Unit 1: Polynomials

Day 1: BEDMAS

When there are multiple mathematical operations in a math problem, the operations must be completed in a specific order, according to BEDMAS

(Brackets, Exponents, (Division,Multiplication)*, (Addition, Subtraction)*

* Whichever comes first within each bracket.

Ex: $4 + 3 \times 5 - 2^3 + 1$
$= 4 + 3 \times 5 - 9 + 1$
$= 4 + 15 - 9 + 1$
$= 19 - 9 + 1$
$= 10 + 1$
$= 11$

Day 2: INTEGERS

Integers include zero, and all positive and negative non-decimal numbers. (Ex: -4, 0, 8, 132, -68)

To add a negative number: subtract it. Ex: $13 + (-6)$
$= 13 - 6$
$= 7$

To subtract a negative number: add it. Ex: $13 - (-6)$
$= 13 + 6$
$= 19$

When multiplying or dividing a positive # and a negative #, the result is always negative. Ex: $5 \times (-4) = -20$ Ex2: $32 \div (-4) = -8$

When multiplying or dividing two negative #'s, the result is always positive. Ex: $(-5) \times (-4) = 20$ Ex2: $-32 \div (-4) = 8$

Day 3: +/- FRACTIONS

Fractions represent the parts of a whole. For example: $\frac{3}{4}$ means there are 3 out of a total of 4 parts.

To add or subtract a fraction, write both fractions as fractions with the same denominator (bottom #), then keep the denominator and add or subtract the numerators (top #).

Ex: $\frac{2}{3} + \frac{1}{5}$
$= \frac{10}{15} + \frac{3}{15}$
$= \frac{13}{15}$

Day 4: X/÷ FRACTIONS

To multiply fractions, multiply the numerators to get the new numerator, and multiply the denominators to get the new denominator.

Ex: $\frac{2}{5} \times \frac{3}{7} = \frac{6}{35}$

To divide fractions, multiply by the reciprocal (flipped) of the second fraction.

Ex: $\frac{1}{2} \div \frac{2}{3}$
$= \frac{1}{2} \times \frac{3}{2}$
$= \frac{3}{4}$

Day 5: EXPONENTS

In the expression a^n, a is the base, and n is the exponent. "n" tells you how many times to multiply "a" by itself. Ex: 4^3
$= 4 \times 4 \times 4$
$= 64$

* Note: An exponent only applies to a negative sign that is in brackets.

Ex: $(-2)^4$ vs. -2^4

$(-2)^4 = (-2) \times (-2) \times (-2) \times (-2) = 16$

$-2^4 = -2 \times 2 \times 2 \times 2 = -16$

* Special case: An exponent of zero always gives a result of 1.
Ex: $5^0 = 1$

Day 6: EXPONENT RULES

Product rule: When multiplying powers with the same base, multiply the coefficients and add the exponents.
Ex: $4a^2 \times 3a^4 = 12a^6$

Quotient rule: When dividing powers with the same base, divide the coefficients and subtract the exponents.
Ex: $16b^{12} \div 8b^5 = 2b^7$

Power of a Power: To take the power of a power, apply the exponent to the coefficient, and multiply the exponents.
Ex: $(3c^5)^3 = 27c^{15}$

Day 7: COMMUNICATING WITH ALGEBRA

In the expression $12c^3$, 12 is the coefficient, c is the variable, and 3 is the exponent. This expression, all linked by multiplication, is called a term.

1 term = monomial, 2 terms = binomial, 3 terms = trinomial
2 terms or more = polynomial

The degree of a term is the sum of its exponents.
Ex: $5a^3b$ has a degree of 4 (how?! 3 + 1)

The degree of a polynomial is the highest degree of any term in the polynomial.
Ex: $2c^2d^2 - 6e^5f + 10g^2h^3$ has a degree of 6

Day 8: LIKE TERMS

Like terms have the same variable(s) and exponent. If terms are not like, they are called unlike.

Ex: Like terms: 4a and 7a Ex2: Like terms: $-2y^2z$ and $7y^2z$

Ex: Unlike terms: 8d and 3f Ex2: Unlike terms: $4w^3z^2$ and $3w^2z^2$

You can only add and subtract like terms.

Ex: $6j - 2k + 4j + 5k$
$= 6j + 4j - 2k + 5k$
$= 10j + 3k$

Day 9: +/- POLYNOMIALS

If there is a + sign in front of a polynomial in brackets, you can simply remove the brackets and leave everything as is, then simplify.

Ex: $(4y - 2z) + (5z - 8y)$
$= 4y - 2z + 5z - 8y$
$= 4y - 8y - 2z + 5z$
$= -4y + 3z$

To subtract a polynomial, add its opposite.

Ex: $(3d^2e + d^3) - (2d^2e - 4d^3)$
$= 3d^2e + d^3 - 2d^2e + 4d^3$
$= 3d^2e - 2d^2e + d^3 + 4d^3$
$= d^2e + 5d^3$

Day 10: DISTRIBUTIVE LAW

Distributive Law: $a(b + c) = (a \times b) + (a \times c)$

AND: $a(b - c) = (a \times b) - (a \times c)$

Ex: $3(5h + 2i)$
$= (3 \times 5h) + (3 \times 2i)$
$= 15h + 6i$

Ex2: $5m(6m - 7p)$
$= (5m \times 6m) - (5m \times 7p)$
$= 30m^2 - 35mp$

M	A	T	H	O
Evaluate: $9 + 3^2 \times 2 - 6 \div 2$	Evaluate: $(-8)^2$	Simplify: $\frac{(2r^6s^2 \times 10rs^2)}{(2r^3s)^2}$	Simplify: $7p - 9q + 5p + q$	Expand: $6(-3e + 8f)$
Evaluate: $7 + (-5) \times 4$	Evaluate: -12^0	Simplify: $\frac{(3g^2h)^2 \times 4g^3h}{12g^4h}$	Simplify: $3d^3e - 6d^3 + 4d^3e - 1$	Expand: $4g(5g^2 - 3gh)$
Evaluate: $\frac{2}{3} + \frac{1}{4} - \frac{1}{2}$	Simplify and evaluate: $4^{22} \times 4^{-19}$	**FREE**	Simplify: $4y^2 + (-5y^2 + 12y)$	Expand and Simplify: $2(7a + 1) + 5(9 - 2a)$
Evaluate: $\frac{2}{5} + 1\frac{1}{10} - \frac{1}{2} \times \frac{3}{5}$	Simplify and evaluate: $\frac{6^{13} \times 6^6}{(6^2)^9}$	What is the degree of the term below? $12g^5h^4i^3j^2k$	Simplify: $(20w - 12x) + (-6w + 10x)$	Expand and Simplify: $-3m(9n + 2) + 2n(6mn - 2n)$
Evaluate: $3 + \left(-\frac{1}{2}\right) \div \frac{2}{3} + 2\frac{3}{8}$	Simplify: $\frac{45a^2b^5}{9ab^2}$	What is the degree of the polynomial below? $5a^3 - 2ab + 12$	Simplify: $(-3mn + n) - (5mn - 6n)$	Expand and Simplify: $3y^2z(5y^3z - 6yz) - 10y^3z^2$

Unit 2: Equations

Day 1: SOLVING SIMPLE EQUATIONS

To determine the value of a variable, you must isolate it. In other words, get it alone on one side of the equal sign. How?!

Use opposite operations to eliminate terms from the side the variable is on.

→ Since you are solving the equation, it is easiest to apply BEDMAS backwards (so do the addition and subtraction before mult./div.)

→ If you do something on one side of the equal sign, you must do it on the other.

Ex:

$$4a - 13 = 71$$
$$4a - 13 + 13 = 71 + 13$$
$$4a = 84$$
$$\frac{4a}{4} = \frac{84}{4}$$
$$a = 21$$

Day 2: SOLVING COMPLEX EQUATIONS

It is easier (but not necessary) to collect like terms before starting opposite operations.

If the variable is on both sides of the equal sign, you must move all of the terms with the variable to the same side, using opposite operations.

If there are brackets in the equation, remove them at the beginning.

Ex1:

$$8a + 15 = 14a + 27$$
$$8a + 15 - 14a = 14a - 14a + 27$$
$$-6a + 15 = 27$$
$$-6a + 15 - 15 = 27 - 15$$
$$-6a = 12$$
$$\frac{-6a}{-6} = \frac{12}{-6}$$
$$a = -2$$

Ex2:

$$21 - (3y - 8) = 5$$
$$21 - 3y + 8 = 5$$
$$-3y + 29 = 5$$
$$-3y + 29 - 29 = 5 - 29$$
$$-3y = -24$$
$$\frac{-3y}{-3} = \frac{-24}{-3}$$
$$y = 8$$

Day 3: SOLVING EQUATIONS WITH FRACTIONS

To solve an equation that involves fractions, you should first get all terms out of fractional form. How?

Multiply each term by the common denominator of all the fractions in the equation.

Ex:

$$\frac{x-3}{4} + \frac{x}{8} = \frac{3}{4}$$
$$8 \times \frac{(x-3)}{4} + 8 \times \frac{x}{8} = 8 \times \frac{3}{4}$$
$$2(x-3) + x = 2 \times 3$$
$$2x - 6 + x = 6$$
$$3x - 6 = 6$$
$$3x - 6 + 6 = 6 + 6$$
$$3x = 12$$
$$\frac{3x}{3} = \frac{12}{3}$$
$$x = 4$$

Day 4: RE-ARRANGING FORMULAS

In order to isolate a variable in a formula, you can follow the same steps (opposite operations) as you would to solve for a variable.

Ex: isolate "h" in the formula: $A = \frac{bh}{2}$

$$2 \times A = 2 \times \frac{bh}{2}$$
$$2A = bh$$
$$\frac{2A}{b} = \frac{bh}{b}$$
$$\frac{2A}{b} = h$$

Day 5: ALGEBRAIC MODELLING

You can model word problems using algebra if you first define the variables you are going to use in "let" statements. You can solve for the variable after you have a correct equation.

Ex: 3 more than double Joey's age equals 35. Write an equation representing Joey's age and use it to determine his age.

Let "n" represent Joey's age.

$3 + 2n = 35$

Ex: $3 + 2n = 35$

$$3 - 3 + 2n = 35 - 3$$
$$2n = 32$$
$$\frac{2n}{2} = \frac{32}{2}$$
$$n = 16$$

Joey's age is 16.

Day 6: MORE ALGEBRAIC MODELLING

If there is more than one unknown, you can solve for them by writing an equation that includes multiple unknowns, all expressed using only one variable.

Ex: Katie's dad is 2 years younger than double Katie's age, and her mom is 1 year younger than her dad. If Katie and her parents' ages add up to 130, how old is each person?

Let k represent Katie's age.
Katie's dad's age = 2k – 2
Katie's mom's age = 2k – 3

	Katie's Dad	Katie's Mom
$k + (2k - 2) + (2k - 3) = 130$		
$k + 2k - 2 + 2k - 3 = 130$		
$5k - 5 = 130$	$= 2k - 2$	$= 2k - 3$
$5k - 5 + 5 = 130 + 5$	$= 2(27) - 2$	$= 2(27) - 3$
$5k = 135$	$= 54 - 2$	$= 54 - 3$
$\frac{5k}{5} = \frac{135}{5}$	$= 52$	$= 51$
$k = 27$	Katie's dad is 52 years old.	Katie's mom is 51 years old.
Katie is 27 years old.		

Day 7: RATIOS AND PROPORTIONS

A ratio is a comparison of two or more numbers, usually separated by colons. Ex: 4 girls to 5 guys could be expressed as: 4:5.

A ratio in simplest form has numbers that can no longer be divided by the same number. Ex: 2:4 = 1:2 (1:2 is in simplest form)

A proportion is a statement with an equal ratio on each side. Each term in one ratio gets multiplied or divided by the same number to create the equivalent ratio.

Ex: 3:8 = a:32

$$\frac{32}{8} = 4$$
$$a = 3 \times 4$$
$$a = 12$$

3:8 = 12:32

Day 8: RATES AND PERCENTAGE

A rate is a comparison between two numbers that usually have different units. Example1: Kim can type 300 words every 5 minutes.
Mathematically: 300 words/5 minutes

A unit rate tells you how many of the first number for every 1 of the second number. You can determine the unit rate from a rate by dividing the first number by the second.

Example2: Rate: 300 words/5 minutes
Unit rate: 60 words/minute

A percent is a rate per 100. Ex: 64 out of 100 or 64%

To go from a fraction to a decimal, divide the numerator by the denominator. To get the percent, multiply the decimal by 100.

Ex: $\frac{20}{25} = 0.80 = 80\%$

M	A	T	H	O
Solve the equation: $-3b + 18 = 33$	Solve the equation: $6(2a + 10) = 12(3a + 9)$	Isolate r: $A = 2\pi r$	1 more than 4 times a number is 77. What is the number?	Write the ratio in simples form: 32:108
Solve the equation: $\frac{m}{8} = 16$	Solve the equation: $14p - (10p + 2) = 3(5 + p)$	Isolate h: $A = 2\pi r^2 + 2\pi rh$	The total number of songs on the Taylor Swift cd is 2 less than triple the number of good songs. If there are 13 songs on the cd, how many are good?	Determine the value of the missing variables. 9:18:w = 99:x:121
Solve the equation: $11y - 4 + 5y = 60$	Solve the equation: $\frac{z}{5} + \frac{z}{4} = 1\frac{7}{20}$	**FREE**	Mrs. McColeman's class has 6 more students than Mrs. Loppe's class. If their classes contain a total of 56 students, how many students are in each class?	Write the following as a unit rate: $28.00 for 35L of gas
Solve the equation: $6a + 1 = 9a - 26$	Solve the equation: $\frac{d-4}{2} + 5 = d + 9$	Isolate h: $V = \frac{\pi r^2 h}{3}$	Mr. McDougall's class had 6 times more pennies than Mrs. Laurie's class in the penny drive. If the two classes had a total of 1841 pennies, how many pennies did each class have?	Write each as a percent: a) 0.58 b) $\frac{9}{20}$ c) 15
Solve the equation: $2(5y - 1) = -62$	Solve the equation: $\frac{2b+3}{3} = \frac{10b-6}{12}$	Isolate t: $d = \frac{at^2}{2} + 6$	Over a hockey season, Dylan scored 6 less than twice as many goals as Alex, and Will scored 3 more goals than Dylan. If the three guys scored a total of 96 goals, how many goals did each guy score?	If a shirt with an original price of $34.99 is 25% off, what is its sale price?

Unit 3: Relations

Day 1: SCATTER PLOTS

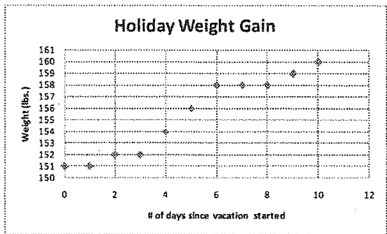
A scatter plot is a graph with points plotted to show the relationship between two variables.

The variable that affects the other variable is called the independent variable, and goes on the x-axis (horizontal).

The variable that is affected by (or depends on) the other variable is called the dependent variable, and goes on the y-axis.

You can describe the relationship on a graph by saying how the independent variable affects the dependent variable.

Ex

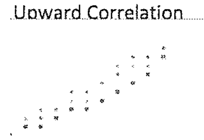


As the number of days in the holidays increases, the weight increases.

Day 2: CORRELATION

Trends (also known as correlations) refer to patterns in data. A correlation can be either upward or downward.

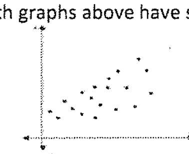
Upward Correlation



Downward Correlation

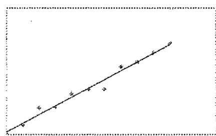
Correlations can also be strong or weak, depending on how clearly the points are going in a direction. Both graphs above have strong correlations.

Weak upward correlation:

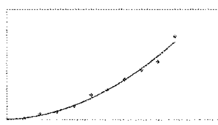


Day 3: LINEAR AND NON-LINEAR RELATIONS

A **linear relation** produces a fairly straight line on a graph. You can draw a straight line to show the relation, called a line of best fit. This line should have about the same number of points above and below it.



A **non-linear relation** does not produce a straight line on a graph. You can draw a smooth curve to represent the data, called a curve of best fit.



You can use the line or curve of best fit to **interpolate** (estimate a value that is between points in the data).

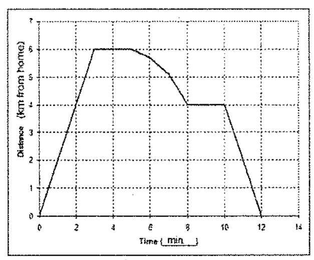
You can extend the line or curve of best fit to **extrapolate** (estimate a value that is beyond the data points).

Day 4: DISTANCE-TIME GRAPHS

Distance-time graphs can be used to determine:

→ the position at any time
→ the direction of motion (upward = away from start, downward = toward the start)
→ the type of motion (linear = constant speed, non-linear = changing speed)
→ determine the speed (distance ÷ time) – more generally, the steeper the line, the faster the motion

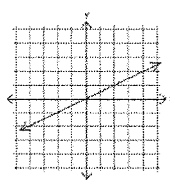
Ex: Sunday Drive



- In the first 3 minutes, the car went 6km away from home, at a constant speed of 2km/min.
- The car was stopped for the next 2 mins.
- Over the next 3 minutes, the car drove 2km toward home, speeding up as it went.
- The car was stopped for the next 2 mins.
- Over the last 2 minutes, the car drove home at a constant speed of 2km/min.

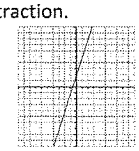
Day 5: DIRECT AND PARTIAL VARIATION

<u>Direct variation</u> describes a relation between two variables that are related by only multiplication or division. Ex: $y = \frac{1}{2}x$



On a graph, a direct variation is linear and goes through the origin.

<u>Partial variation</u> describes a relation between two variables that are related by multiplication or division, and by addition and subtraction.
Ex: $y = 3x + 2$

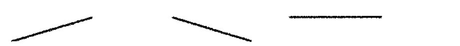


On a graph, a partial variation is linear, but does not go through the origin.

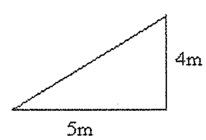
Day 6: SLOPE

Slope measures steepness. Mathematically: slope = $\frac{rise}{run}$

Positive slope   Negative slope   Zero slope   Undefined slope



Ex:



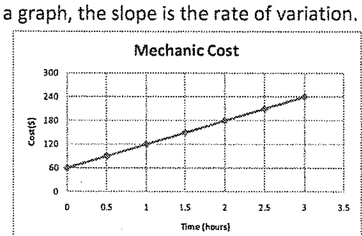
slope = $\frac{4}{5}$

Day 7: SLOPE AS RATE OF VARIATION

A <u>rate of change</u> is the change in one number compared to the change in another. Ex1: The average teenager's heart pumps 7200L of blood each 24 hours. This is a rate of variation of 300L/h

On a graph, the slope is the rate of variation.

Ex:



slope = $\frac{180}{3}$

slope = 60

rate of variation is $60/h

Day 8: FIRST DIFFERENCES

<u>First differences</u> are the differences in consecutive values of « y ».

Ex1 :

x	y	First Difference
-2	-9	
		4
0	-5	
		4
2	-1	
		4
4	3	

If the first differences are all the same, with x increasing by the same amount each time, then the relation is linear.

Slope = $\frac{\Delta y}{\Delta x}$

Ex1 is linear with a slope of 2. Why?

Slope = $\frac{4}{2}$

Slope = 2

Ex2 is non-linear.

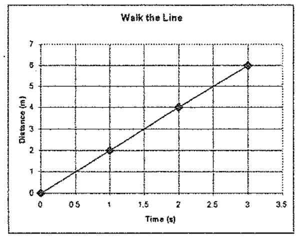
Ex2 :

x	y	First Difference
-2	2	
		6
-1	8	
		13
0	21	
		4
1	25	

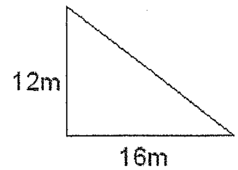
M	A	T	H

M: Determine the independent variable in the following situation: "The faster you are skating, the larger the distance it takes to stop."

A: Determine the speed of the walker on the graph below.



T: Determine the slope of the line below.

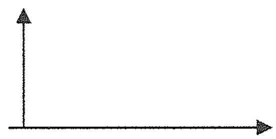


H: Does the table below represent a linear or non-linear relation?

x	y
0	-5
1	-2
2	1
3	4

M: Determine the independent variable in the following situation: "The students that studied the most for their math exam got the highest marks."

A: Sketch the graph of a person that walks out of the house and down their driveway, stops and sits in the car, then realizes he forgot something in the house and runs back to the house.

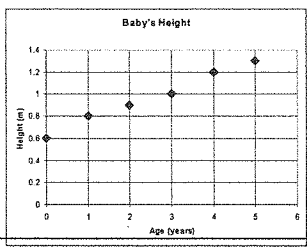


T: Determine the slope of the line below.

H: Does the table below represent a linear or non-linear relation?

x	y
-2	0
0	3
2	8
4	15

M: Describe the correlation on the graph below. (strong or weak, upward or downward)



A: Determine whether each equation represents a direct or partial variation.

a) $y = 3x - 5$

b) $y = -6x$

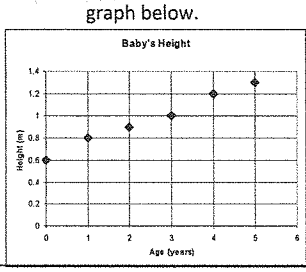
c) $y = 1 + x$

T: **FREE**

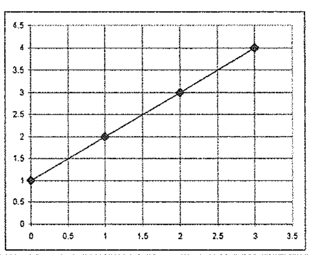
H: Explain why the table below represents a non-linear relation, even though first differences are all the same.

x	y
0	0
10	100
25	200
50	300

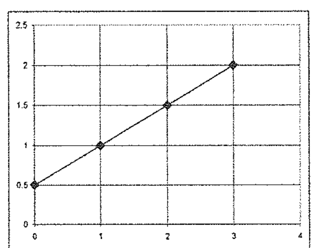
M: Describe the relationship on the graph below.



A: Does the graph below represent a direct or partial variation.



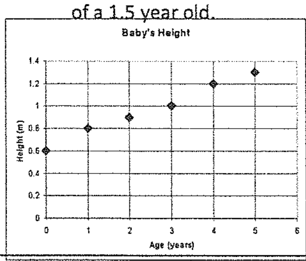
T: Determine the slope of the line on the graph below.



H: What would be the slope of the line represented by the table below?

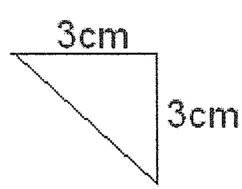
x	y
-1	4
0	10
1	16
2	22

M: Draw a line or curve or best fit on the graph, and estimate the height of a 1.5 year old.



A: Does the following situation represent a direct or partial variation.
"The long distance provider "Chat S'more" charges $19.95 for 200 minutes of long distance, plus 5 cents per minute over 200 minutes."

T: Determine the slope of the line below.



H: What would be the slope of the line represented by the table below.

x	y
-2	-12
0	0
2	12
4	24
6	36

Unit 4: Equation of the Line

Day 1: GRAPHING y=mx + b

The equation of the line for a straight line is always: **y = mx + b**

m = slope b = y-intercept

Recall: slope = $\frac{rise}{run}$, and the y-intercept is where the line hits the y-axis.

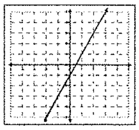
To graph y = mx + b: first plot the y-intercept, then apply the slope from that point.

For good communication:

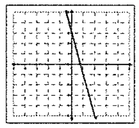
→ Draw the line most of the way across the graph, and put arrows on the ends of it to show that it continues.

→ Write the equation of the line on the line.

Ex: y = 2x – 1



Ex2: y = -4x + 3



Day 2: STANDARD FORM

Another common form for writing the equation of the line is called standard form: Ax + By + C = 0, where A, B, and C are numbers.

Ex: 3x + 2y – 7 = 0   (A = 3, B = 2, C = -7)

There are two rules for writing the equation in standard form:

1. There cannot be any fractions or decimals.
2. "A" must be a positive number.

Ex: Write each equation in standard form.

a) y = 2x – 5

-2x + y + 5 = 0

2x – y – 5 = 0

b) $y = -\frac{2}{5}x + 1$

$(5)y = 5\left(-\frac{2}{5}x\right) + (5)1$

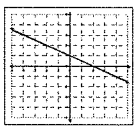
5y = -2x + 5

2x + 5y – 5 = 0

Day 3: GRAPHING USING INTERCEPTS

The y-intercept is the point where a line passes through the y-axis, and the x-intercept is the point where a line passes through the x-axis.

Ex:



y-intercept = 1 (and x = 0 here)

x-intercept = 2 (and y = 0 here)

You can substitute x = 0 into an equation to get the y-intercept, and you can substitute y=0 into an equation to get the x-intercept.

Ex: Determine the x and y intercepts of the line 3x + 4y – 24 = 0

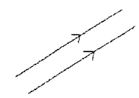
<u>x-intercept</u> (y= 0)	<u>y-intercept</u> (x = 0)
3x + 4y – 24 = 0	3x + 4y – 24 = 0
3x + 4(0) – 24 = 0	3(0) + 4y – 24 = 0
3x – 24 = 0	4y – 24 = 0
3x = 24	4y = 24
x = 8	y = 6

Day 4: PARALLEL AND PERPENDICULAR LINES

Parallel lines will never intersect.

The slopes of parallel lines are the same.

Ex:



Ex: *y = 8x – 2* and *y = 8x + 4* are parallel.

Perpendicular lines intersect at a 90° angle.

The slopes of perpendicular lines are negative reciprocals.

(Slope is flipped and sign changes.)

Ex:

Ex: *y = 3x – 5* and $y = -\frac{1}{3}x + 4$ are perpendicular.

Practice: Determine the equation of a line that is parallel to the line y = -5x +1, and has a y-intercept of 2.

m = -5 (because it is parallel to a line with a slope of -5)

b = 2

y = -5x + 2

Day 5: FIND THE EQUATION FROM A SLOPE AND A POINT

Points are given in the form (x,y). So the point (4,5) tells us x = 4, y = 5.

When you are given a slope and a point, you can substitute "x", "y", and "m" into the equation *y = mx + b* to solve for "b" (the y-intercept).

Next you can put "m" and "b" back into y = mx + b.

Ex: Determine the equation of a line with a slope of -4, that goes through the point (3, 8).

y = mx + b

8 = -4(3) + b

8 = -12 + b

8 + 12 = b

20 = b

y = -4x + 20

Day 6: FIND THE EQUATION FROM TWO POINTS

The equation for the slope of a line given two points is: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Once you have found the slope, you can use the slope and one of the points to find the equation of the line (see directions in Day 5).

Ex: Determine the equation of the line that passes through the points (-3, 1) and (2, -4).

$m = \frac{-4-1}{2-(-3)}$

$m = \frac{-5}{5}$

$m = -1$

y = mx + b

1 = (-1)(-3) + b

1 = 3 + b

1 - 3 = b

-2 = b

y = -x - 2

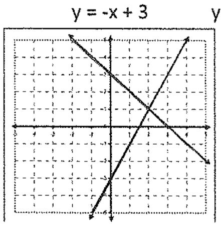
Day 7: LINEAR SYSTEMS

A linear system is a set of two or more linear equations considered at the same time.

The solution to a linear system is the point of intersection of the different lines.

Ex: Determine the solution to the system: y = 2x – 3 and y = -x + 3

y = -x + 3   y = 2x - 3



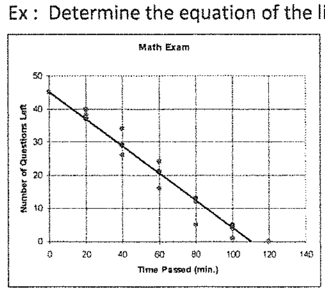
The solution is (2, 1).

Day 8: EQUATION FOR A SCATTER PLOT

In order to find an equation of a line for a scatter plot, we must draw a line of best fit, then find its equation by looking at the y-intercept and slope.

* Do not forget to look at the values along the y and x axis. Don't just count boxes on the graph.

Ex : Determine the equation of the line of best fit on the scatter plot below.

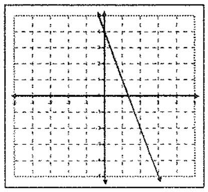
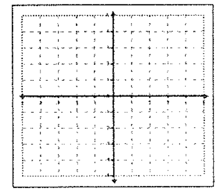
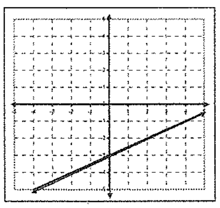
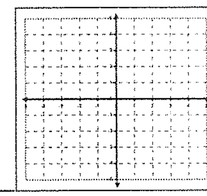
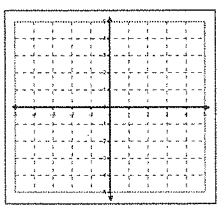
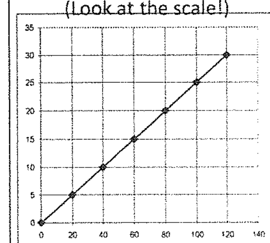
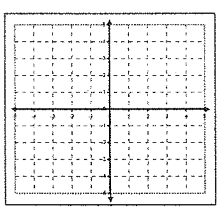
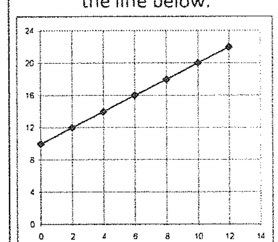
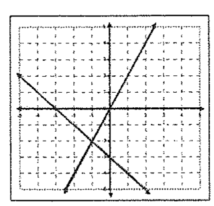
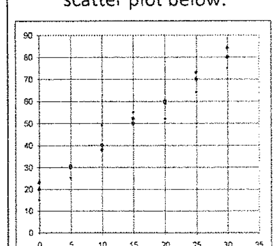


b = 45

$m = -\frac{45}{110}$

$m = -\frac{9}{22}$

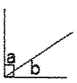
$y = -\frac{9}{22}x + 45$

M	A	T	H	O
Determine the equation of the line below. 	Write the equation $y = \frac{3}{4}x - 1$ in standard form.	Write the equation of a line that is parallel to the line y = 2x + 6, and has the same y-intercept as the line y = 12x – 4.	Write the equation of a line that is parallel to the line y = x – 5, and passes through the point (-2, 7).	Using the graph below, determine the solution to the linear system: y = 2x + 4, y = -3x - 1 
Determine the equation of the line below. 	Write the equation 5x – 3y + 12 = 0 in slope-intercept form.	Write the equation of a line that is perpendicular to the line y = 3x + 1, and passes through the point (0, 4).	Write the equation of a line that passes through the points (2,4) and (3, -5).	Using the graph below, determine the solution to the linear system: $y = \frac{1}{4}x - 1$ and $y = -\frac{3}{4}x + 3$ 
Draw the line y = 2x – 4 on the graph below. 	Determine the x-intercept of the equation y = -x + 9.	**FREE**	Write the equation of a line that passes through the points (-8, 1) and (-6, 4).	Calculate the slope of the line on the graph below. (Look at the scale!) 
Draw the line: $y = \frac{3}{4}x - 1$ on the graph below. 	Determine the y-intercept of the equation: 10x – 6y + 18 = 0	Write the equation of a line that has a slope of 4, and passes through the point (9, -3).	Write the equation of a line that passes through the point (2,9), and has an x-intercept of -1.	Determine the equation of the line below. 
Write the equation y = -6x + 1 in standard form.	What is the slope of a line that is perpendicular to the line y = -7x + 34 ?	Write the equation of a line that has a slope of $\frac{3}{4}$ and passes through the point (8, -1).	What is the solution to the linear system on the graph below? 	Determine the equation of a line of best fit for the scatter plot below. 

Unit 5: Geometry

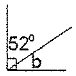
Day 1: ANGLE PROPERTIES

Complementary angles add up to 90°.



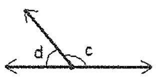
$a + b = 90°$

Ex: Determine the value of the missing angle.

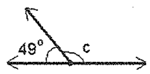


$b = 90° - 52°$
$b = 38°$

Supplementary angles add up to 180°.

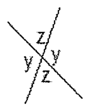


Ex: Determine the value of the missing angle.



$c = 180° - 49°$
$c = 131°$

Opposite angles are equal.

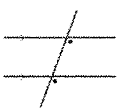


Ex: Determine the value of each variable.

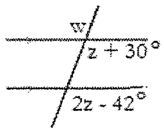
$g = 99°$

$h = 180° - 99°$
$h = 81°$

Corresponding angles are equal. (F pattern)



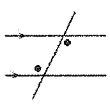
Ex: Determine the value of each variable.



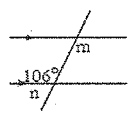
$2z - 42° = z + 30°$
$2z - z = 30° + 42°$
$z = 72°$

$w = z + 30°$
$w = 72° + 30°$
$w = 102°$

Alternate angles are equal. (Z pattern)



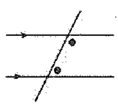
Ex: Determine the value of each variable.



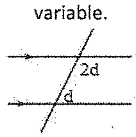
$m = 106°$

$n = 180° - 106°$
$n = 74°$

Co-interior angles add up to 180°.



Ex: Determine the value of each variable.



$2d + d = 180°$
$3d = 180°$
$d = \frac{180°}{3}$
$d = 60°$

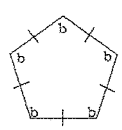
Day 4: POLYGONS

The sum of the interior angles of any convex polygon can be calculated using the formula: sum of interior angles = 180°(n-2), where n is the number of sides.

Ex: What is the sum of the interior angles of a pentagon?

Sum of interior angles $= 180°(n - 2)$
$= 180°(5 - 2)$
$= 180°(3)$
$= 540°$

A regular polygon has all equal sides and angles.

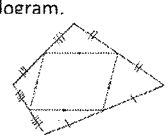


$b = 540° \div 5$
$b = 108°$

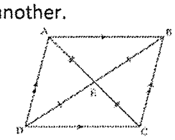
The sum of the exterior angles of any convex polygon is 360°.

Day 6: MIDPOINTS AND DIAGONALS IN QUADRILATERALS

If you join the midpoints of any convex quadrilateral, you will get a parallelogram.



The diagonals of a parallelogram bisect one another.

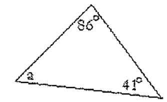


Day 2: TRIANGLES

The sum of the interior angles of a triangle is 180°.

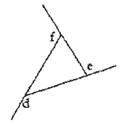
$a + b + c = 180°$

Ex: Determine the value of the variable.



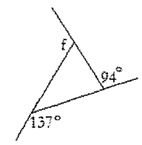
$a = 180° - (86° + 41°)$
$a = 180° - (127°)$
$a = 53°$

The sum of the exterior angles of a triangle is 360°.



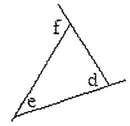
$d + e + f = 360°$

Ex: Determine the value of the variable.



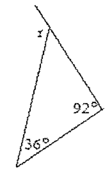
$f = 360° - (137° + 94°)$
$f = 360° - (231°)$
$f = 129°$

An exterior angle of a triangle is equal to the sum of the two opposite interior angles.



$d + e = f$

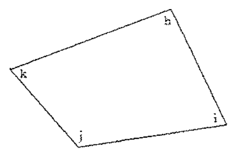
Ex: Determine the value of the variable.



$r = 36° + 92°$
$r = 128°$

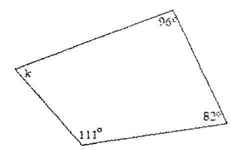
Day 3: QUADRILATERALS

The sum of the interior angles of a quadrilateral is 360°.



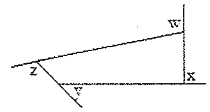
$h + i + j + k = 360°$

Ex: Determine the value of each variable.



$k = 360° - (111° + 82° + 96°)$
$k = 360° - (289°)$
$k = 71°$

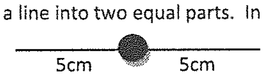
The sum of the exterior angles of a quadrilateral is also 360°.



$w + x + y + z = 360°$

Day 5: MIDPOINTS AND MEDIANS IN TRIANGLES

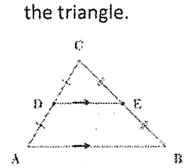
A midpoint splits a line into two equal parts. In other words, the midpoint bisects the line.



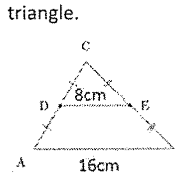
5cm 5cm

The line created by joining two midpoints in a triangle will:

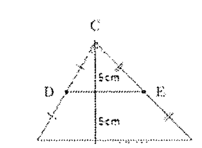
→ be parallel to the third side of the triangle.



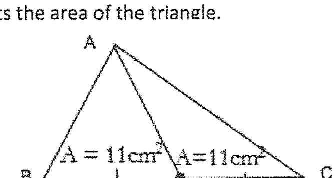
→ be half the length of the third side of the triangle.

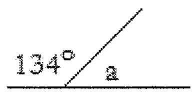
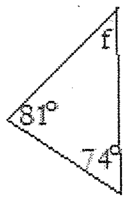
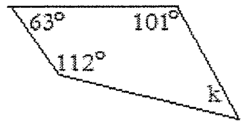
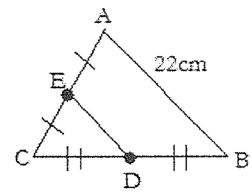
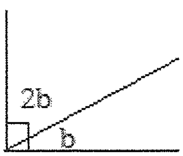
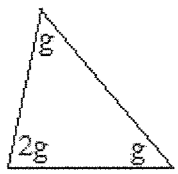
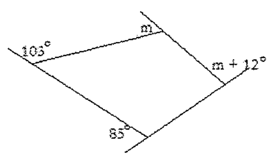
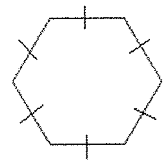
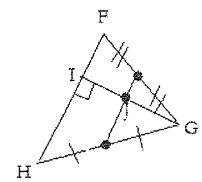
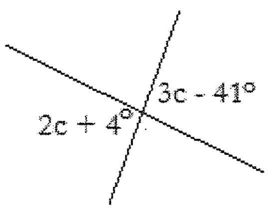
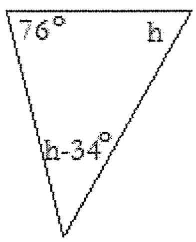
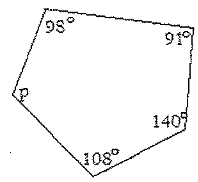
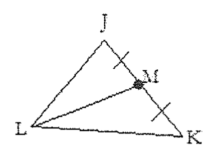
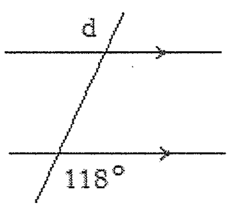
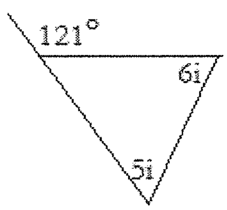
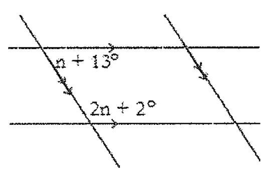
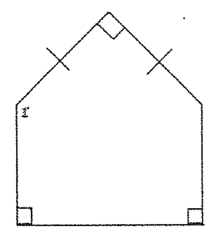
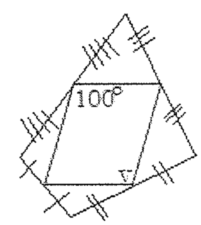
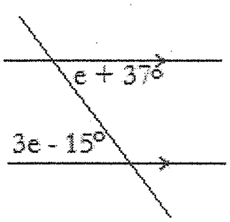
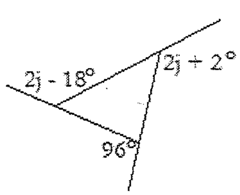
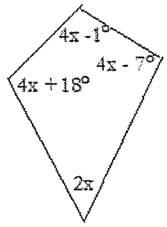
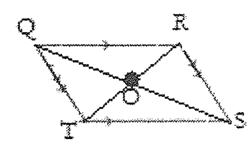


→ bisect the height of the triangle.



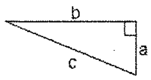
A median is a line joining a midpoint to the opposite vertex of the triangle.
→ A median bisects the area of the triangle.



M	A	T	H	O
Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable.  	Determine the sum of the interior angles of a heptagon.	Determine the length of line segment ED. 
Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of one of the interior angles in the regular polygon 	If line segment JI = 9cm, what is the length of line segment GI? 
Determine the value of the variable.  	Determine the value of the variable.  	**FREE**	Determine the value of the variable.  	The area of triangle JLM is $232cm^2$, what is the area of triangle KLM? 
Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable. 
Determine the value of the variable.  	Determine the value of the variable.  	Determine the value of the variable.  	A regular polygon has interior angles of 160° each. How many sides does this regular polygon have?	If line segment TO is 19cm long, how long the diagonal TR? 

Unit 6: Measurement

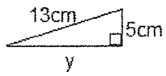
Day 1: PYTHAGOREAN THEOREM



$a^2 + b^2 = c^2$ | $c^2 - b^2 = a^2$ | $c^2 - a^2 = b^2$

* Note 1: The Pythagorean theorem only works for right triangles.
* Note 2: "c" is always the hypotenuse, which is the side that does not touch the right angle.

Ex: Determine the length of the missing triangle side.

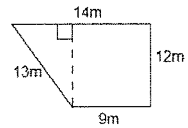


$y^2 = (13cm)^2 - (5cm)^2$
$y^2 = 169cm^2 - 25cm^2$
$y^2 = 144cm^2$
$y = \sqrt{144cm^2}$
$y = 12cm$

Day 2: AREA AND PERIMETER OF COMPOSITE FIGURES

Composite figures are composed of more than one geometric shape.
The perimeter of a composite shape is the sum of all of its outside sides.
The area of a composite shape is the sum of all shapes that compose it.

Ex: Determine the perimeter and area of the composite shape below.



Perimeter

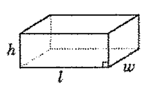
$P = 9m + 13m + 14m + 12m$
$P = 48m$

Area

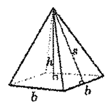
$A = A_{rec} + A_{tri}$
$A = lw + \frac{bh}{2}$
$A = (9m \times 12m) + \frac{(12m \times 5m)}{2}$
$A = 108m^2 + 30m^2$
$A = 138m^2$

Day 3: PRISMS AND PYRAMIDS

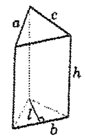
2



S.A. = 2(lw + lh + wh)
V = lwh

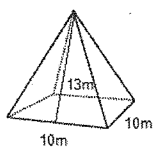


$S.A. = b^2 + 2s$
$V = \frac{b^2h}{3}$



S.A. = ah + bh + ch + bl
$V = \frac{blh}{2}$

Ex: Determine the volume of the square-based pyramid.



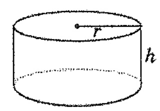
$V = \frac{b^2h}{3}$

h = ?

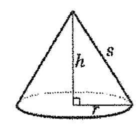
$h^2 = 13^2 - 5^2$
$h^2 = 169 - 25$
$h^2 = 144$
$h^2 = \sqrt{144}$
$h = 12$

$V = \frac{b^2h}{3}$
$V = \frac{10^2(12)}{3}$
$V = 400m^2$

Day 4: CYLINDERS AND CONES

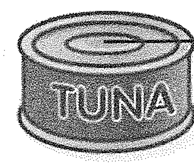


$S.A. = 2\pi r^2 + 2\pi rh$
$V = \pi r^2 h$



$S.A. = \pi rs + \pi r^2$
$V = \frac{\pi r^2 h}{3}$

Ex: Determine the amount of paper needed to make the tuna can label. (Hint: The label does not cover the top of bottom of the can.)

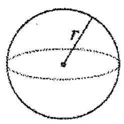


r = 5cm
h = 4cm

$S.A. = 2\pi rh$
$S.A. = 2\pi(5cm)(4cm)$
$S.A. = 125.7cm^2$

$125.7cm^2$ of paper is needed to make the label.

Day 5: SPHERES



$S.A. = 4\pi r^2$
$V = \frac{4\pi r^3}{3}$

Ex1: Determine the radius of a sphere with a surface area of $2800cm^2$.

$S.A. = 4\pi r^2$
$2800cm^2 = 4\pi r^2$
$\frac{2800cm^2}{4\pi} = r^2$
$222.8cm^2 = r^2$
$\sqrt{222.8cm^2} = r$

Ex2: How would the volume of a sphere change if its radius doubled?

$V = \frac{4\pi r^3}{3}$
If r is doubled: $(2r)^3$
$= 8r^3$
If r is doubled, the volume with be 8 times larger.

Day 6: RECTANGLE OPTIMIZATION

The largest rectangle that you can make with a given perimeter is the square (all 4 sides equal).

Ex: Mr. Ashton has 64m of fencing to make a play area in the backyard for his twin boys. What is the biggest play area Mr. Ashton can make if he uses the fencing for all four sides of the play area?

The biggest possible area will be produced by making a square.

Each side = $\frac{64m}{4}$
Each side = 16m

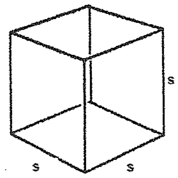
Area = lw
Area = (16m)(16m)
Area = $256m^2$

The biggest play area that Mr. Ashton can make is $256m^2$.

Day 7: SQUARE-BASED PRISM OPTIMIZATION

An optimal object will use the smallest amount of material (surface area) to produce the largest possible volume.

A cube is the optimal square-based prism.



S.A. = 2(lw + lh + wh)
$S.A. = 2(s^2 + s^2 + s^2)$
$S.A. = 2(3s^2)$
$\mathbf{S.A. = 6s^2}$

V = lwh
$\mathbf{V = s^3}$

For a cube, l = w = h = s *(side)*

Ex: Determine the least material need to wrap a cube with a volume of $475cm^2$.

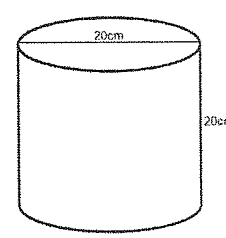
$V = s^3$
$475cm^3 = s^3$
$\sqrt[3]{475cm^2} = s$
7.08cm = s

$S.A. = 6s^2$
$S.A. = 6(7.08cm)^2$
$S.A. = 6(60.88cm^2)$
$S.A. = 365.3cm^2$

The least material needed to wrap the cube is $365.3cm^2$.

Day 8: CYLINDER OPTIMIZATION

An optimal cube has an equal height and diameter.



h = d or h = 2r

$S.A. = 2\pi r^2 + 2\pi rh$
$S.A. = 2\pi r^2 + 2\pi r(2r)$
$S.A. = 2\pi r^2 + 4\pi r^2$
$\mathbf{S.A. = 6\pi r^2}$

$V = \pi r^2 h$
$V = \pi r^2(2r)$
$\mathbf{V = 2\pi r^3}$

Ex: A cylindrical hot water tank is constructed a 2m x 2m sheet of metal. What is the maximum capacity of the tank if all the metal is used?

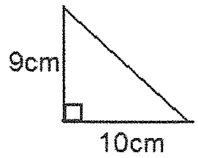
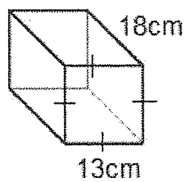
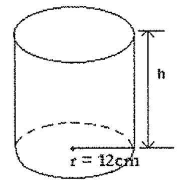
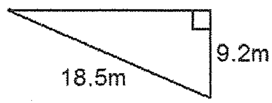
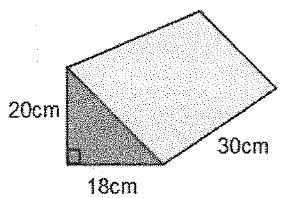
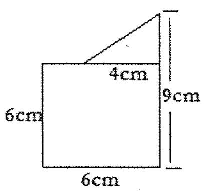
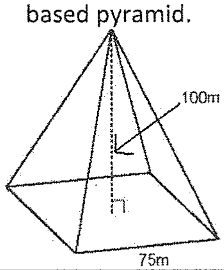
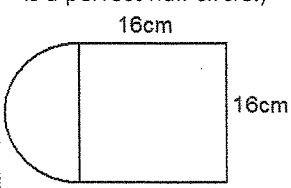
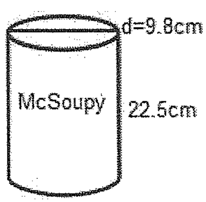
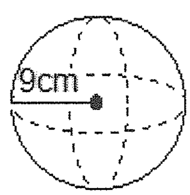
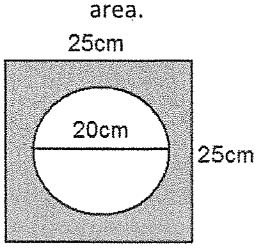
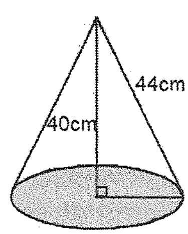
S.A. = lw
S.A. = 2m x 2m
$S.A. = 4m^2$

$S.A. = 6\pi r^2$
$4m^2 = 6\pi r^2$
$\frac{4m^2}{6\pi} = r^2$

$0.21m^2 = r^2$
$\sqrt{0.21m^2} = r$
0.46m = r

$V = 2\pi r^3$
$V = 2\pi(0.46m)^3$
$V = 2\pi(0.098m^3)$
$V = 0.6m^3$

The largest possible capacity of the tank is $0.6m^3$.

M	A	T	H	O
Determine the missing side length. 	Determine the surface area of the rectangular prism. 	What is the height of the cylinder if it has a surface area of $4560cm^2$? 	How would the surface area of a sphere change if its radius was tripled?	What is the largest square-based prism that you could make out of $100m^2$ of materials?
Determine the missing side length. 	Determine the volume of the triangular prism. 	A $200cm^3$ cone fits perfectly into a cylinder, because they have the same height and diameter. What is the volume of the cylinder?	What are the side lengths of a square with an area of $12.96cm^2$?	What is the smallest amount of cardboard you would need to make a $1325cm^3$ square-based box?
Determine the perimeter of the shape below. 	Determine the surface area of the square based pyramid. 	**FREE**	What are the side lengths of a square with a perimeter of 45.4m ?	Pop cans hold about $330cm^3$. What is the minimum amount of material they could use to construct a can?
Determine the area of the shape below. (Left is a perfect half circle.) 	How much soup should the soup can below hold? 	Determine the volume of the sphere below. 	What is the largest rectangular area you could close off using only a 380m rope?	You have $1200cm^2$ of paper. What is the largest volume cylinder that you could create if you used all the material?
Determine the shaded area. 	Determine the surface area of the cone. 	Determine the radius of a sphere that has a surface area of $136.5cm^2$.	Determine the side length of a cube with a volume of $24\ 389cm^3$.	Determine the height of the pyramid if it has the same volume as the cone.