many finger lengths along the circumference of the drum would he have counted?

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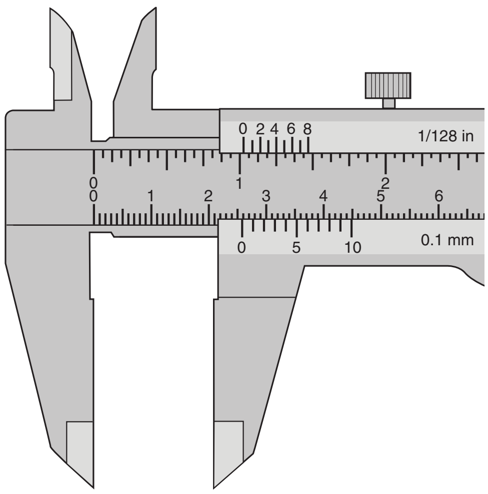
3. What is the reading on the calliper, in centimetres?



4. Convert each measurement to the indicated unit.

a. 60 inches = ____________ feet

b. 3 hours and 14 minutes = ____________ minutes

5. Darcy is 6 feet 1 inch tall.

   a. What is Darcy’s height in centimetres?

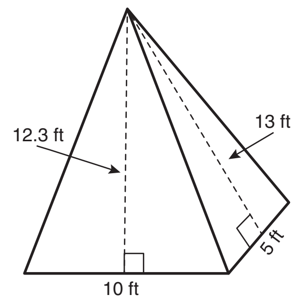
   b. Use mental math and estimation to justify that the answer is reasonable.

Unit 2: Surface Area and Volume

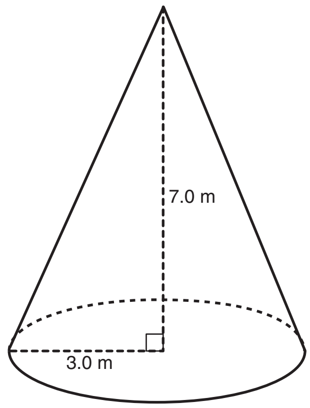
Concepts	**I know how to do that**	**I'm going to review that topic**
Find the surface area of right prisms, right cylinders, right cones, right pyramids, and spheres		
Determine a missing dimension of a right prism, right cylinder, right cone, right pyramid, or sphere, given the surface area and the remaining dimensions		
Find the volume of right prisms, right cylinders, right cones, right pyramids, and spheres		
Determine a missing dimension of a right prism, right cylinder, right cone, right pyramid, or sphere, given the volume and the remaining dimensions		
Solve problems involving composite objects		

Unit 2: Surface Area and Volume Review Questions

1. Calculate the surface area of the right rectangular pyramid shown, to the nearest square foot.



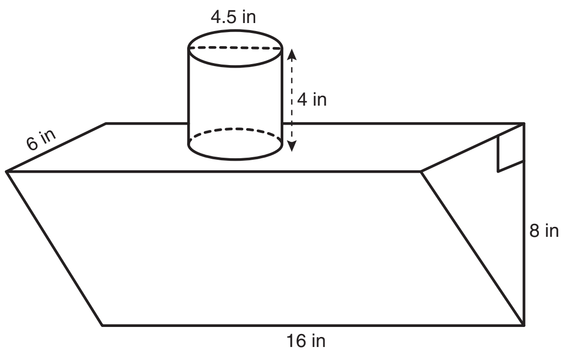
2. Calculate the volume of the right cone shown, to the nearest cubic metre.



3. A sphere has a surface area of 15.4 m^2. What is the radius of the sphere, to the nearest tenth of a metre?

4. A right cylindrical can has a volume of approximately 563.9 cm^3. What is the volume of a right cone with the same base and height, to the nearest cubic centimetre?

5. Determine the exposed surface area of a solid, triangular prism shelf attached to a wall and the cylindrical container sitting on it, to the nearest tenth of a square inch.

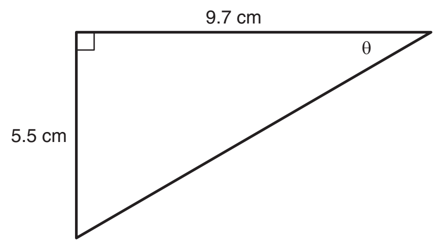


Unit 3: Trigonometry

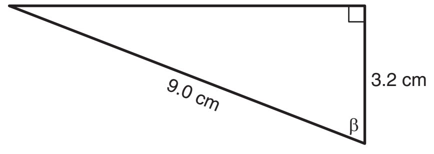
Concepts	**I know how to do that**	**I'm going to review that topic**
Explain the relationship between similar right triangles and the sine, cosine, and tangent ratios		
Identify the hypotenuse and the sides opposite and adjacent to a given acute angle in a right triangle		
Solve right triangles		
Solve problems involving right triangles by applying the primary trigonometric ratios, the Pythagorean theorem, and the triangle angle sum		
Use measuring instruments and the primary trigonometric ratios or the Pythagorean theorem to solve a problem		

Unit 3: Trigonometry Review Questions

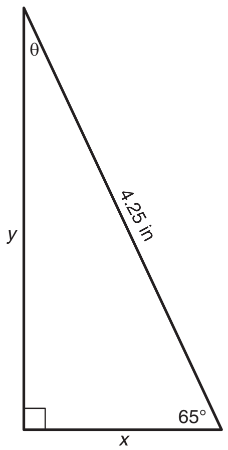
1. a. Determine the measure of $\angle\theta$, to the nearest tenth of a degree.



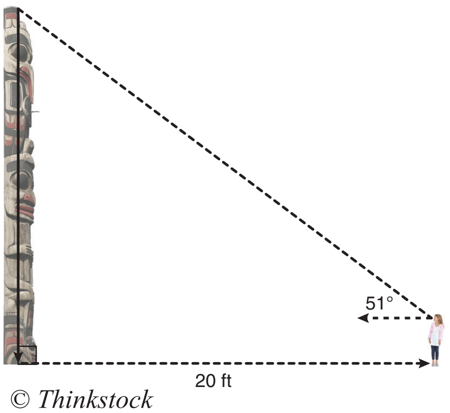
b. Determine the measure of $\angle\beta$, to the nearest degree.



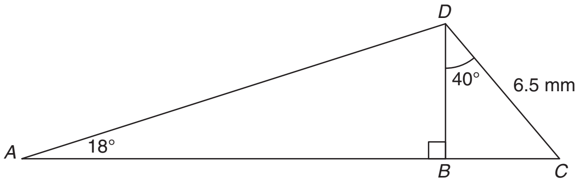
2. Solve the right triangle shown. Express side lengths to the nearest tenth of an inch and angles to the nearest degree.



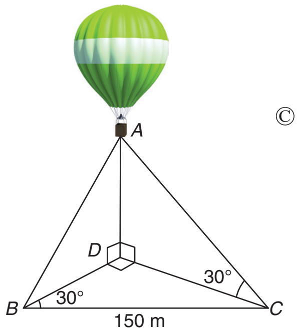
3. Sarah’s math class went on a field trip to the BC coast and took measurements of different totem poles. Sarah stood 20 feet away from the smallest totem pole and used a clinometer to determine the angle of elevation to the top of the totem pole to be 51°. If Sarah’s eyes are 5.5 feet from the ground, what is the height of the totem pole, to the nearest tenth of a foot?



4. Using the information in the diagram, determine the length of *AD*, to the nearest tenth of a millimetre.



5. The High River Hot Air Balloon Festival was held in September of 2013. One of the hot air balloons was tethered to the ground at points *B*, *C*, and *D*, using three guy wires, as shown.



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How far above the ground was the hot air balloon, to the nearest tenth of a metre?

Unit 4: Exponents and Radicals

Concepts	I know how to do that	I'm going to review that topic
Determine the prime factors of a Whole Number		
Explain why specific numbers have no prime factors		
Use strategies for determining the GCF and LCM of Whole Numbers		
Solve problems involving prime factors, GCF, LCM, square roots, and cube roots		
Use examples to explain the meaning of the index of a radical		
Determine whether a Whole Number is a perfect square, perfect cube, or neither		
Use strategies for determining the square root of a perfect square and the cube root of a perfect cube		
Express an entire radical as a mixed radical in simplest form and vice versa		
Sort Real Numbers according to the subsets Irrational, Rational, Integer, Whole, Natural		
Order Irrational Numbers on the number line		
Apply and explain the exponent laws, including negative and rational exponents		
Solve problems using exponent laws or radicals		

Unit 4: Exponents and Radicals Review Questions

1. Write the prime factorization of 520.

2. Determine the GCF and LCM of 420 and 190.

3. a. Determine the square root of 2 500.

   b. Determine the cube root of 91 125.

4. Evaluate or simplify the following radicals, expressing each in exact value form. Then, categorize them as Rational or Irrational.

Number	Exact Value Answer	Rational	Irrational
$\sqrt{\frac{4}{196}}$			
$\sqrt{54}$			
$\sqrt[3]{-16}$			
$\sqrt{225}$			
$\sqrt[3]{216}$			
$\sqrt{\frac{49}{81}}$			

5. Between which two consecutive Integers is $\sqrt[3]{-122}$?

6. Simplify each expression using positive exponents.

a. $\left((5^{\frac{3}{2}})(5^{\frac{1}{3}})\right)^{6}$

b. $\dfrac{2^{-1}a^2b^{-3}}{4a^3b^{-5}}$

7. a. Write $42^{\frac{5}{3}}$ as a radical.

b. Write $\sqrt{\left(\frac{5}{6}\right)^{11}}$ as a power.

8. Biologists use the formula $b = 0.01m^{\frac{2}{3}}$ to estimate the brain mass, b, in kilograms, of a mammal with body mass m, in kilograms. Determine the brain mass of a koala with body mass 11.8 kilograms, to the nearest hundredth of a kilogram.

Unit 5: Polynomials

Concepts	**I know how to do that**	**I'm going to review that topic**
Model the multiplication of two binomials using pictures or algebra tiles, and record the process symbolically		
Explain how binomial multiplication is related to area		
Explain the relationship between binomial multiplication and multiplying two-digit numbers		
Verify polynomial multiplication using substitution		
Multiply two polynomials and combine like terms in the product		
Explain how to multiply any two polynomials		
Correct errors in a polynomial multiplication		
Factor a polynomial using the GCF of its terms		
Model the factoring of a trinomial using pictures or algebra tiles, and record this process symbolically		
Factor a polynomial that is a difference of squares		
Identify and correct errors in a polynomial factorization		
Factor a polynomial and verify by multiplying the factors		
Use examples to show the relationship between multiplying and factoring polynomials		
Generalize and explain strategies used to factor a trinomial		
Express a polynomial as a product of its factors		

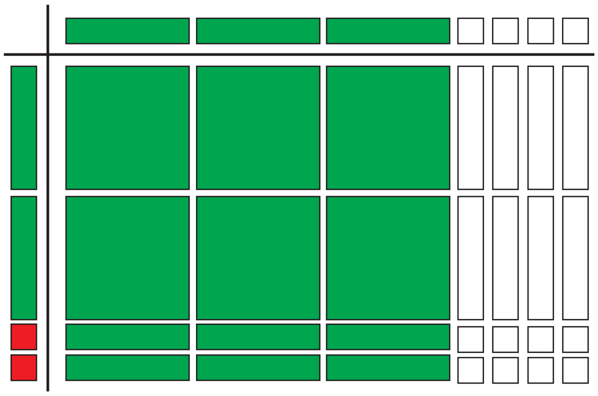
Unit 5: Polynomials Review Questions

1. Expand and simplify.

$(x+6)(x-8)$

	x	6
x		
–8		

2. What binomials and binomial product do the algebra tiles represent?



3. Expand and simplify.

$(3t-6)(t^2-8t+2)$

4. Fully factor each of the following expressions.

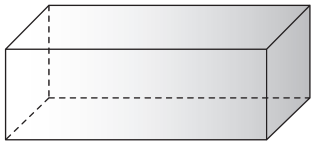
   a. $21x^2yz - 3x^2y^2 + 24x^3y^3$

   b. $w^2 - 13w - 30$

   c. $36d^2 - 49e^2$

   d. $x^2 - 18xy + 81y^2$

5. The volume of a rectangular prism can be expressed as $80x^3 + 156x^2 + 72x$.



a. Determine a possible set of expressions for the length, width, and height of the rectangular prism.

b. Determine the volume of the prism if $x = 2$ cm.

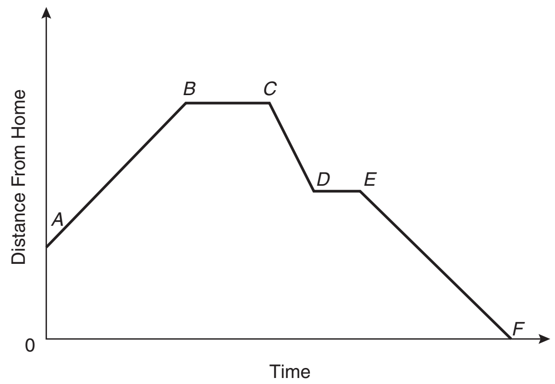
Unit 6: Relations and Functions

Concepts	I know how to do that	I'm going to review that topic
Describe a possible situation for a given graph		
Identify independent and dependent variables in a given context		
Understand the difference between continuous and discrete data		
Sketch a possible graph for a given situation		
Determine, and express in various ways, the domain and range of a graph, a set of ordered pairs, or a table of values		
Express in various ways the domain and range of a graph of a relation		
Graph, with or without technology, a set of data and determine the restrictions on the domain and range		
Explain why data points should or should not be connected on the graph for a situation		
Graph linear relations given a table of values, a given situation, or an equation		
Determine whether a graph, a table of values, a set of ordered pairs, a situation, or an equation represents a linear relation and explain why or why not		
Match corresponding representations of linear relations		
Draw a graph from a set of ordered pairs within a given situation and determine whether the relationship between the variables is linear		
Understand the relationship between rate of change and the slope of a line		
Determine the slope of a line segment by measuring or calculating the rise and run		
Classify lines in a given set as having positive or negative slopes		
Explain the meaning of the slope of a horizontal or vertical line		
Explain why the slope of a line can be determined by using any two points on that line		
Draw a line given its slope and point on the line		
Determine another point on a line given the slope and a point on the line		

Explain, using examples, why some relations are not functions but all functions are relations		
Determine if a set of ordered pairs represents a function		
Sort a set of ordered pairs or non-functions		
Generalize and explain rules for determining whether graphs and sets of ordered pairs represent functions		
Express the equation of a linear function in two variables using function notation		
Express an equation given a function notation as a linear function in two variables		
Sketch the graph of a linear function expressed in function notation		
Solve for the domain and range values when given the range and domain values for a linear function		

Unit 6: Relations and Functions Review Questions

1. The graph representing Julie's morning run shows the relationship between her distance from home and time.



a. Describe a possible situation for each segment of the graph.

AB: ______________________________

____

BC: ______________________________

____

CD: ______________________________

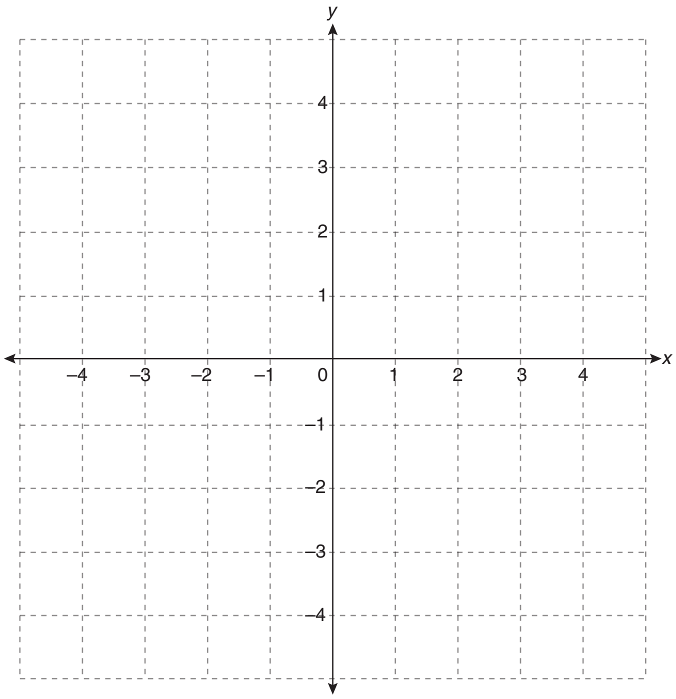
DE: ______________________________

EF: ______________________________

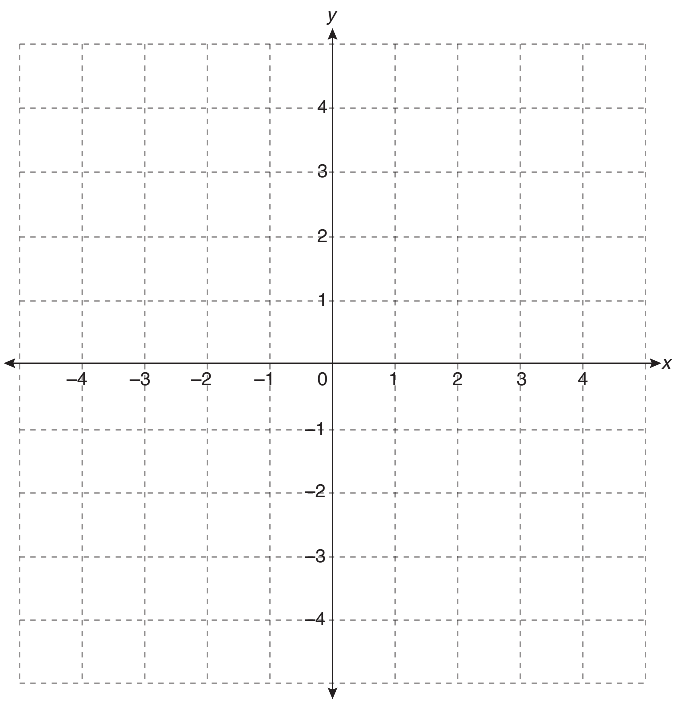
b. During which segment was Julie running the fastest?

2. Sketch a graph to represent a relation with each of the following restrictions.

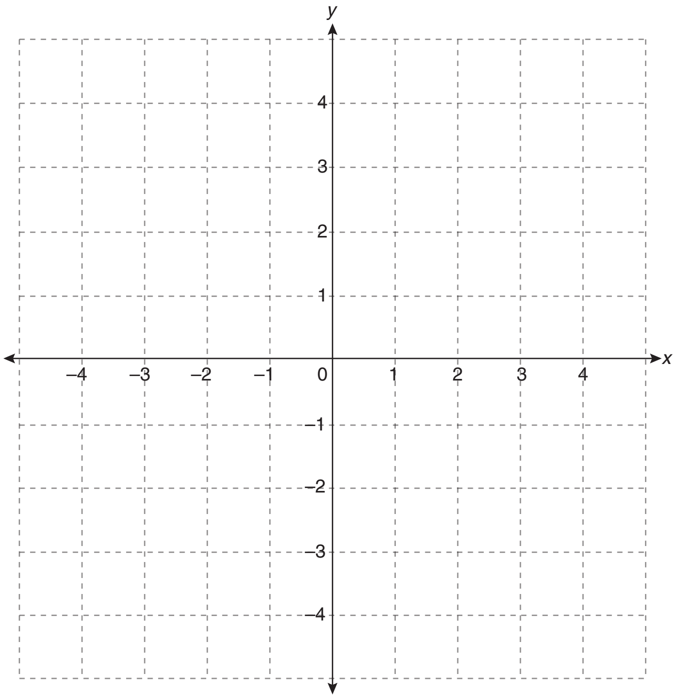
a. domain [–2,3), range (–3,2]



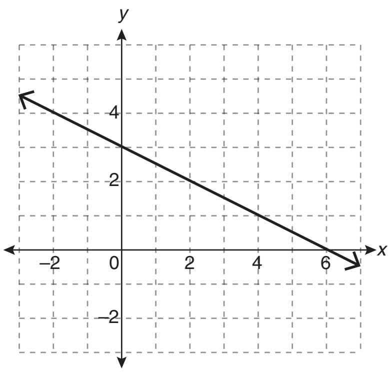
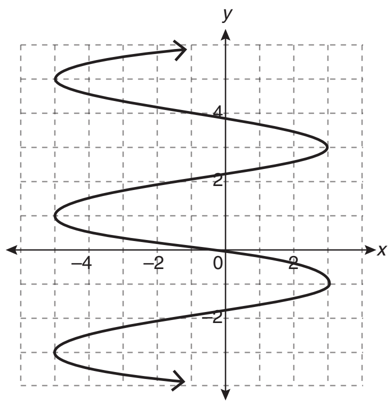
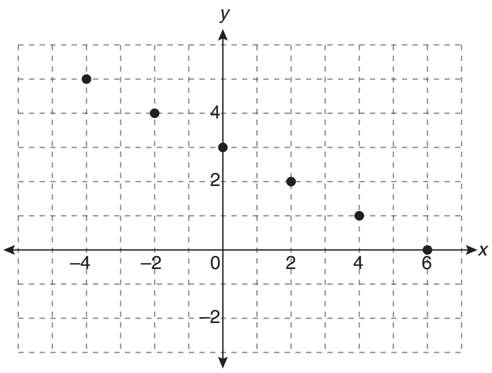
b. domain $\{x \in R\}$, range {3}



c. domain $\{x \mid 0 \leq x \leq 4, x \in R\}$, range $\{y \mid -3 \leq y \leq 3, y \in R\}$



3. Determine whether each of the following relations is a function. State the domain and range of the graph of each relation.

		
Function: YES NO	Function: YES NO	Function: YES NO
D: R:	D: R:	D: R:

4. Which of the following graphs has a slope

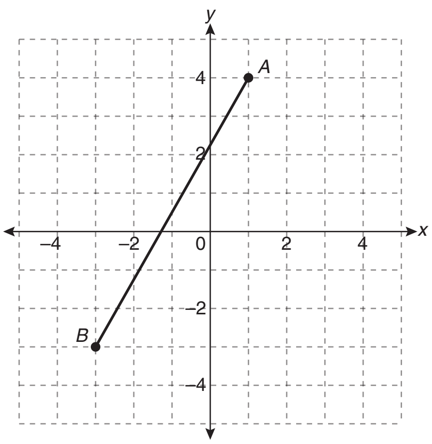
   a. of $\frac{7}{4}$? ________

   b. that is undefined? ________

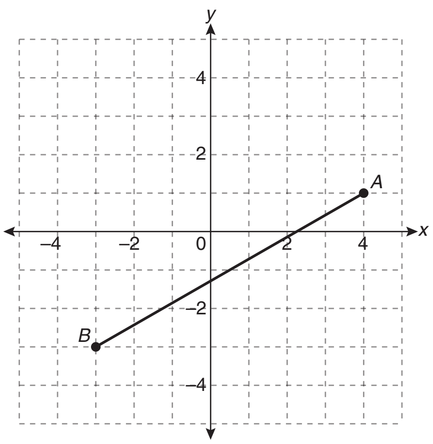
   c. of zero? ________

   d. of $\frac{4}{7}$? ________

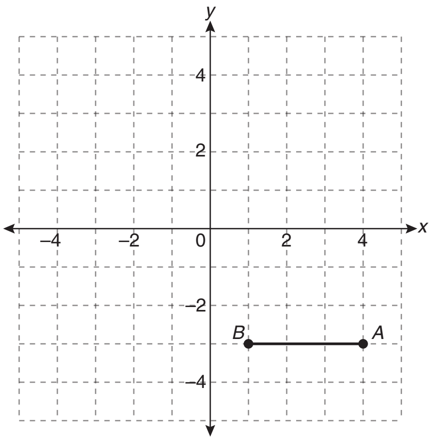
i.



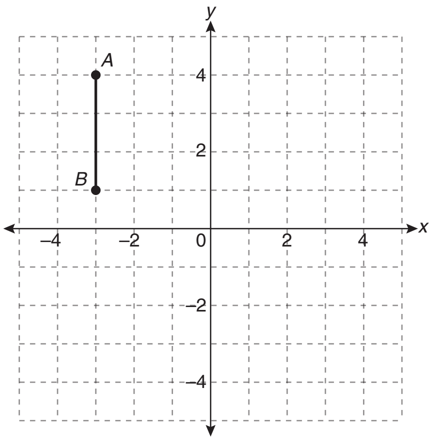
ii.



iii.



iv.



5. Cherries from the Okanagan Valley in BC are popular treat during early summer months. They are also high in dietary fibre. The table below represents the amount of dietary fibre from various masses of cherries.

Mass of Cherries (g)	180	360	540
Amount of Fibre (g)	3.5	7	10.5

a. Does the data represent a linear or non-linear relationship between the amount of fibre and the mass of cherries? Explain.

____

____

____

____

b. Identify the dependent and independent variables.

____

____

____

____

____

____

____

c. Would the graph of the relation be continuous or discrete? Explain.

____

____

____

____

d. Determine the slope of the graph.

e. Explain the meaning of the slope as a rate of change.

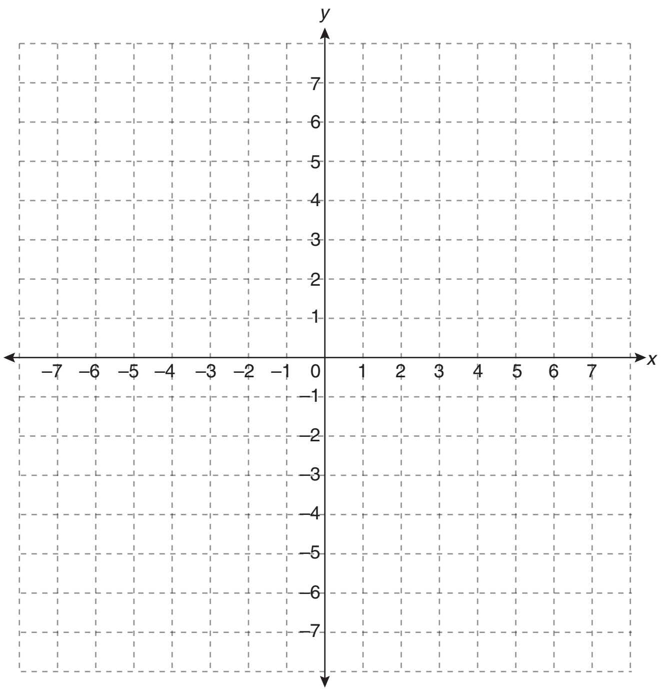
Unit 7: Equations and Graphs of Linear Relations

Concepts	I know how to do that	I'm going to review that topic
Determine the intercepts of the graph a linear relation		
Determine the slope of a graph of a linear relation		
Determine the domain and range of a linear relation		
Sketch a linear relation that has one, two, or an infinite number of intercepts		
Identify a graph that corresponds to a given slope and y-intercept		
Identify the slope and y-intercept that corresponds to a given graph		
Solve problems using the intercepts, slope, domain, or range of a linear relation		
Express linear relations in slope-intercept, general, and slope-point form		
Rewrite a linear relation in slope-intercept or general form		
Explain how to graph relations in slope-intercept, general, and slope-point forms		
Graph linear relations with and without technology		
Identify equivalent linear relations		
Match linear relations to their graphs		
Write the equation of a graph in slope-intercept form		
Determine the equation of a relation using the slope and a point		
Determine the equation of a relation using two points		
Use slope to determine whether lines are parallel or perpendicular		
Determine the equation of a relation using a point on the line and the equation of a parallel or perpendicular line		
Graph a linear relation from a context and write the equation of the line		
Solve problems using a linear relations		

Unit 7: Equations and Graphs of Linear Relations Review Questions

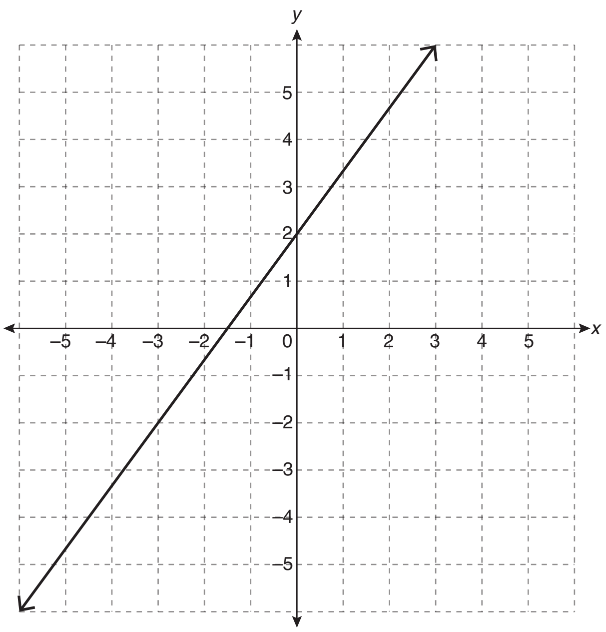
1. a. Determine the x- and y-intercepts of the graph of the relation $6x + 9y + 36 = 0$.

b. Graph the relation.



c. Write the equation of the relation $6x + 9y + 36 = 0$ in slope-intercept form.

2. a. State the equation of the relation, in slope-intercept form, of the following graph.



b. Rewrite the equation in general form.

3. Determine the slope of a line that is perpendicular to the line through $C(-10,4)$ and $D(7,-2)$.

4. Determine the equation of a line that is parallel to $-6x + y + 21 = 0$ and has a y-intercept of -5.

5. The number of girls playing organized ice hockey from January of 1990 to January of 2010 increased by approximately 4 000 girls per year. Specifically, in January of 2000, there were approximately 45 000 girls playing organized ice hockey.

    a. Write an equation, in slope-point form, to represent the number of girls, g, playing organized ice hockey as it relates to the number of years, t, after 1990.

    b. Use the equation from part a. to determine the number of girls who played organized ice hockey in January of 2005.

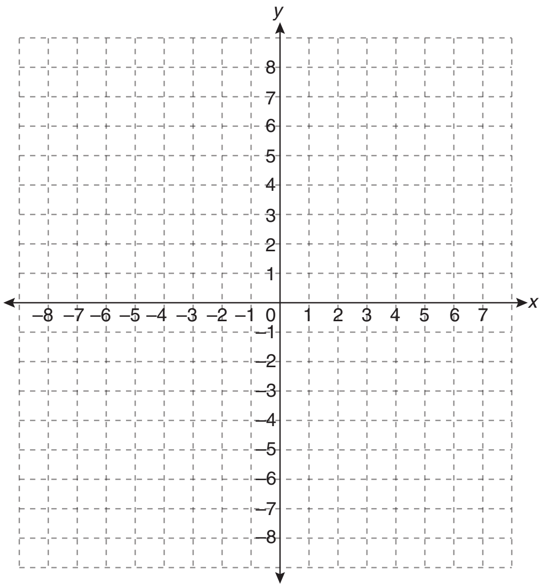
Unit 8: Systems of Linear Equations

Concepts	**I know how to do that**	**I'm going to review that topic**
Determine the solution to a system of linear equations graphically, without technology		
Determine the solution to a system of linear equations graphically, with technology		
Explain the meaning of the point of intersection on the graph of a system of linear equations		
Solve a system of linear equations by substitution, and verify the solution		
Solve a system of linear equations by elimination, and verify the solution		
Explain why a system of equations may have no solution, one solution, or an infinite number of solutions		
Explain a strategy to solve a system of linear equations		
Model a situation using a system of linear equations		
Relate a system of linear equations to the context of a problem		
Solve a problem that involves a system of linear equations		

Unit 8: Systems of Linear Equations Review Questions

1. Graphically solve the following system of linear equations. Verify the solution.

$2y - 14 = 4x$
$y - 1 = x$



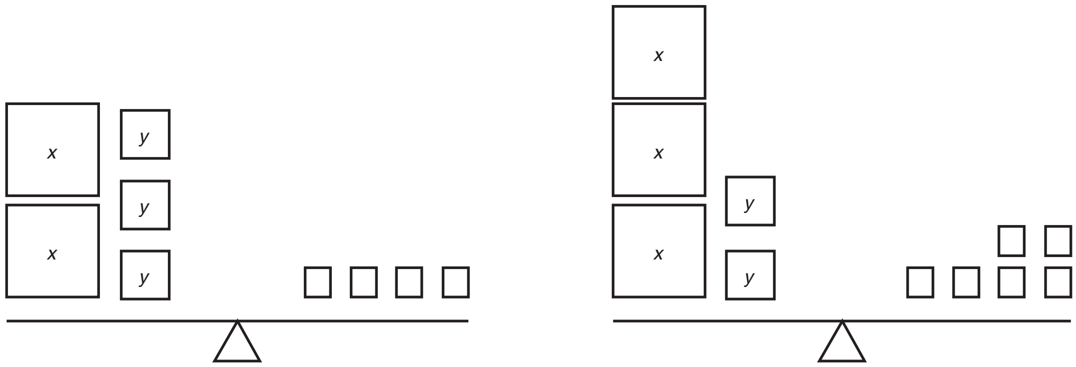
2. Use substitution to solve the following system of linear equations. Verify the solution.

$x = 4 + y$
$2x + 8y = -132$

3. Use elimination to solve the following system of linear equations. Verify the solution.

$8x - 6y = 20$
$2x + 5y = 18$

4. What system of linear equations is modelled by these balanced scales? Each small square on the right side of the scales represents 3 kg.



5. Create a system of linear equations to model each of the following situations. Do not solve the system.

   a. The perimeter of an isosceles triangle is 45 cm. The base of the triangle is 10 cm longer than each equal side.

   b. Charlie operates a grass-cutting business. He charges $15 for a small lawn and $25 for a large lawn. One weekend, Charlie made $290 by cutting 16 lawns.

6. To rent a car, a person is charged a flat daily rate and a fee for each kilometre driven. When Cheyenne rented a car for 7 days and drove 800 km, the charge was $540.00. When she rented the same car for 16 days and drove 1 950 km, the charge was $1 295.00.

   a. Model the situation with a system of linear equations.

   b. Determine the daily rate and the fee for each kilometre driven. Verify the solution.

After all required components of *Units 1* to *8* have been completed, marked, and returned to you, review the concepts. Contact your teacher to discuss any concepts about which you are unsure. When you are ready, contact your exam supervisor or your local ADLC office to schedule an appointment to write the *Final Exam*.

Appendix

Unit 1: Measurement Solutions

1. a. inch or centimetre
   b. inch or centimetre
   c. yard or metre
   d. yard or metre
   e. millimetre
   f. foot or inch or centimetre

2. $\frac{27 \text{ in}}{3 \text{ in}} = 9$ finger lengths

3. 2 cm + 0.5 cm + 0.08 cm = 2.58 cm

4. a. Let x = unknown feet

$$\frac{x \text{ ft}}{60 \text{ in}} = \frac{1 \text{ ft}}{12 \text{ in}}$$
$$\frac{x \text{ ft}}{60 \text{ in}} \bullet 60 \text{ in} = \frac{1 \text{ ft}}{12 \text{ in}} \bullet 60 \text{ in}$$
$$\frac{x \text{ ft}}{\cancel{60 \text{ in}}} \bullet \cancel{60 \text{ in}} = \frac{1 \text{ ft}}{12 \cancel{\text{in}}} \bullet 60 \cancel{\text{in}}$$
$$x \text{ ft} = 5 \text{ ft}$$

or

$$60 \text{ in} \bullet \frac{1 \text{ ft}}{12 \text{ in}} = 60 \cancel{\text{in}} \bullet \frac{1 \text{ ft}}{12 \cancel{\text{in}}}$$
$$= 5 \text{ ft}$$

   b. Convert 3 hours to minutes:

$$3 \text{ h} \bullet \frac{60 \text{ min}}{1 \text{ h}} = 3 \cancel{\text{h}} \bullet \frac{60 \text{ min}}{1 \cancel{\text{h}}}$$
$$= 180 \text{ min}$$

180 minutes + 14 minutes = 194 minutes

5. a. Convert 6 feet 1 inch to inches.

$$6 \text{ ft} \cdot \frac{12 \text{ in}}{1 \text{ ft}} = 6 \cancel{\text{ft}} \cdot \frac{12 \text{ in}}{1 \cancel{\text{ft}}}$$
$$= 72 \text{ in}$$

72 in + 1 in = 73 in

Convert Darcy's height from inches to centimetres.

$$73 \text{ in} \cdot \frac{2.54 \text{ cm}}{1 \text{ in}} = 73 \cancel{\text{in}} \cdot \frac{2.54 \text{ cm}}{1 \cancel{\text{in}}}$$
$$= 185.42 \text{ cm}$$

Darcy is 185.42 cm tall.

b. To check:

$1 \text{ ft} \doteq 30 \text{ cm}$
$6 \text{ ft} \doteq 180 \text{ cm}$
So, 6 ft 1 in $=$ 185.42 cm is reasonable.

Unit 2: Surface Area and Volume Solutions

1. $$SA_{\text{right retangular pyramid}} = lw + 2\left(\frac{ls_1}{2}\right) + 2\left(\frac{ws_2}{2}\right)$$
$$SA_{\text{right retangular pyramid}} = (10 \text{ ft} \cdot 5 \text{ ft}) + 2\left(\frac{10 \text{ ft} \cdot 12.3 \text{ ft}}{2}\right) + 2\left(\frac{5 \text{ ft} \cdot 13 \text{ ft}}{2}\right)$$
$$SA_{\text{right retangular pyramid}} = 50 \text{ ft}^2 + 123 \text{ ft}^2 + 65 \text{ ft}^2$$
$$SA_{\text{right retangular pyramid}} = 238 \text{ ft}^2$$

2. $$V_{\text{right cone}} = \frac{1}{3}\pi r^2 h$$
$$V_{\text{right cone}} = \frac{1}{3}\pi(3.0 \text{ m})^2(7.0 \text{ m})$$
$$V_{\text{right cone}} = \frac{1}{3}\pi(63.0 \text{ m}^3)$$
$$V_{\text{right cone}} \doteq 66 \text{ m}^3$$

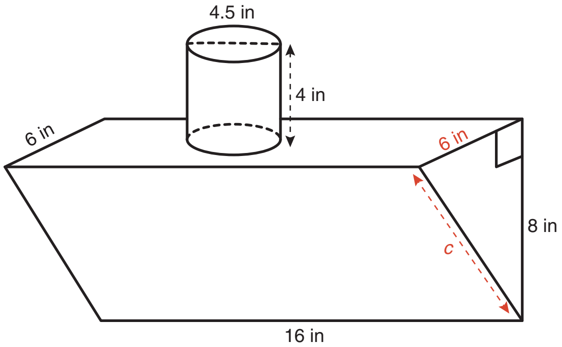
3.
$$SA_{\text{sphere}} = 4\pi r^2$$
$$15.4\ \text{m}^2 = 4\pi r^2$$
$$\frac{15.4\ \text{m}^2}{4\pi} = \frac{4\pi r^2}{4\pi}$$
$$\frac{15.4\ \text{m}^2}{4\pi} = r^2$$
$$\sqrt{\frac{15.4\ \text{m}^2}{4\pi}} = \sqrt{r^2}$$
$$1.1\ \text{m} \doteq r$$
$$r \doteq 1.1\ \text{m}$$

4.
$$V_{\text{right cylinder}} = \pi r^2 h$$
$$V_{\text{right cylinder}} = 563.9\ \text{m}^3$$

$$V_{\text{right cone}} = \frac{1}{3}\pi r^2 h$$
$$V_{\text{right cone}} = \frac{1}{3}(V_{\text{right cylinder}})$$
$$V_{\text{right cone}} \doteq \frac{1}{3}(563.9\ \text{m}^3)$$
$$V_{\text{right cone}} \doteq 187.9666\ldots$$
$$V_{\text{right cone}} \doteq 188\ \text{cm}^3$$

5. Use the Pythagorean theorem to find the missing measurement for the front lateral face of the prism.

$b = 6$ in and $a = 8$ in



$$a^2 + b^2 = c^2$$
$$(8\ \text{in})^2 + (6\ \text{in})^2 = c^2$$
$$64\ \text{in}^2 + 36\ \text{in}^2 = c^2$$
$$\sqrt{100\ \text{in}^2} = \sqrt{c^2}$$
$$10\ \text{in} = c$$

Use parts of the formulas for the surface area of a right cylinder and surface area of a right triangular prism.

Let l be the length of the shelf and let h be the height of the container.

$$r = \frac{\text{diameter}}{2} = \frac{4.5\ \text{in}}{2} = 2.25\ \text{in}$$

$$SA_{\text{composite object}} = (\text{cylinder } - \text{bottom circle}) + (\text{triangular prism} - \text{bottom circle} - \text{rectangular surface against the wall})$$

$$SA_{\text{composite object}} = \text{cylinder} + \text{triangular prism}$$
$$SA_{\text{composite object}} = (\pi r^2 + 2\pi rh) + \left(2\left(\frac{ba}{2}\right) + lc + (lb - \pi r^2)\right)$$
$$SA_{\text{composite object}} = (\pi(2.25 \text{ in})^2 + 2\pi(2.25 \text{ in} \cdot 4 \text{ in})) + ((6 \text{ in} \cdot 8 \text{ in}) + (16 \text{ in} \cdot 10 \text{ in}) + (16 \text{ in} \cdot 6 \text{ in} - \pi(2.25 \text{ in})^2))$$
$$SA_{\text{composite object}} = (5.062\,5 \text{ in}^2\pi + 18 \text{ in}^2\pi) + 288.095... \text{ in}^2$$
$$SA_{\text{composite object}} \doteq 360.5 \text{ in}^2$$

Unit 3: Trigonometry Solutions

1. a.
$$\tan\theta = \frac{opp}{adj}$$
$$\tan\theta = \frac{5.5 \text{ cm}}{9.7 \text{ cm}}$$
$$\theta = \tan^{-1}\left(\frac{5.5}{9.7}\right)$$
$$\theta \doteq 29.6^\circ$$

b.
$$\cos\beta = \frac{adj}{hyp}$$
$$\cos\beta = \frac{3.2 \text{ cm}}{9.0 \text{ cm}}$$
$$\beta = \cos^{-1}\left(\frac{3.2}{9.0}\right)$$
$$\beta \doteq 69^\circ$$

2.
$$\theta = 180^\circ - (90^\circ + 65^\circ)$$
$$\theta = 25^\circ$$

$$\cos 65^\circ = \frac{adj}{hyp}$$
$$\cos 65^\circ = \frac{x}{4.25 \text{ in}}$$
$$4.25 \text{ in} \cdot \cos 65^\circ = \frac{x}{4.25 \text{ in}} \cdot 4.25 \text{ in}$$
$$1.8 \text{ in} \doteq x$$

$$\sin 65^\circ = \frac{opp}{hyp}$$

$$\sin 65^\circ = \frac{y}{4.25\text{ in}}$$

$$4.25\text{ in} \cdot \sin 65^\circ = \frac{y}{\cancel{4.25\text{ in}}} \cdot \cancel{4.25\text{ in}}$$

$$3.9\text{ in} \doteq y$$

3.

$$\tan\theta = \frac{opp}{adj}$$

$$20\text{ ft} \cdot \tan 51^\circ = \frac{t}{\cancel{20\text{ ft}}} \cdot \cancel{20\text{ ft}}$$

$$24.7 \doteq t$$

$$24.7\text{ ft} + 5.5\text{ ft} \doteq \text{Total height}$$

$$30.2\text{ ft} \doteq \text{Total height}$$

$\therefore$ The total height of the totem pole is 30.2 ft.

4.

$$\cos 40^\circ = \frac{adj}{hyp}$$

$$\cos 40^\circ = \frac{BD}{6.5\text{ mm}}$$

$$6.5\text{ mm} \cdot \cos 40^\circ = \frac{BD}{\cancel{6.5\text{ mm}}} \cdot \cancel{6.5\text{ mm}}$$

$$4.979...\text{ mm} = BD$$

$$\sin 18^\circ = \frac{opp}{hyp}$$

$$\sin 18^\circ = \frac{4.979...\text{ mm}}{AD}$$

$$\sin 18^\circ \cdot AD = \frac{4.979...\text{ mm}}{\cancel{AD}} \cdot \cancel{AD}$$

$$\sin 18^\circ \cdot AD = 4.979...\text{ mm}$$

$$\cancel{\sin 18^\circ} \cdot \frac{AD}{\cancel{\sin 18^\circ}} = \frac{4.979...\text{ mm}}{\sin 18^\circ}$$

$$AD = \frac{4.979...\text{ mm}}{\sin 18^\circ}$$

$$AD \doteq 16.1\text{ mm}$$

5.

$$\sin 30^\circ = \frac{opp}{hyp}$$
$$\sin 30^\circ = \frac{CD}{150\text{ m}}$$
$$150\text{ m} \cdot \sin 30^\circ = \frac{CD}{\cancel{150\text{ m}}} \cdot \cancel{150\text{ m}}$$
$$75\text{ m} = CD$$

$$\tan 30^\circ = \frac{opp}{adj}$$
$$\tan 30^\circ = \frac{AD}{75\text{ m}}$$
$$75\text{ m} \cdot \tan 30^\circ = \frac{AD}{\cancel{75\text{ m}}} \cdot \cancel{75\text{ m}}$$
$$43.3\text{ m} \doteq AD$$

The hot air balloon was approximately 43.3 metres above the ground.

Unit 4: Exponents and Radials Solutions

1.

$$\begin{array}{l} 2 \,|\, 520 \\ \quad 2 \,|\, 260 \\ \qquad 2 \,|\, 130 \\ \qquad\quad 5 \,|\, 65 \\ \qquad\qquad 13 \end{array}$$

$520 = 2 \cdot 2 \cdot 2 \cdot 5 \cdot 13$

2. Prime factorization:

$$\begin{array}{l} 2 \,|\, 420 \\ \quad 2 \,|\, 210 \\ \qquad 5 \,|\, 105 \\ \qquad\quad 3 \,|\, 21 \\ \qquad\qquad 7 \end{array} \qquad\qquad \begin{array}{l} 2 \,|\, 190 \\ \quad 5 \,|\, 95 \\ \qquad 19 \end{array}$$

GCF	LCM
$420 = 2 \cdot 2 \cdot 5 \cdot 3 \cdot 7$ $190 = 2 \quad \cdot 5 \quad\quad \cdot 19$	$420 = 2 \cdot 2 \cdot 5 \cdot 3 \cdot 7$ $190 = 2 \quad \cdot 5 \quad\quad \cdot 19$
$\text{GCF} = 2 \quad \cdot 5$ $\text{GCF} = 10$	$\text{LCM} = 2 \cdot 2 \cdot 5 \cdot 3 \cdot 7 \cdot 19$ $\text{LCM} = 7\,980$

3. a. $\sqrt{2\,500} = 50$

   b. $\sqrt[3]{91125} = 45$

4.

Number	Exact Value Answer	Rational	Irrational
$\sqrt{\frac{4}{196}}$	$\frac{\sqrt{4}}{\sqrt{196}} = \frac{2}{14} = \frac{1}{7}$	✓	
$\sqrt{54}$	$\sqrt{54} = \sqrt{9 \bullet 6} = 3\sqrt{6}$		✓
$\sqrt[3]{-16}$	$\sqrt[3]{-16} = \sqrt[3]{-8 \bullet 2} = -2\sqrt[3]{2}$		✓
$\sqrt{225}$	$\sqrt{225} = 15$	✓	
$\sqrt[3]{216}$	$\sqrt[3]{216} = 6$	✓	
$\sqrt{\frac{49}{81}}$	$\frac{\sqrt{49}}{\sqrt{81}} = \frac{7}{9}$	✓	

5. $\sqrt[3]{-125} = -5$
   $\sqrt[3]{-64} = -4$

   $-5 < \sqrt[3]{-122} < -4$

6. a. $$\left(\left(5^{\frac{3}{2}}\right)\left(5^{\frac{1}{3}}\right)\right)^6 = \left(5^{\frac{3}{2}\cdot 6}\right)\left(5^{\frac{1}{3}\cdot 6}\right)$$
$$= \left(5^9\right)\left(5^2\right)$$
$$= 5^{11}$$

   b. $$\frac{2^{-1}a^2b^{-3}}{4a^3b^{-5}} = \frac{a^{2-3}b^{-3-(-5)}}{2 \bullet 4}$$
$$= \frac{a^{-1}b^2}{8}$$
$$= \frac{b^2}{8a}$$

7. a. $42^{\frac{5}{3}} = \sqrt[3]{42^5}$

   b. $\sqrt{\left(\frac{5}{6}\right)^{11}} = \left(\frac{5}{6}\right)^{\frac{11}{2}}$

8. $b = 0.01m^{\frac{2}{3}}$
$b = 0.01(11.8 \text{ kg})^{\frac{2}{3}}$
$b \doteq 0.05 \text{ kg}$
The brain mass of a koala is approximately 0.05 kilograms.

Unit 5: Polynomials Solutions

1. Expand and simplify.

$(x+6)(x-8)$

	x	6
x	$x \cdot x = x^2$	$x \cdot 6 = 6x$
–8	$-8 \cdot x = -8x$	$-8 \cdot 6 = -48$

$$\begin{aligned}(x+6)(x-8) &= x^2 + 6x + (-8x) + (-48) \\ &= x^2 - 2x - 48\end{aligned}$$

2. $(3x-4)(2x+2) = 6x^2 - 2x - 8$

3. $(3t-6)(t^2 - 8t + 2)$
$= (3t \cdot t^2) + (3t \cdot (-8t)) + (3t \cdot 2) + ((-6) \cdot t^2) + ((-6) \cdot (-8t)) + ((-6) \cdot 2)$
$= 3t^3 + (-24t^2) + 6t + (-6t^2) + 48t + (-12)$
$= 3t^3 - 30t^2 + 54t - 12$

4. a. $3x^2y(7z - y + 8xy^2)$

b. $(w-15)(w+2)$

c. $(6d-7e)(6d+7e)$

d. $(x-9y)(x-9y) = (x-9y)^2$

5. a. $80x^3 + 156x^2 + 72x$
$= 4x(20x^2 + 39x + 18)$
$= 4x(20x^2 + 15x + 24x + 18)$
$= 4x(5x(4x + 3) + 6(4x + 3))$
$= 4x(4x + 3)(5x + 6)$

The length, width, and height can be represented by $4x$, $4x + 3$, and $5x + 6$.

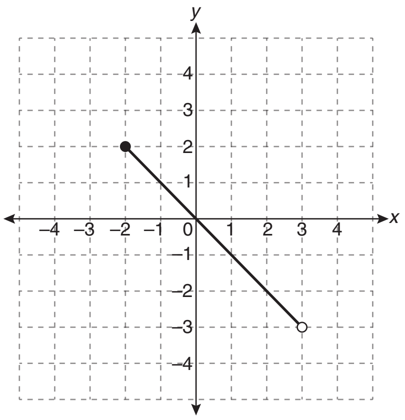
b. $V = 4x(4x + 3)(5x + 6)$
$V = (4 \cdot 2\text{ cm})(4(2\text{ cm}) + 3)(5(2\text{ cm}) + 6)$
$V = 8\text{ cm} \cdot 11\text{ cm} \cdot 16\text{ cm}$
$V = 1\,408\text{ cm}^3$

Unit 6: Relations and Functions Solutions

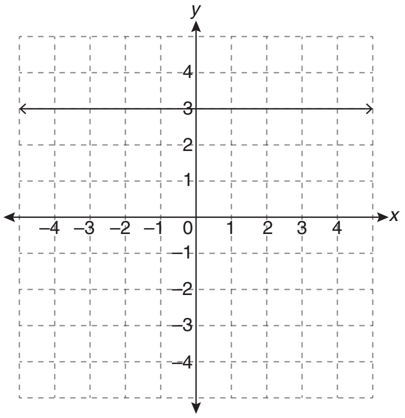
1. a. *AB*: Julie started her run a small distance from her home.
BC: Julie stopped running to take a rest for a small amount of time.
CD: Julie began running towards home at a faster pace.
DE: Julie took another, shorter, rest.
EF: Julie ran the rest of the way home at a slower pace.

b. Line segment *CD* is the steepest, so it represents the fastest portion of Julie's run.

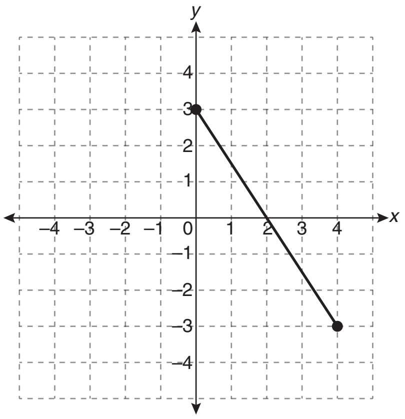
2. a. Answers vary. A sample is shown.



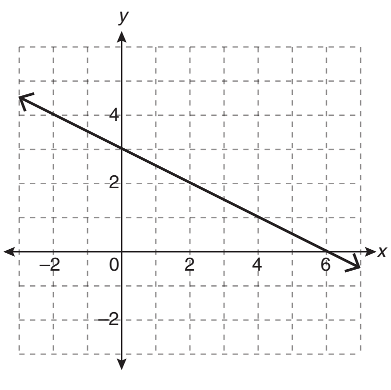
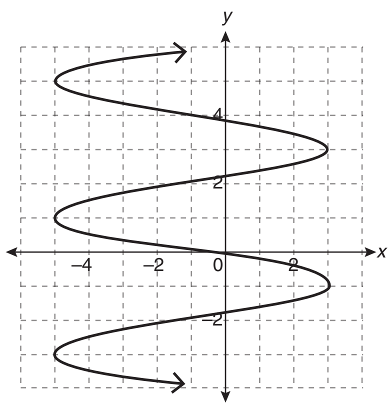
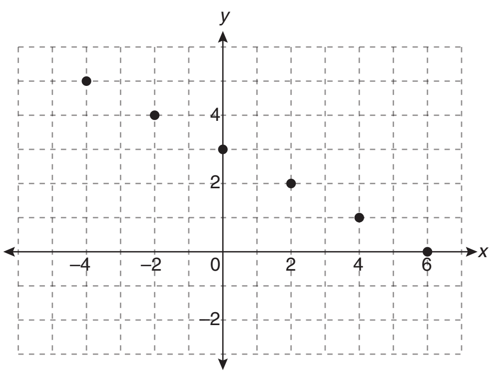
b. Answers vary. A sample is shown.



c. Answers vary. A sample is shown.



3.

		
Function: (YES) NO	Function: YES (NO)	Function: (YES) NO
D: $\{x \mid x \in \mathrm{R}\}$ R: $\{y \mid y \in \mathrm{R}\}$	D: $\{x \mid -5 \le x \le 3, x \in \mathrm{R}\}$ R: $\{y \mid y \in \mathrm{R}\}$	D: $\{-4, -2, 0, 2, 4, 6\}$ R: $\{0, 1, 2, 3, 4, 5\}$

4. a. i

   b. iv

   c. iii

   d. ii

5. a. The relationship is linear. For every increase in mass of 180 g, there is an increase in fibre of 3.5 g.

   b. The independent variable is the mass of cherries and the dependent variable is the amount of fibre.

   c. The graph of the relation would be continuous because there can be decimal values for mass.

   d. $m = \frac{y_2 - y_1}{x_2 - x_1}$

   $m = \frac{7 - 3.5}{360 - 180}$

   $m = \frac{3.5}{180}$

   $m \doteq 0.02$

   e. For every 180 grams of cherries, there is a 3.5 g increase in fibre. It is also acceptable to state it as a per unit increase. So, for every 1 gram of cherries, there is approximately a 0.02 g increase in fibre.

   Note, however, that it might be more appropriate to state the rate of change as a value or fraction that reflects real-life. Few people would consume 1 g of cherries, but many would consume 180 g, so using the fraction $m = \frac{3.5\text{ g}}{180\text{ g}}$ has more meaning in this context than 0.02 g/g.

Unit 7: Equations and Graphs of Linear Relations Solutions

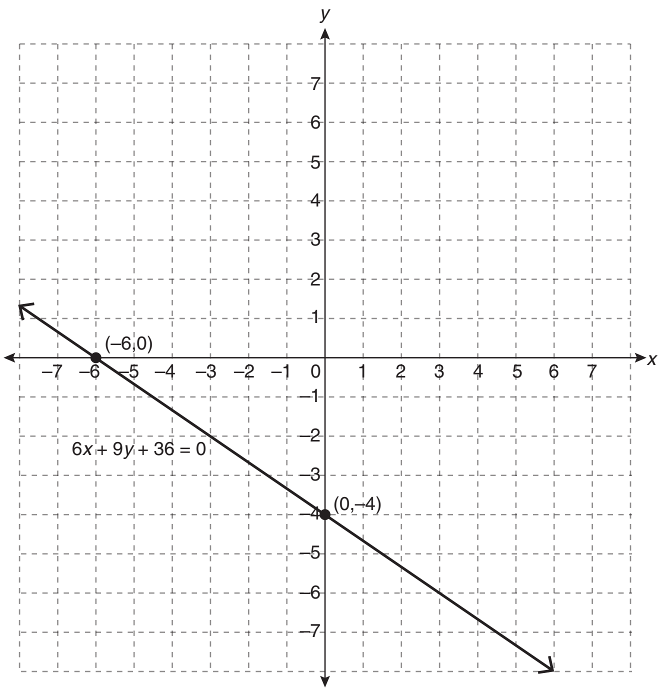
1. a. Determine the *x*-intercept by substituting 0 for *y*.

$$\begin{aligned} 6x + 9y + 36 &= 0 \\ 6x + 9(0) + 36 &= 0 \\ 6x + 36 &= 0 \\ 6x + \cancel{36} - \cancel{36} &= 0 - 36 \\ 6x &= -36 \\ \frac{\cancel{6}x}{\cancel{6}} &= \frac{-36}{6} \\ x &= -6 \end{aligned}$$

Determine the *y*-intercept by substituting 0 for *x*.

$$\begin{aligned} 6x + 9y + 36 &= 0 \\ 6(0) + 9y + 36 &= 0 \\ +9y + 36 &= 0 \\ 9y + \cancel{36} - \cancel{36} &= 0 - 36 \\ 9y &= -36 \\ \frac{\cancel{9}y}{\cancel{9}} &= \frac{-36}{9} \\ y &= -4 \end{aligned}$$

b. Use the points $(-6, 0)$ and $(0, -4)$ to sketch the graph.



c.
$$6x + 9y + 36 = 0$$
$$6x + \cancel{9y} + 36 - \cancel{9y} = 0 - 9y$$
$$\frac{6x + 36}{-9} = \frac{\cancel{-9}y}{\cancel{-9}}$$
$$-\frac{6}{9}x - \frac{36}{9} = y$$
$$-\frac{2}{3}x - 4 = y$$

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

The y-intercept of this graph is 2 and the slope can be determined by substituting two points on the line into the slope formula.

$(0, 2)$ and $(-3, -2)$

$$\begin{aligned} m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-2 - 2}{-3 - 0} \\ &= \frac{-4}{-3} \\ &= \frac{4}{3} \end{aligned}$$

b.

$$\begin{aligned} y &= \frac{4}{3}x + 2 \\ y - \frac{4}{3}x - 2 &= \cancel{\frac{4}{3}}x + \cancel{2} - \cancel{\frac{4}{3}}x - \cancel{2} \\ -\frac{4}{3}x + y - 2 &= 0 \\ -3\left(-\frac{4}{3}x + y - 2\right) &= -3(0) \\ 4x - 3y + 6 &= 0 \end{aligned}$$

3. $$\begin{aligned} m_{CD} &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-2 - 4}{7 - (-10)} \\ &= -\frac{6}{17} \end{aligned}$$

The negative reciprocal of the slope of CD is $-\left(-\frac{17}{6}\right) = \frac{17}{6}$. So, a line perpendicular to CD would have a slope of $\frac{17}{6}$.

4. Rearrange the general form of the equation $-6x + y + 21 = 0$ to slope-intercept form to determine the slope.

$$
\begin{aligned}
-6x + y + 21 &= 0 \\
-6x + \cancel{y} + 21 - \cancel{y} &= 0 - y \\
\frac{-6x + 21}{-1} &= \frac{-y}{-1} \\
6x - 21 &= y
\end{aligned}
$$

The slope of the given line is 6. The y-intercept is –5.

$y = mx + b$

$y = 6x - 5$

5. a. The increase in girls playing organized ice hockey represents the slope.
$m = 4\ 000$

The year 2000 is 2000 – 1990 = 10 years after 1990. So, an ordered pair that satisfies this equation is: (10,45 000)

Write the equation in slope-point form.

$m(x - x_1) = y - y_1$

Replace y with g and replace x with t.

$m(t - t_1) = g - g_1$

Substitute (10,45 000) and $m = 4\ 000$ into the equation.

$4\ 000(t - 10) = g - 45\ 000$

b. The year 2005 is 15 years after 1990.

Substitute $t = 15$ in the equation $4\ 000(t - 10) = g - 45\ 000$.

$$
\begin{aligned}
4\ 000(15 - 10) &= g - 45\ 000 \\
4\ 000(5) &= g - 45\ 000 \\
20\ 000 + 45\ 000 &= g - \cancel{45\ 000} + \cancel{45\ 000} \\
65\ 000 &= g
\end{aligned}
$$

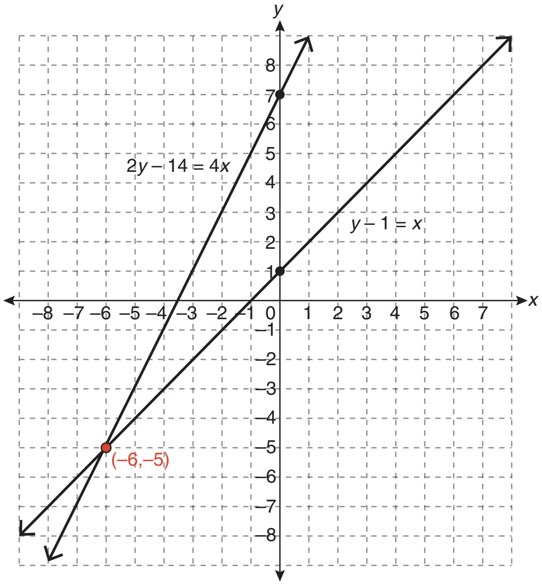
There were approximately 65 000 girls playing organized ice hockey in January of 2005.

Unit 8: Systems of Linear Equations Solutions

1.

$$
\begin{aligned}
2y - 14 &= 4x \\
2y - \cancel{14} + \cancel{14} &= 4x + 14 \\
\frac{\cancel{2}y}{\cancel{2}} &= \frac{4x + 14}{2} \\
y &= 2x + 7
\end{aligned}
$$

$$
\begin{aligned}
y - 1 &= x \\
y - \cancel{1} + \cancel{1} &= x + 1 \\
y &= x + 1
\end{aligned}
$$



Verify the solution of (–6,–5).

$2y - 14 = 4x$

Left Side	Right Side
$2y - 14$ $2(-5) - 14$ $-10 - 14$ -24	$4x$ $4(-6)$ -24
LS = RS	

$y - 1 = x$

Left Side	Right Side
$y - 1$ $-5 - 1$ -6	x -6
LS = RS	

2.

$$
\begin{aligned}
x &= 4 + y \\
2x + 8y &= -132
\end{aligned}
$$

$$
\begin{aligned}
2(4 + y) + 8y &= -132 \\
8 + 2y + 8y &= -132 \\
\cancel{8} - \cancel{8} + 10y &= -132 - 8 \\
\frac{\cancel{10}y}{\cancel{10}} &= \frac{-140}{10} \\
y &= -14
\end{aligned}
$$

$$
\begin{aligned}
x &= 4 + y \\
x &= 4 + (-14) \\
x &= -10
\end{aligned}
$$

Verify the solution of (–10,–14).

$x = 4 + y$

Left Side	Right Side
x -10	$4 + y$ $4 + (-14)$ -10
LS = RS	

$2x + 8y = -132$

Left Side	Right Side
$2x + 8y$ $2(-10) + 8(-14)$ $-20 + (-112)$ -132	-132
LS = RS	

3. $8x - 6y = 20$
$2x + 5y = 18$

$8x - 6y = 20$
$4(2x + 5y = 18)$

$$\begin{array}{rrrrl} & 8x - & 6y = & 20 & \\ -(& 8x + & 20y = & 72 &) \\ \hline & & -26y = & -52 & \end{array}$$

$$\frac{\cancel{-26}y}{\cancel{-26}} = \frac{-52}{-26}$$
$$y = 2$$

$$8x - 6(2) = 20$$
$$8x - \cancel{12} + \cancel{12} = 20 + 12$$
$$\frac{8}{8}x = \frac{32}{8}$$
$$x = 4$$

Verify the solution of (4,2).

$8x - 6y = 20$

Left Side	Right Side
$8x - 6y$ $8(4) - 6(2)$ 20	20
LS = RS	

$2x + 5y = 18$

Left Side	Right Side
$2x + 5y$ $2(4) + 5(2)$ 18	18
LS = RS	

4. $2x + 3y = 12$
$3x + 2y = 18$

5. a. Let b be the base length of the isosceles triangle and s be the two equal side lengths of the triangle.

$2s + b = 45$
$s + 10 = b$

b. Let s be the number of small lawns and l be the number of large lawns.

$s + l = 16$
$15s + 25l = 290$

6. a. Let f be the daily rate, in dollars, and let k be the cost, in dollars, for each kilometre driven.

$7f + 800k = 540$
$16f + 1\,950k = 1\,295$

b. $7f + 800k = 540$

$16f + 1\,950k = 1\,295$

$16(7f + 800k = 540)$

$7(16f + 1\,950k = 1\,295)$

$$\begin{array}{rrcrcr} & 112f & + & 12\,800k & = & 8\,640 \\ -\ (& 112f & + & 13\,650k & = & 9\,065\ ) \\ \hline & & & -850k & = & -425 \end{array}$$

$$\frac{-850k}{-850} = \frac{-425}{-850}$$

$$k = 0.50$$

$$7f + 800(0.50) = 540$$

$$7f + 400 - 400 = 540 - 400$$

$$\frac{7}{7}f = \frac{140}{7}$$

$$f = 20$$

Verify the solution of $f = 20, k = 0.5$.

$7f + 800k = 540$

Left Side	Right Side
$7f + 800k$ $7(20) + 800(0.50)$ 540	540
LS = RS	

$16f + 1950k = 1295$

Left Side	Right Side
$16f + 1\,950k$ $16(20) + 1\,950(0.50)$ $1\,295$	1295
LS = RS	

The daily rate is \$20 and the fee for each kilometre driven is \$0.50.

Mathematics 10C Formula Sheet

Measurement

Conversion Tables:

Linear
12 inches = 1 foot
3 feet = 1 yard
36 inches = 1 yard
1 760 yards = 1 mile

Mass
16 ounces = 1 pound
2000 pounds = 1 ton

Volume
2 cups = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon

Prefix	Conversion Factor
kilo	0.001
hecto	0.01
deca	0.1
	1
deci	10
centi	100
milli	1 000

Capacity
1 imperial gallon = 4.546 litres
1 litre = 0.220 imperial gallons
1 US gallon = 3.79 litres
1 litre = 0.264 US gallons
1 cubic inch = 16.387 cubic centimetres
1 cubic centimetre = 0.061 cubic inches
1 cubic yard = 0.765 cubic metres
1 cubic metre = 1.308 cubic yards

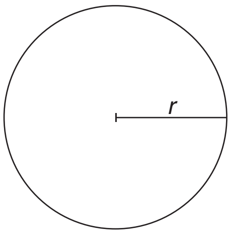
Length
1 inch = 2.54 centimetres
1 centimetre = 0.394 inches
1 foot = 0.305 metres
1 metre = 3.281 feet
1 yard = 0.914 metres
1 metre = 1.094 yards
1 mile = 1.609 kilometres
1 kilometre = 0.621 miles

Mass
1 ounce = 28.350 grams
1 gram = 0.035 ounces
1 pound = 0.454 kilograms
1 kilogram = 2.205 pounds

Surface Area and Volume

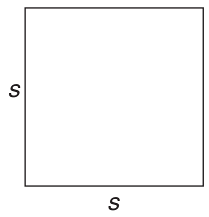
2-D Shapes:

Circle



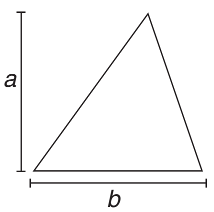
$$A_{\text{circle}} = \pi r^2$$

Square



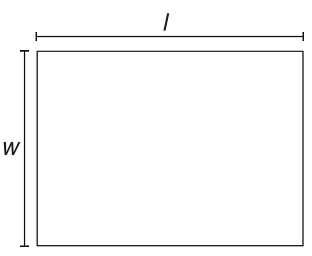
$$A_{\text{square}} = s^2$$

Triangle



$$A_{\text{triangle}} = \frac{ab}{2}$$

Rectangle

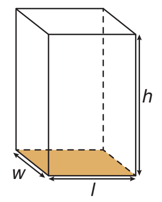


$$A_{\text{rectangle}} = lw$$

3-D Shapes:

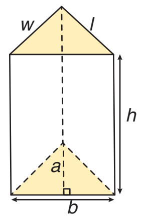
$$SA_{\text{right rectangular prism}} = 2lw + 2hw + 2lh$$

$$V_{\text{right rectangular prism}} = lwh$$



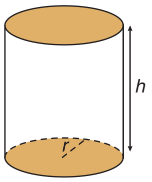
$$SA_{\text{right triangular prism}} = bh + lh + wh + ab$$

$$V_{\text{triangular prism}} = \frac{1}{2}abh$$



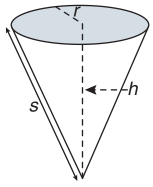
$$SA_{\text{right cylinder}} = 2\pi r^2 + 2\pi h$$

$$V_{\text{right cylinder}} = \pi r^2 h$$



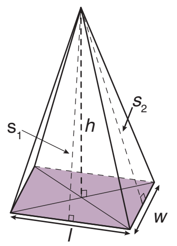
$$SA_{\text{cone}} = \pi r^2 + \pi rs$$

$$V_{\text{right cone}} = \frac{1}{3}\pi r^2 h$$



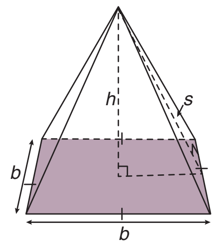
$$SA_{\text{right rectangular pyramid}} = lw + 2\left(\frac{ls_1}{2}\right) + 2\left(\frac{ws_2}{2}\right)$$

$$V_{\text{rigth pyramid}} = \frac{1}{3}lwh$$



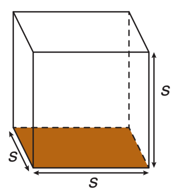
$$SA_{\text{right square pyramid}} = 4\left(\frac{sb}{2}\right) + b^2$$

$$V_{\text{rigth pyramid}} = \frac{1}{3}b^2 h$$



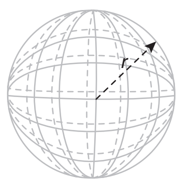
$$SA_{\text{cube}} = 6s^2$$

$$V_{\text{cube}} = s^3$$



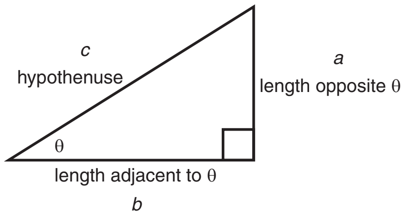
$$SA_{\text{sphere}} = 4\pi r^2$$

$$V_{\text{sphere}} = \frac{4}{3}\pi r^3$$



Trigonometry

Pythagorean Theorem: $a^2 + b^2 = c^2$



Trigonometric Ratios:

$\tan\theta = \dfrac{\text{length opposite } \theta}{\text{length adjacent to } \theta}$	$\cos\theta = \dfrac{\text{length adjacent to } \theta}{\text{hypotenuse}}$	$\sin\theta = \dfrac{\text{length opposite } \theta}{\text{hypotenuse}}$

Linear Equations

Slope of Line: $m = \dfrac{\text{rise}}{\text{run}}$ or $m = \dfrac{y_2 - y_1}{x_2 - x_1}$	Slope-Intercept Form: $y = mx + b$
General Form: $Ax + By + C = 0$	Slope-Point Form: $y - y_1 = m(x - x_1)$

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