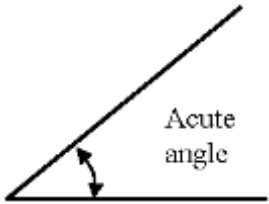
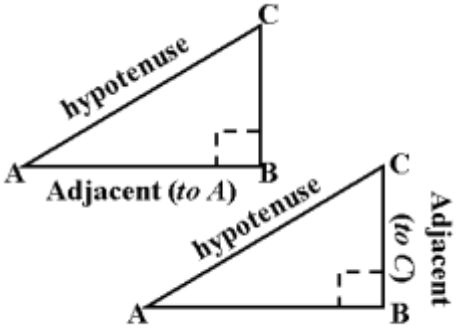
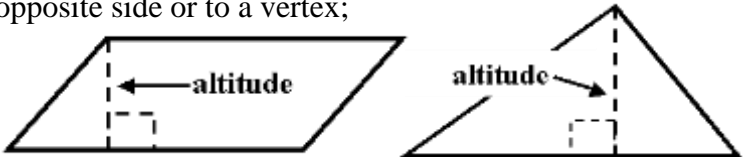
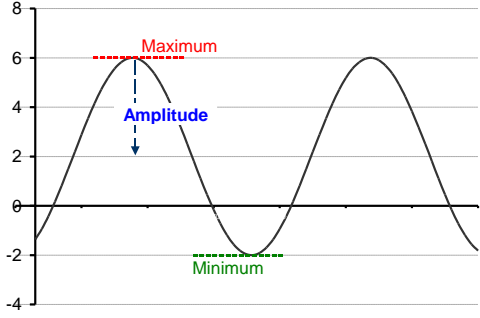
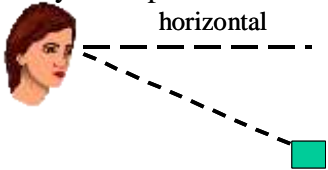
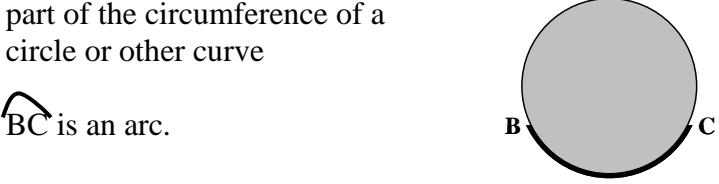
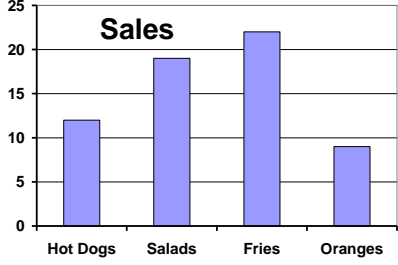
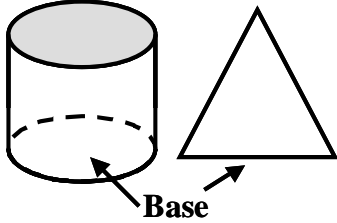
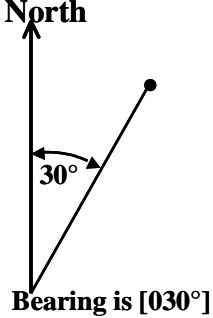


GRADE 12 MATH GLOSSARY

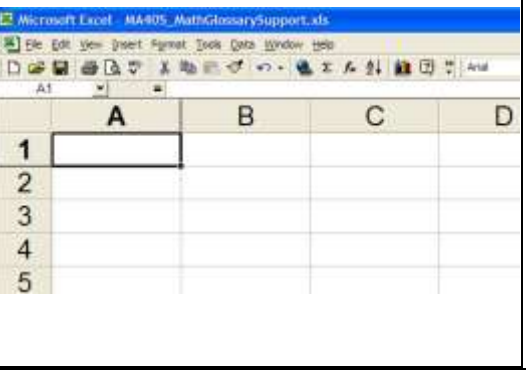
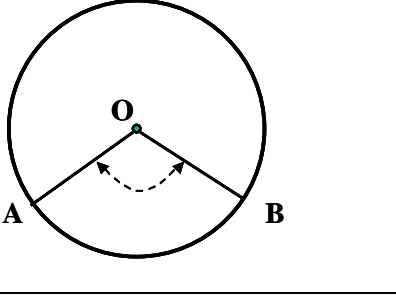
absolute cell reference:	<p>in a spreadsheet formula, a reference to one particular cell of the spreadsheet that will not change when the formula is moved to a different cell</p> <p>eg: The '\$' operator in $\\$B\\3 indicates that the value or expression contained in cell B3 is to be always used in the formula.</p>
accuracy:	<p>when referring to a measurement, it indicates how close the measurement comes to its true value. <i>Compare with precision.</i></p>
active cell:	<p>the cell of a spreadsheet into which an item of data is placed when you start to type</p>
acute angle:	<p>an angle whose measure is less than 90°.</p> <p><i>Contrast with obtuse.</i></p>  <p>The diagram shows an acute angle formed by two rays meeting at a vertex. A curved arrow indicates the angle's measure. The text 'Acute angle' is written next to the angle.</p>
adjacent side:	<p>in a right triangle, the side next to the named angle that is not the hypotenuse</p>  <p>The diagram shows two right-angled triangles. The first triangle has vertices A, B, and C, with the right angle at B. The side AB is labeled 'Adjacent (to A)'. The second triangle also has vertices A, B, and C, with the right angle at B. The side BC is labeled 'Adjacent (to C)'. Both triangles have their hypotenuses labeled 'hypotenuse'.</p>
algebraic expression:	<p>a mathematical expression that contains at least one variable</p> <p>eg: $6x + 4$ is an algebraic expression.</p>
alleles:	<p>alternative forms of a gene</p>
alternate angles:	<p>see parallel lines</p>
altitude:	<p>(1) the perpendicular distance from the base of a figure to the opposite side or to a vertex;</p>  <p>The diagram shows two figures. On the left is a parallelogram with a dashed vertical line from the top side to the bottom side, labeled 'altitude'. On the right is a triangle with a dashed vertical line from the top vertex to the base, also labeled 'altitude'.</p> <p>(2) the height of an aircraft above the ground or above sea level.</p>

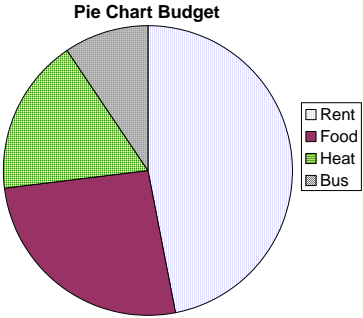
amortization period:	<p>the length of time over which a loan is paid off, usually used for a large amount of loan such as a house purchase.</p> <p>Eg: the amortization period of a car loan is usually 4 or 5 years. For a house most buyers take the loan for 25 years. The longer the amortization period, the more interest you will pay though.</p>
amount of an investment:	<p>the value of the principal plus interest.</p> <p>Eg: Calculate the amount of an investment of \$200 after 3 years at 6.5% compounded annually.</p> $A = P \left(1 + \frac{r}{s} \right)^{n*s}$ <p>where A is the total amount, P is principal, r is the interest rate in decimal form, s is the number of times per year the interest is calculated, and n is the number of years. Evaluating:</p> $A = 200 \left(1 + \frac{0.065}{1} \right)^{3*1} = \241.59
amplitude:	<p>half the distance between the maximum and minimum values of a periodic function.</p> <p>ie: $Amplitude = \frac{\text{maximum value} - \text{minimum value}}{2}$</p> 
angle of declination of the sun	<p>the angle of the sun above or below the equator as measured on the equator at local noon. When the sun has a declination of zero it is a equinox (Mar21 and Sep 21)</p>
angle of depression:	<p>the angle between the horizontal and the oblique line joining the observer's eye to a point lower than eye level.</p> 
angle of elevation:	<p>the angle between the horizontal and the oblique line from the observer's eye to some object above eye level. (contrast with angle of depression)</p>

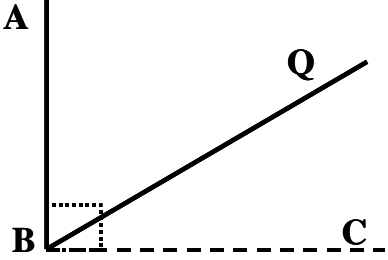
angle of inclination of a line segment:	the acute angle, measured from the horizontal to the line segment
annuity:	a series of regular, equal payments paid into, or out of, an account.
approximation:	a number close to the exact value of a quantity or an expression; the symbols \approx and \cong mean "is approximately equal to". Eg: 3.14 is an approximation for pi, π .
arc:	<p>part of the circumference of a circle or other curve</p> <p></p>
area:	the number of square units needed to cover a surface; common units used to express area include cm^2 , m^2 , and hectares.
arithmetic sequence:	a sequence of numbers in which each term after the first is formed by adding a constant to the preceding term. The numbers 1, 4, 7, 10 form an arithmetic sequence, since each term after the first is formed by adding 3 to the preceding number.
average:	<p>a single number that is used to represent a set of numbers. To find the average, all the numbers in the data set are added together and the sum is divided by the number of entries in the data set; see mean which is the same thing for discrete numbers</p> <p>Eg: The data set 1, 3, 4, 7, 7, 8 has 6 entries. Average = $(1+3+4+7+7+8)/6 = 5$.</p>
average speed:	<p>the speed that, if the object traveled at that speed constantly, would result in the same total distance being traveled in the same total time. To calculate average speed, the total distance traveled during the given time period is divided by the total time.</p> <p>Eg: In one hour, a car travels 100 km. The car stops for $\frac{1}{2}$ hr and then travels another 80 km in the last hour. Find the average speed of the car.</p> <p>The total distance traveled is 180 km and the time required to travel this distance includes the 2 hours of driving and the stopping time of $\frac{1}{2}$ hr.</p> $\text{Average speed} = \frac{\text{total distance}}{\text{total time}} = \frac{180\text{km}}{2.5\text{hr}} = 72\text{km/hr}$

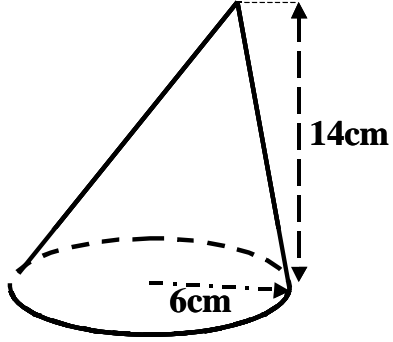
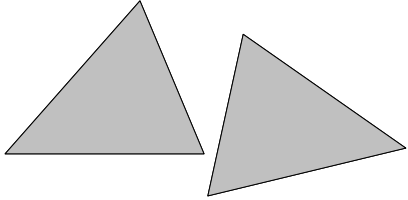
bar graph:	<p>a graph that displays data by using horizontal or vertical bars whose lengths are proportional to the number they represent</p>  <table border="1" data-bbox="857 201 1252 464"> <caption>Sales</caption> <thead> <tr> <th>Item</th> <th>Sales</th> </tr> </thead> <tbody> <tr> <td>Hot Dogs</td> <td>12</td> </tr> <tr> <td>Salads</td> <td>19</td> </tr> <tr> <td>Fries</td> <td>22</td> </tr> <tr> <td>Oranges</td> <td>9</td> </tr> </tbody> </table>	Item	Sales	Hot Dogs	12	Salads	19	Fries	22	Oranges	9
Item	Sales										
Hot Dogs	12										
Salads	19										
Fries	22										
Oranges	9										
base:	<p>(1) the side of a polygon, or the face of a solid, from which the height is measured.</p>  <p>(2) the factor repeated in a power. Eg: In the expression of a power 5^3, the 5 is the base, the 3 is the exponent.</p>										
bear market:	a term used to describe the stock market when stock prices are falling.										
bearing:	<p>the 3-digit angle, measured in a clockwise direction, between the north direction and the direction to a point or object. Usually measured with a magnetic compass or a GPS or with a protractor on a map. Eg: The bearing shown to the ball is [030°]</p> 										
bias:	When finding statistics through a survey; bias is an emphasis on characteristics that are not typical of the entire population. Bias will intentionally or accidentally change the statistics.										
biased sample:	a sample containing members of the population that are not representative of the whole population. Asking people on a bus if they think buses are important would be a biased sample.										

<p>binomial distribution:</p>	<p>the probability distribution for a binomial experiment.</p> <p>The population mean of a binomial distribution is $\mu = np$.</p> <p>The deviation is given by:</p> $\sigma = \sqrt{np(1-p)} = \sqrt{npq}$ <div data-bbox="987 218 1468 546" style="float: right;"> <p>25% Probability of Picking the correct key N times in 20 trials P=0.25</p> </div>
<p>binomial experiment:</p>	<p>an experiment with a fixed number of independent trials in which the outcomes can be classified as success or failure and the probabilities remain constant for each individual trial of the experiment.</p> <p>Eg: I have four identical keys to open my classroom. There is a therefore 25% chance I will pick the correct key. So what is the probability that I get the correct key 12 times out of 20 trials? It works out in theory that it should only be about in 1% of the experiments that I will get 12 out of 20 right.</p>
<p>blueprints:</p>	<p>the initial drawings used in a construction project.</p>
<p>board lot:</p>	<p>a unit of trading in the stock market.</p>
<p>broken-line graph:</p>	<p>a graph that displays data by using points that are joined by line segments</p> <div data-bbox="954 1121 1396 1411" style="float: right;"> <p>Broken Line Graph</p> </div>
<p>budget:</p>	<p>a written plan to outline how money will be spent</p>
<p>bull market:</p>	<p>a term used to describe the stock market when stock prices are rising</p>
<p>cash investments:</p>	<p>short-term investments that are easily accessible; include bank accounts, term deposits, and money market funds.</p>

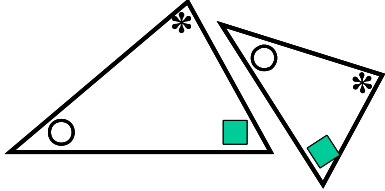
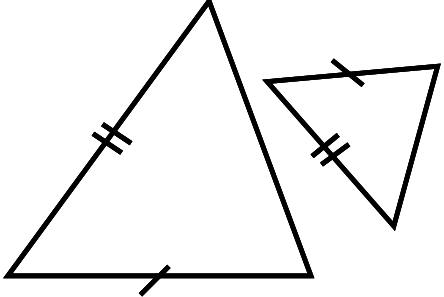
cell:	a rectangle in a spreadsheet into which data may be entered.	
cell reference:	<p>the name of a cell in a spreadsheet, given by indicating the column and row to which it belongs</p> <p>Eg: Cell B3 is the cell in column B and row 3 of the spreadsheet document.</p>	
central angle:	<p>the angle whose vertex is at the centre of a circle between two radii central angle subtended by an arc.</p> <p>Eg: $\angle AOB$ is subtended by arc AB.</p>	
central angle subtended by an arc	<p>the angle at the centre of a circle between the radii from the ends of an arc of the circle. We can also say that the arc is 'intercepted' by the angle.</p>	
central tendency	<p>A type of statistical value that indicates the 'central number' of data. The three most common measures of central tendency are: the mean, the median, and the mode.</p>	
circle:	<p>the set of points in a plane that are a given distance from a fixed centre point.</p> <p>The area, A, of a circle with radius r Area = $\pi * r^2$.</p> <p>The circumference, C, of a circle with radius r or diameter d is $C=2\pi r$ or $C=\pi d$.</p>	

circle graph (pie chart)	<p>a diagram that uses parts of a circle to display data.</p>  <p style="text-align: center;">Pie Chart Budget</p> <p>Legend: Rent Food Heat Bus</p>
circumference	the distance around a circle; the boundary of any region whose boundary is a simple closed curve.
cluster sample:	<p>a sample in which every member of a randomly chosen section of the population is selected.</p> <p>Eg: only surveying 18 to 24 year olds about an issue.</p>
collecting like terms:	<p>putting together terms that have exactly the same variable expressions, then simplifying by addition or subtraction.</p> <p>Eg: Collect like terms:</p> $4(3x - 1) + 5x - 2$ $= 12x - 4 + 5x - 2$ $= 12x + 5x - 4 - 2$ $= 17x - 6$
column matrix:	<p>a matrix with only one column</p> <p>Eg: $\begin{bmatrix} 1 \\ 4 \\ -9 \end{bmatrix}$</p>
Combination	<p>The number of ways of selecting objects to form an unordered group is a combination.</p> <p>Example: how many ways can 3 players of a 10 person team be selected for a league all-star game? It doesn't matter what order you get selected in, just that you make the team. The answer is ${}_{10}C_3$ or 120 ways</p> <p>Compare to permutation.</p>
common difference:	<p>the number obtained by subtracting any term from the next term in an arithmetic sequence For the arithmetic sequence 1, -5, -11, -17, . the common difference = $(-5) - 1 = -6$.</p>
common ratio:	<p>the ratio of one term in a geometric sequence to the preceding term. For the geometric series 1, 2, 4, 8, 16, the common ratio is 16/8 or 2.</p>

complement of event A:	the entire set of outcomes that are not favourable to A. Eg: the complement of the entire set of people that are that are cute is the remaining set comprising all those people that are not cute!
complementary angles:	<p>two angles whose measures add up to 90°.</p>  <p>$\angle ABQ$ is complementary to $\angle CBQ$</p>
compound interest:	<p>when the interest due is added to the original amount invested and thereafter earns interest the interest earned is compound interest. Eg: Calculate the amount of an investment of \$200 after 3 years at 6.5% compounded annually.</p> <p>$A = P\left(1 + \frac{r}{s}\right)^{n*s}$ where A is the total amount, P is principal, r is the interest rate in decimal form, s is the number of times per year the interest is calculated, and n is the number of years. Evaluating:</p> <p>$A = 200\left(1 + \frac{0.065}{1}\right)^{3*1} = \\241.59</p>
compounding:	the process of converting interest into principal. After a certain length of time, the interest becomes part of the money that earns interest. A compounding investment grows exponentially .
conditional probability:	<p>the probability that an event will occur given that another event has occurred. The probably I have brown eyes ‘given that’ I have black hair could be written as: $P(\text{Brown eyes} \text{Black Hair})$</p>

cone:	<p>a solid figure in three dimensions that is formed by a region (the base of the cone) and all the line segments joining points on the boundary of the region to a point not on the region</p> <p>The volume of a cone is given by:</p> $V = \frac{1}{3} * \text{area of base} * \text{height}$ <p>or in the case of the circular cone at right</p> $V = \frac{1}{3} * \pi * 6^2 * 14$ $= 527.8 \text{ cm}^3$ 
confidence interval:	
congruent:	<p>figures that have the same size and shape, but not necessarily the same orientation. Corresponding sides are the same length, and corresponding corners have the same angular measure.</p> 
conjecture:	<p>a conclusion based on examples. Eg: every bird I have ever seen flies; I conjecture (or 'theorize') that all birds fly!</p>
consecutive integers:	<p>integers that come one after the other without any integers missing 34, 35, 36 are consecutive integers; ;so are -2, -1, 0, 1.</p>
Consistent system of equations:	<p>a system of equations with at least one solution. Eg: $\mathbf{x + y = 3}$, and $\mathbf{x - y = 1}$ is a consistent system since (2, 1) solves both equations. A consistent system can be further categorized as dependant (meaning the two lines are the same so all the points on the line satisfy the system) or independent (meaning the lines are different and cross only in one place giving only one solution)</p>
constant:	<p>a particular number. Eg: 7 is a constant. 4x is not a constant because it is 4 bunches of a variable.</p>

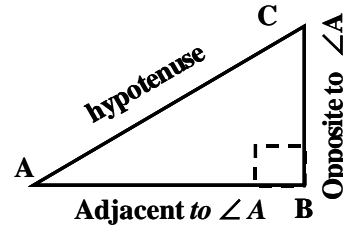
constant term:	a number. In the equation $y = 4x + 2$, the constant term is 2.	
continuity correction:	an adjustment of 0.5 added to or subtracted from the endpoints when the normal distribution is used to approximate the binomial distribution in probability calculations	
continuous data:	data that can assume any value without a break; data concerning the duration of time it takes for a plant to grow is continuous because the in-between values have meaning. <i>Contrast with discrete data</i>	
control chart:	used in statistical process control to track the value of some aspect of a product over time	
convenience sample	a sample whose members are selected based on convenience.	
coordinate axes:	the horizontal and vertical number lines on a grid that represents a plane.	
coordinate plane:	a two-dimensional surface on which a coordinate system has been set up	
coordinates:	<p>also called Cartesian coordinates (after the French mathematician Cartes); the numbers in an ordered pair that locate a point in the coordinate plane.</p> <p>The coordinates of the dot are (7, 5).</p>	
correlation coefficient:	a measure of how closely data can be described by a certain type of function; the closer the value of the correlation coefficient to 1 or -1 the closer the data fit of the function.	
corresponding angles:	see parallel lines	

<p>corresponding angles</p>	<p>in similar triangles two angles, one in each triangle, that are equal in angular measure.</p> <p>Similar symbols show corresponding corners of these similar triangles.</p> 
<p>corresponding sides</p>	<p>in similar triangles two sides, one in each triangle, are related by some proportion or factor.</p> <p>Eg: <i>Each</i> corresponding side of the bigger triangle might be twice the length of those of the little triangle. In the similar triangles to the right, corresponding sides are marked with the same marks.</p> 

cosine:

for an acute angle $\angle A$ in a right triangle, the ratio of the length of the side adjacent to the angle $\angle A$ to the length of the hypotenuse.

$$\cos(\angle A) \equiv \frac{\text{Adjacent side}}{\text{Hypotenuse}}$$

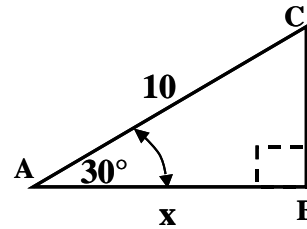


Example; finding adjacent side:

$$\cos(30^\circ) = \frac{x}{10}$$

$$\text{from a calculator } 0.866 = \frac{x}{10}$$

$$\therefore x = 10 * 0.866 = 8.66$$



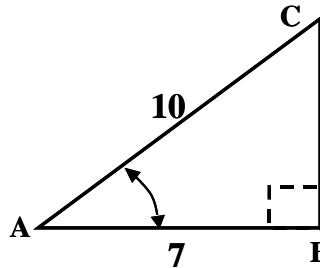
Example: finding measure of angle:

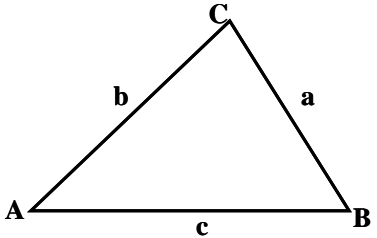
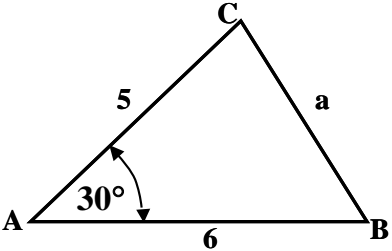
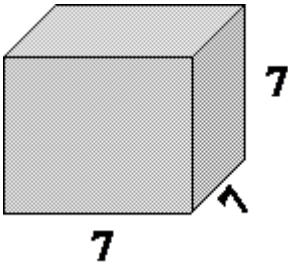
$$\cos(\angle A) \equiv \frac{\text{Adj side}}{\text{Hypotenuse}}$$

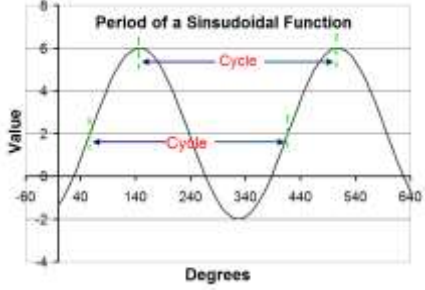
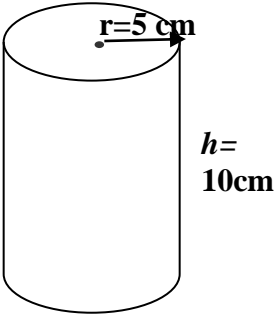
$$\cos(\angle A) = \frac{7}{10} = 0.7$$

Use the inverse cosine on calculator:

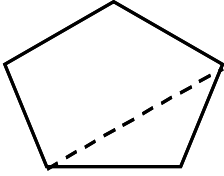
$$\angle A = \cos^{-1}(0.7) \approx 45^\circ$$

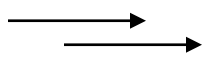


<p>Cosine Law:</p>	<p>a trigonometric law used to solve triangles that are not necessarily right triangles</p> <p>For the triangle at the right, the following relationships are all true:</p> $a^2 = b^2 + c^2 - 2bc \cdot \cos(\angle A),$ $b^2 = a^2 + c^2 - 2ac \cdot \cos(\angle B);$ $c^2 = a^2 + b^2 - 2ab \cdot \cos(\angle C)$ <p>Use the Cosine law when:</p> <ul style="list-style-type: none"> • All three side lengths are given; or • 2 side lengths and the measure of an included angle are given <p><i>Example:</i> Find side a: $a^2 = 5^2 + 6^2 - 2(5)(6)\cos(30^\circ)$ $a^2 = 25 + 36 - 60 \cdot 0.866$ $a^2 = 9.04$ $\therefore a = \sqrt{9.04} = 3.01$</p>  
<p>cost of financing:</p>	<p>the difference between the cash price and the sum of the payments made for an item</p>
<p>Counter example:</p>	<p>an example that shows a conjecture is false. Eg: I had conjectured that all birds fly; but then I found out that penguins and ostriches are birds that do not fly. They are counter-examples to disprove my conjecture.</p>
<p>cube:</p>	<p>a rectangular solid whose length, width, and height are all equal</p> <p>The object at right is a cube.</p> <p>It has volume of $7 \cdot 7 \cdot 7 = 343$ cubic units.</p> <p>It has surface area of: 6 sides of 49 square units each. Total surface area is 294 square units</p> 

cube root	a number that, when raised to the exponent 3, results in the given number. Eg: the cube root of 8 is 2, since $2*2*2$ is 8 Or in mathematical symbols: $\sqrt[3]{8} = 2$
cubic units:	units that measure volume; common cubic units include cm^3 and m^3 .
cycle:	a cycle of a periodic function is a part of its graph from any point to the next point where the graph starts repeating. 
cylinder:	a solid with two parallel, congruent, circular bases $Volume_{cyl} = base * height$ $= \pi * r^2 * h$ $= \pi * 5^2 * 10 = 785\text{cm}^3$ $SurfaceArea =$ $2 * \pi * r^2 + 2 * \pi * r * h$ $= 471\text{cm}^2$ 

data:	numeric or non-numeric facts or information
debt:	money owing
declination of the sun:	see angle of declination of the sun
dependent events:	the occurrence of one event is affected by the occurrence of another event. Eg: The probability of randomly selecting a blue sock on a second draw from your drawer depends on the outcome of the first draw.
dependent variable:	the output of a relation, often denoted as y; also called the responding variable

depreciation:	the decrease in value of an asset. Eg: a new car depreciates in value very rapidly the first year.
diagonal:	a line that joins two vertices of a figure, but is not a side 
diameter:	a line segment that joins two points on a circle (or sphere) and passes through its centre; the diameter of a circle is twice the length of the radius; see circle .
dimensions of a matrix:	the number of rows and columns of a matrix; an M x N matrix has M rows and N columns. A matrix of dimension 3 x 5 $\begin{bmatrix} 1 & 2 & 3 & -5 & 4 \\ 2 & 4 & 6 & 0 & 0 \\ 2 & 7 & -2 & 1/2 & 0 \end{bmatrix}$
direct variation:	when the ratio of two variable quantities remains constant. If y varies directly as x, the equation that relates y to x is $y = mx$, where m is a constant. The graph of a direct variation is a straight line that passes through the origin.
discrete data:	distinct data; data about the number of oranges in a crate are discrete because intermediate values have no meaning
displacement:	a vector that describes the distance and direction an object moves or in which forces act
distance:	(1) the space between two points; or (2) the distance traveled by an object that is moving at a constant speed for a time is determined from the relation Distance = Speed x Time, where a consistent set of units must be used. If an object travels at a constant speed of 20 m/s for 2 min, the distance traveled is $d = (20 \text{ m/s})(120 \text{ s}) = 2400 \text{ m}$ or 2.4 km.
distance formula:	a formula used to determine the distance between two points whose coordinates are known. Given two points P_1 at (x_1, y_1) and P_2 at (x_2, y_2) , the distance between the two points is given by: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

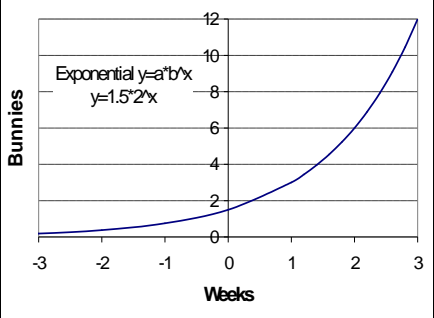
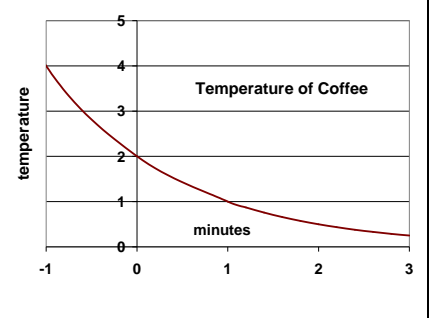
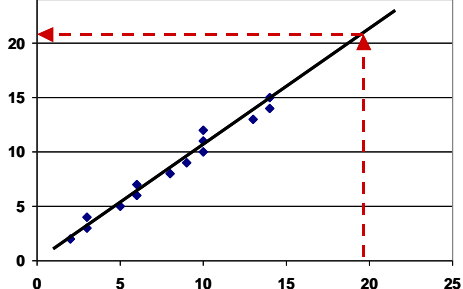
Distribution:	See probability distribution
dividends:	a portion of a company's earnings paid to shareholders
domain of a relation or function	the set of all possible x-values (or valid input values) represented by the graph or equation
dominant trait:	in genetics, only one dominant allele needs to be present for the trait to be expressed
effective annual interest rate:	the rate that with annual compounding has the same effect as the stated rate. Eg: an interest rate of 1% per month compounded monthly is the same as an effective rate of 12.68% per year if it had been just compounded yearly.
elements:	<p>the entries in a matrix</p> <p>The elements of a matrix are always specified by (Row, Column)</p> $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 9 & 8 & 7 \end{bmatrix}$ <p>The element $a_{2,3}$ has the value 6</p>
equal vectors:	<p>Vectors that have the same magnitude and direction</p> <p>Like the 'Snowbirds' in formation. </p>
equation:	a mathematical statement indicating that two expressions are equal eg: $2x + 5y = -4$ is an equation. $y = 3x^2$ is an equation
equation of a line:	an equation that gives the relationship between the coordinates of every point on the line; see linear equation and its graph .
equidistant:	the same distance apart.
equilibrant:	a force, equal and opposite to the resultant of forces acting on an object so that the object does not move. When you sit in a chair, the chair pushes back at the same amount as your weight, otherwise you would fall through the chair.

equity:	<p>the difference between the market value of real estate and the amount still owing.</p> <p>Eg. If you own a house, and it is worth about \$100K if you were to sell it, but you owe the bank \$40K still on the mortgage, the equity you have in your home is $\\$100\text{K} - \\40K or \$60K.</p>
equity investments:	stocks and mutual funds
evaluate an expression:	<p>substitute a value for each variable in the expression, then calculate the resulting arithmetic expression applying the order of operations rules</p> <p>eg: Evaluate $2x^2 + 3y - 4$, if $x = -3$ and $y = 5$.</p> <p>Replace each letter with its given value, placing each number in parentheses to prevent errors with signs.</p> $ \begin{aligned} &2x^2 + 3y - 4 \\ &= 2(-3)^2 + 3(5) - 4 \\ &= 2(9) + 3(5) - 4 \\ &= 18 + 15 - 4 \\ &= 29 \end{aligned} $
event:	any outcome, or set of outcomes, of an experiment
expected value:	<p>(1) the number that would be expected to be the average when an experiment is repeated many times; or,</p> <p>eg: if heads comes up 50% of the time, you would expect after 100 tosses that 50 heads would come up.</p> <p>(2) the mean of a probability distribution.</p>
expenses:	items that must be paid from income; for example, food, shelter, transportation
experiment:	a procedure, carried out under controlled conditions, that is used to test a hypothesis
experimental probability:	probability determined using sampling or a simulation. To test the probability of something happening by doing it! Of course it is often better to have an accurate formula from theoretical probability theory so you don't actually have to do the experiment.

exponent:

a number, shown in a smaller size and raised (as a *superscript*), that tells us how many times a [base](#) is used as a factor.
 eg: 2 is the exponent in the power 6^2 .
 The laws of exponents are given below left, with examples to the right.

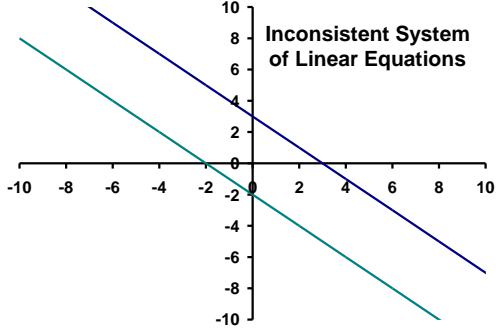
Exponent Law	Example
$a^m * a^n = a^{(m+n)}$ for same base a	$3^2 * 3^3 = 3^5$ $x^4 * x^2 = x^6$
$(a^m)^n = a^{(m*n)}$ for same base a	$(2^2)^3 = 2^6$ $(z^4)^3 = z^{12}$
$\frac{a^m}{a^n} = a^{(m-n)}$ for same base a	$\frac{3^4}{3^2} = 3^2$ $\frac{y^3}{y} = y^2$
$(ab)^m = a^m b^m$	$(3*4)^2 = 3^2 * 4^2$ $(2x)^2 = 4x^2$
$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\left(\frac{1}{2}\right)^3 = \frac{1^3}{2^3}$ $\left(\frac{xy}{z}\right)^2 = \frac{x^2 y^2}{z^2}$
$a^{-m} = \frac{1}{a^m}$ for same base a	$2^{-2} = \frac{1}{2^2}$
$a^0 = 1$	$5^0 = 1$ $(\text{anything})^0 = 1$ $\left(\frac{4\pi q \sqrt{5}}{z2}\right)^0 = 1$

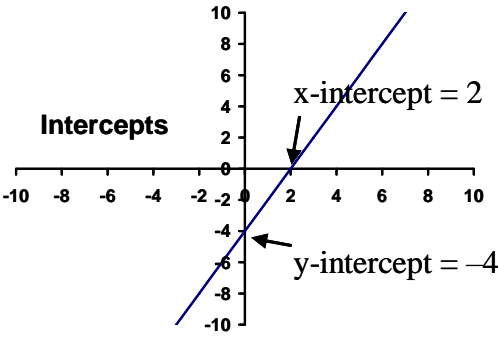
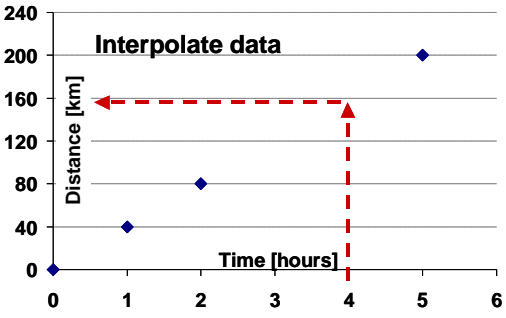
<p>Exponential function</p>	<p>A function that increases or decreases in proportion with its value. <i>ie:</i> the bigger it is, the faster it grows (like mould!), the smaller it is, the slower it diminishes (like the temperature of your coffee).</p> <div style="display: flex; justify-content: space-around;">   </div>
<p>expression:</p>	<p>a meaningful combination of mathematical symbols, such as a polynomial. $3x - 2$ is an expression, as is $-13x^2 - 5x + 6$. If x is you brother's age now; to say that 3 years ago your brother was 16 would be to say: $x - 3 = 16$ If you Mathilde, wanted to say that you were 4 years older than your friend Jason, you might <i>express</i> that as: $M = J + 5$.</p>
<p>extrapolate:</p>	<p>To estimate a value beyond the known values. A rather hazardous thing to assume!</p> 
<p>extremes:</p>	<p>the highest and lowest values in a set of numbers.</p>
<p>Factorial ‘!’</p>	<p>A special notation to show that a succession of descending integers down to one are multiplied together. $n! \equiv n * (n - 1) * (n - 2) * (n - 3) * \dots * 1$ eg: $5! = 5 * 4 * 3 * 2 * 1 = 120$</p>
<p>fair market value:</p>	<p>an expert's determination of the value of a saleable item. Eg: the fair market value of your house.</p>
<p>Fibonacci sequence:</p>	<p>a sequence of numbers in which each term after the second is formed by adding the two preceding terms 1, 1, 2, 3, 5, 8, 13, 21, ... It is in the movie ‘<i>DaVinci Code</i>’ like other magical sequences</p>

fixed income investments:	provide a source of regular income with limited risk; includes bonds, debentures, and guaranteed investment certificates.
force:	a push or a pull on an object in a certain direction. The units of force are the 'Newton'. A force of 1 Newton (1N) will cause a 1-kg object to accelerate at a rate of 1 meter per second every second (or $1\text{m}/\text{sec}^2$).
formula:	an equation that is used to describe the relationship between two or more quantities eg: The formula that describes how the volume, V, of a sphere is related to its radius, r, is $V = 4\pi r^3$
formula rearrangement:	changing a formula to an equivalent form using the rules of equality and algebra. Eg: Like saying Kevin is 4 years <i>older</i> than Jason, so that is the same as saying Jason is 4 years <i>younger</i> than Kevin. Eg: Rearrange the equation $y = 3x + 5$ to <i>isolate</i> x by itself. $y = 3x + 5$ \rightarrow subtract 5 from both sides $y - 5 = 3x$ \rightarrow Divide both sides by 3 $\frac{(y - 5)}{3} = x$ or $x = \frac{1}{3}y - \frac{5}{3}$
fractals	geometric figures that can be generated by repeating the same process many times.
frequency	(1) the number of times an event occurs in an experiment or a survey; Eg: You might have a frequency of 6 heads in a coin toss experiment of 10 coin tosses. Eg: you might have 25 people say they like maple syrup and 14 say they don't. (2) the number of times that something occurs in a given time; a common unit is the Hertz (Hz), which is the number of cycles that occur in 1 s. Eg: If you eat breakfast, lunch, and dinner every day, your meal frequency is 3 times per day. Eg: If a pendulum swings back and forth 10 times in 5 s, its frequency would be $10 \text{ cycles}/5 \text{ s} = 2 \text{ cycles/s} = 2 \text{ Hz}$

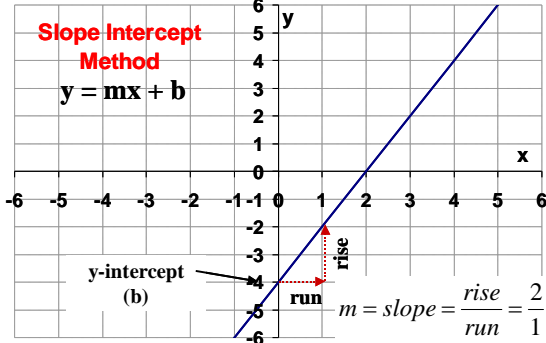
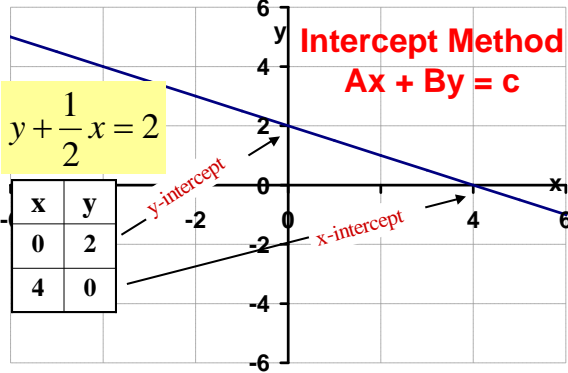
function:	a rule that gives a single output number for each input number $y = 3x + 2$ and $y = 5x^2$ are functions. A function allows you make simple and predictable models of different processes and real life situations.
function notation:	the use of the function name, such as f , to indicate the output value for a particular input $f(x) = 3x + 2$.
Fundamental Counting Principle:	if one item can be selected in m different ways and a second item can be selected in n different ways, then the two items can be selected in $m * n$ different ways. Eg: if I have a choice of 3 pairs of pants and 6 shirts, there are $3 * 6 = 18$ different outfits I can wear.
genotype:	the pair of alleles that determine a genetic characteristic
geometric sequence:	a sequence of numbers in which each term after the first is formed by multiplying' the preceding term by a constant eg: 1, 2, 4, 8, 16, 32,
Geometric vectors:	a directed line segment used to represent a vector quantity; the length represents the magnitude and the arrowhead indicates the direction.
gradian:	a unit of angle measure; $400 \text{ grad} = 360^\circ$ in a circle.
Gross income:	the amount of money earned before deductions.
gross profit:	the difference between the cost price and selling price of an item; also called the markup. eg: Lori's Fashions buys a coat for \$29.00 and sells it for \$49.99. The gross profit on the coat is $\$(49.99 - 29.00)$, or \$20.99.
Guaranteed Investment Certificates:	a type of investment offered at banks and trust companies which usually offers a higher rate of return than a bank account, but is for a fixed period of time and is not cashable until the expiration of the fixed period

half-life:	A statistical measure; the time taken for an item or system to reduce its quantity by half. A exponential decay of something. Eg; the half-life of hamsters is 6 months (thankfully); so, if you had 20 hamsters, after 6 months you would only have 10 (provided they are not allowed to breed, then you get into an exponential growth instead of decay) Eg: the half-life of some dangerous nuclear radiation is 10,000 years!
head-to-tail:	two vectors are drawn head-to-tail if the second vector begins where the first vector ends.
heading:	the direction toward which a vehicle or vessel is pointed.
hectare:	a metric unit used for land area; the area of a square of sides 100 m, so 1 hectare = 10 000 m ² . A hectare is about 2.5 times the size of land as an acre in the old imperial British system.
histogram:	a graph that uses bars, where each bar represents a range of values. The category of what is being measured is on the bottom axis, and the frequency is on the vertical axis.
horizontal intercept:	the horizontal coordinate of the point(s) where the graph of the line or function intersects the horizontal axis; see intercepts .
hypotenuse:	In any right-angled triangle, the side opposite the right angle.

<p>Imperial system:</p>	<p>a system of measures that was used in Canada prior to 1976; a variation is still used in the U.S.A.. Measuring devices using this system often have each unit subdivided by halving, then halving the subdivisions, etc. Eg: ½ inch, ¼ inch, 2 pints to a quart, etc.</p> <table border="1" data-bbox="602 415 1468 905"> <thead> <tr> <th colspan="2">Selected conversions</th> </tr> <tr> <th>Imperial to Imperial</th> <th>Imperial to Metric (or SI)</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;">Length</td> </tr> <tr> <td>1 mile=1760 yards</td> <td>1 mile=1.609 km</td> </tr> <tr> <td>1 yard = 3 feet</td> <td>1 yard = 0.9144 m</td> </tr> <tr> <td>1 foot = 12 inches</td> <td>1 inch =2.54 cm</td> </tr> <tr> <td colspan="2" style="text-align: center;">Capacity (volume)</td> </tr> <tr> <td>1 gallon = 4 quarts</td> <td>1 Gallon = 4.546 l</td> </tr> <tr> <td>1 quart = 2 pints</td> <td></td> </tr> <tr> <td colspan="2" style="text-align: center;">Mass (weight)</td> </tr> <tr> <td>1 ton = 2000 lbs</td> <td>1 pound = 0.454 kg</td> </tr> <tr> <td>1 pound = 16 ounces</td> <td>1 ounce = 28.35 g</td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table> <p><i>Caution:</i> <i>US gallons and quarts are different capacities than Imperial</i></p>	Selected conversions		Imperial to Imperial	Imperial to Metric (or SI)	Length		1 mile=1760 yards	1 mile=1.609 km	1 yard = 3 feet	1 yard = 0.9144 m	1 foot = 12 inches	1 inch =2.54 cm	Capacity (volume)		1 gallon = 4 quarts	1 Gallon = 4.546 l	1 quart = 2 pints		Mass (weight)		1 ton = 2000 lbs	1 pound = 0.454 kg	1 pound = 16 ounces	1 ounce = 28.35 g		
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<p>income tax:</p>	<p>money paid as tax to the federal and provincial governments based on the amount of income earned.</p>																										
<p>Inconsistent system of equations:</p>	<p>a system of linear equations with no solutions $x + y = 3$ and $x + y = -2$ is an inconsistent system. The solution represents distinct parallel lines.</p> 																										
<p>Independent events:</p>	<p>two or more events for which the occurrence or non-occurrence of one does not affect the occurrence of the others. Example: winning the lottery and being struck by lightning are independent events, one has nothing to do with the other.</p> <p>Contrast: Dependent events</p>																										
<p>Independent variable:</p>	<p>the input variable in a relation, often called x; also called the manipulated variable, the thing you are changing to measure a response.</p>																										

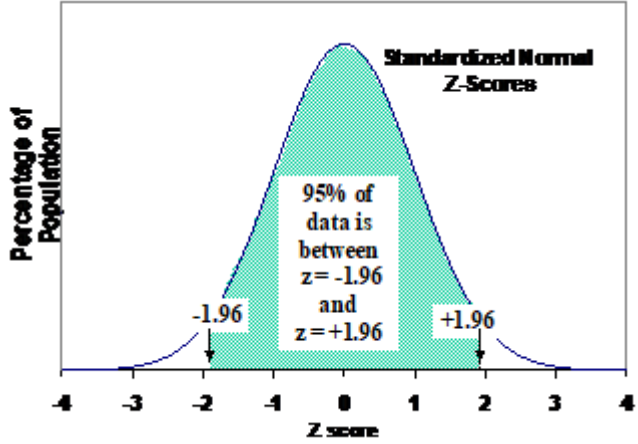
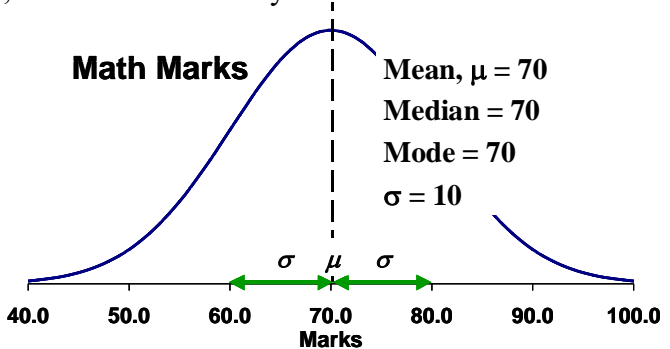
index:	used to measure the performance of the stock market; common indices are the TSE 300 and the Dow Jones
inferential Statistics:	Statistics calculated for a set of data collected from a sampling of the population; used to draw conclusions about the population. Eg: If we find a mean characteristic (like height) of a large sample then we can infer that that mean characteristic for everyone in Canada is about the same.
initial (probability) matrix:	a row matrix containing the probabilities or distribution at the beginning of an experiment or survey. Eg: if 30% of the country drives a van, and 70% drive a car the initial probability matrix would be: $[0.3 \ 0.7]$
integers:	see number systems
intercepts:	<p>the horizontal and vertical coordinates of the points at which a graph crosses the horizontal and vertical axes</p> <p>At the right: The x-intercept is 2 and the y-intercept is -4.</p> 
interest(simple):	<p>money paid for the use of money, usually at a predetermined percent. If P is the amount invested or borrowed, r, the rate of interest per annum, and t, the time in years, then I, the interest, is given by the formula: $I = Prt$.</p> <p>Juanita purchased a \$500 bond at an interest rate of 6.5% per annum. After 6 months, she receives the following interest: $I = \\$500 \times 6.5\% \times 6/12 = \\$500 \times 0.065 \times 0.5 = \\16.25</p>
interpolate:	<p>Estimate a value that lies between known values.</p> <p>To use the graph at the right to estimate the distance travelled after 4 it appears as though the distance would be interpolated as 160 km for 4 hours.</p> 

irrational numbers:	see number systems																
iterative procedure:	<p>a procedure in which a sequence of steps is repeated many times and calculations depend on previous calculations. Eg: making a table of compound interest amounts of an investment</p> <table border="1"> <thead> <tr> <th>Time</th> <th>Start Value</th> <th>Interest</th> <th>End Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>\$500.00</td> <td>\$50.00</td> <td>\$550.00</td> </tr> <tr> <td>1</td> <td>\$550.00</td> <td>\$55.00</td> <td>\$605.00</td> </tr> <tr> <td>2</td> <td>\$605.00</td> <td>\$60.50</td> <td>\$665.50</td> </tr> </tbody> </table>	Time	Start Value	Interest	End Value	0	\$500.00	\$50.00	\$550.00	1	\$550.00	\$55.00	\$605.00	2	\$605.00	\$60.50	\$665.50
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0	\$500.00	\$50.00	\$550.00														
1	\$550.00	\$55.00	\$605.00														
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lease:	to rent an item from the owner; the lease payments cover the depreciation of the item over the course of the lease plus interest on the outstanding balance of the full purchase price.																
least squares method:	for a set of data, a method that is used by many calculators and computers to determine a line or curve of best fit																
limiting factor:	<p>a factor that restricts the number of possible outcomes of an experiment Eg: calculating the number of ways we can line up at the door if we are limited or restricted by the fact that Fiona must be first.</p>																
line of best fit:	<p>a line that passes as close as possible to a set of plotted points</p>																
line segment:	the part of a line between two points on the line, including the two points.																

<p>linear equation and its graph:</p>	<p>an equation that represents a straight line; can be written in the form $y = mx + b$, where m is the slope and b is the y-intercept, or 'standard form' $Ax + By = C$, where A, B, and C are numbers.</p> <p>(1) Slope-Intercept method of graphing. Graph the line $y = 2x - 4$. This line has a slope, m, of 2 and a y-intercept of -4. Mark the point $(0, -4)$ on the y-axis. From that point move up a rise of 2 for every 1 run to the right. Mark this point, and then draw the line joining these points.</p>  <p>(2) Intercept method of graphing. Calculate the points at which the line intersects the axes using a simple table. y-intercept: when $x = 0$, $y = 0.5(0) + 2 = 2$; x-intercept: when $y = 0$, $0 = .5x + 2$; so $x = -4$. Plot, then join the intercepts</p> 
<p>linear function:</p>	<p>a function whose equation can be written in the form $f(x) = mx + b$, and whose graph is a non-vertical line. Each equal increment change in change in the input, x, causes a constant change in the output, $f(x)$</p>
<p>linear system:</p>	<p>two or more linear equations in the same variables $5x - 2y = 7$ and $y = 3x + 1$ form a linear system.</p>
<p>maintenance level:</p>	<p>the maximum level of an ingested substance that will be absorbed into the bloodstream.</p>

margin of error:	the proportion that we add to and subtract from the result to construct the confidence interval.
marginal tax rate:	the rate of income tax charged on the last dollar earned; as your income increases, the rate of tax you pay increases. Mary paid a total of \$26000 tax on her \$81000 salary. She received a final bonus of \$1000, and paid \$450 tax on these last thousand dollars. This means that her marginal tax rate is \$450 per \$1000, or 45%.
markup:	see gross profit
mass:	a measure of the amount of material in an object; common units are grams or kilograms
matrix:	a rectangular array of numbers
mean:	<p>the average of a set of number values. It is a statistic of central tendency. Calculated by adding all the values, x_i, of the data and dividing by the number of data values, n.</p> $\bar{x} = \frac{\sum x_i}{n}$ <p>The mean of 1, 2, 3, 4, 6, 6, 6, 8, 9, 10 is</p> $\bar{x} = \frac{1+2+3+4+6+6+6+8+9+10}{10} = \frac{55}{10} = 5.5$ <p>The mean can also be described as the centre of mass or balance point of the data's histogram. The sum of all the data to the left equals the sum of all the data to the right of the mean.</p> <p>See also: sample mean and population mean.</p>
measurement error:	the difference between a measure and its true value
measurement standards:	the standard set by the General Conference on Weights and Measures in 1889 so that all persons would be dealing in the same measurements
median:	<p>the middle number of a set of numbers arranged in numerical order; half of the data values are less than the median and half are more than the median. If there are two middle numbers, the median is calculated as the average of the two middle numbers.</p> <p>Eg: For the data 2, 4, 8, 9, and 11 the median is 8. For the data 2, 4, 6, 8, 9, and 11 the median is 7, since $(6+8)/2 = 7$.</p>
meiosis:	the process of cell division in which sperm and egg cells are produced

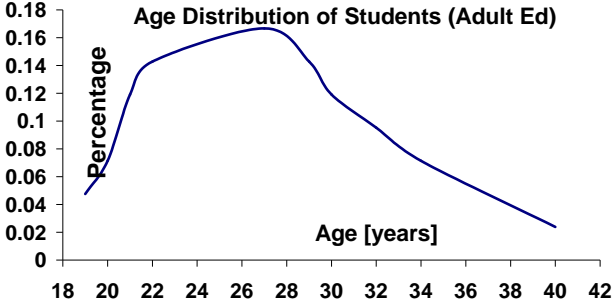
metric system:	<p>also called the SI system; based on a decimal system, with each unit subdivided into tenths and prefixes showing the relation of a unit to the base unit; commonly used base units are: Metre (m) for length Gram (g) for mass Litre (L) for capacity Second (s) for time</p> <p>Note: 1 L = 1000 cm³, so 1 mL = 1 cm³ 1 tonne (sometimes called a metric ton) is used for mass: 1t =1000 kg</p> <p>Convert 34.6 cm to m: from the table above, 1 cm = 0.01 m 34.6 x 1 cm = 34.6 x 0.01 m 34.6 cm = 0.346 m</p> <p>Convert 246 cm² to mm²: from the table above, 1 cm = 10 mm (1 cm)² = (10 mm)² 1 cm² = 100 mm² 246 x 1 cm² = 246 x 100 mm² 246 cm² = 24 600 mm²</p> <p>Convert 35 mL to L: from the table above, 1 mL = 0.001 L 35 x 1 mL = 35 x 0.001 L 35 mL = 0.035 L</p>																						
midpoint:	<p>the point that divides a line segment into two equal parts . . A M B</p> <p>On a coordinate grid, if the endpoints are A(x₁,y₁) and B(x₂,y₂),the coordinates of M are: x_M = $\frac{x_1 + x_2}{2}$ y_M = $\frac{y_1 + y_2}{2}$</p> <p>Find the midpoint of the line segment with endpoints P(-2, 8) and Q(3, 0). Midpoint= (-2; 3, 8; 0) = (f,4)</p>																						
mill rate:	<p>the rate (in thousandths of a dollar) at which property tax is to be paid on the assessed value of the property</p>																						
mode:	<p>the most frequently occurring value in a set of data. In the data set {5, 12, 8, 7, 3, 5, 3, 10, 5},the mode is 5.</p> <div data-bbox="836 924 1234 1218"> <table border="1"> <caption>Shoe Size Frequency Data</caption> <thead> <tr> <th>Shoe Size</th> <th>Frequency</th> </tr> </thead> <tbody> <tr><td>3</td><td>2</td></tr> <tr><td>4</td><td>0</td></tr> <tr><td>5</td><td>3</td></tr> <tr><td>6</td><td>0</td></tr> <tr><td>7</td><td>1</td></tr> <tr><td>8</td><td>1</td></tr> <tr><td>9</td><td>0</td></tr> <tr><td>10</td><td>1</td></tr> <tr><td>11</td><td>0</td></tr> <tr><td>12</td><td>1</td></tr> </tbody> </table> </div>	Shoe Size	Frequency	3	2	4	0	5	3	6	0	7	1	8	1	9	0	10	1	11	0	12	1
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10	1																						
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momentum:	<p>a vector quantity found by multiplying an object's mass by its velocity; see Chapter 7 Project</p>																						
mortgage:	<p>a long-term loan on real estate that gives the person or firm providing the money a claim on the property if the loan is not repaid</p>																						
mutual fund:	<p>an investment in which your money is pooled with the money of many other investors; a professional fund manager invests the monies in a variety of securities; see Tutorial 4.3</p>																						
mutually exclusive events:	<p>two or more events that do not share any common outcomes; see Tutorial 1.5</p>																						
natural numbers:	<p>see number systems</p>																						
negative number:	<p>a number less than 0</p>																						

<p>95% confidence interval:</p>	<p>the range of values that lie within 1.96 standard deviations of the mean; the probability a particular data value lies in that range is 0.95</p>  <p>The graph shows a bell-shaped curve representing a standardized normal distribution. The x-axis is labeled 'Z score' and ranges from -4 to 4. The y-axis is labeled 'Percentage of Population'. A central box indicates that 95% of the data lies between z = -1.96 and z = +1.96. The area under the curve between these two points is shaded green.</p>
<p>nominal rate of interest:</p>	<p>the stated rate of interest for the given period; see Tutorial 4.5</p>
<p>non-linear systems:</p>	<p>two or more equations in which at least one is not a linear equation The system $Y = 2x^2 + 3$ and $4x + 3y = 12$ is a non-linear system.</p>
<p>normal distribution:</p>	<p>a probability distribution with mean, μ, and standard deviation, σ. the bell-shaped graph is symmetrical about the mean. The mean, median, and mode are all equal. Obeys the 68-95-99 rule. A very common distribution in every day life; people's shoe sizes, people's heights, IQs, errors in measurements, school marks, income, etc. Also commonly called: 'the bell curve'</p>  <p>The graph shows a bell-shaped curve for 'Math Marks'. The x-axis is labeled 'Marks' and ranges from 40.0 to 100.0. A vertical dashed line indicates the mean, median, and mode, all equal to 70. The standard deviation σ is 10, with arrows showing the spread from the mean to 60.0 and 80.0.</p> <p> Math Marks Mean, $\mu = 70$ Median = 70 Mode = 70 $\sigma = 10$ </p>

number systems:	<p>$\mathbb{R} \supset \mathbb{Q} \supset \mathbb{N}$. The Natural numbers, \mathbb{N}, also called the counting numbers, are 1, 2, 3, 4, 5, If the number 0 is included, we get the Whole numbers, \mathbb{W}: 0, 1, 2, 3, 4, 5, The Integers, \mathbb{I}, contain all of the whole numbers and all of their negatives: ..., -3, -2, -1, 0, 1, 2, 3, The set of numbers that can be written in the form $\frac{m}{n}$, where m and n are integers and $n \neq 0$ are the Rational numbers, \mathbb{Q}. Integers are rational numbers, since they can be expressed as fractions with denominator 1. All terminating or repeating decimals are rational numbers. Irrational numbers, (2, cannot be expressed as fractions involving integers. They are nonterminating, non-repeating decimals. Numbers such as $\sqrt{2}$ and $\ln 2$ are irrational. The Real number system, \mathbb{R}, consists of all rational numbers together with all irrational numbers. It can be represented by all positions on a number line.</p>
oblique triangle:	a triangle that does not contain a 90° angle
obtuse angle:	an angle greater than 90° but less than 180°
obtuse triangle:	a triangle with one obtuse angle
opposite side:	the side opposite a given angle in a right triangle
opposite vectors:	have the same magnitude but act in opposite directions; see Tutorial 7.1
order of operations:	<p>the rules that are followed when simplifying or evaluating an expression: Complete all operations within brackets following the order of operations. Evaluate all exponents. Complete all multiplication and division in the order they appear from left to right. Complete all addition and subtraction in the order they appear from left to right. Evaluate the following: $5 - 2(4 + 23 + 4)$ Begin with the exponent within the brackets. $= 5 - 2(4 + 8 + 4)$ Complete the division within the brackets. Complete the addition within the brackets. Complete the multiplication. Finish by completing the subtraction. $= 5 - 2(4 + 2) = 5 - 2(6) = 5 - 12 = -7$</p>
ordered pair:	a pair of numbers, written as (x, y) that represent a point on the coordinate plane; see coordinates
orthographic diagram:	a diagram commonly used in industry that shows at least three points of view: the top, front and side; also shows the internal features top front side
outcome:	a possible result of an experiment; a possible answer to a survey question For the experiment of tossing a six-sided die, the possible outcomes are rolling a 1, 2, 3, 4, 5, or 6.
outlier:	an observed value that differs markedly from the pattern established by most of the data

parallel lines:	lines in the same plane that do not intersect m and n Lines m and n are parallel with a transversal, t . If two lines are parallel and cut by a transversal, then the following will be true The alternate interior angles will have equal measures (congruent). $L_3 = L_6$ and $L_4 = L_5$ The corresponding angles will have equal measures (congruent). $L_1 = L_5$ and $L_2 = L_6$ $L_3 = L_7$ and $L_4 = L_8$ The same-side interior angles add up to 180. (supplementary). $L_3 + L_5 = 180$. and $L_4 + L_6 = 180$. If anyone of these conditions is true then the lines must be parallel. Lines that are parallel will have the same slope.
parallelogram:	a quadrilateral with opposite sides parallel c A B A parallelogram has these properties: The opposite sides have equal lengths. $AB = CD$ and $AD = BC$ The opposite angles have equal measures (congruent). $L_A = L_C$ and $L_B = L_D$ The diagonals bisect each other (cut each other into equal lengths). $AE = EC$ and $DE = EB$
parallelogram method of vector addition:	a method for finding the sum of two vectors arranged tail-to-tail; see Tutorial 7.2
parameters:	the constants in the equation of a particular function; see Tutorial 5.4
percent:	means "out of 100"; symbolized by % A percent can be written as a fraction with denominator 100, or as a decimal. $Q = 45$ - $d = 150$ - 45 $VD = 100 - 0.45$ an $1500/0 = 100 - 1.50$ 1. What percent is 33 out of 48? We must determine x , where $\sim = 1 \sim 0$. To isolate x , multiply both sides by 100. $100 \times \sim = 100 \times 1 \sim 0$ $68.75 = x$ Thus, 33 out of 48 is $68.75/0$. 2. Find 70/0of 45.95. $70/0of 45.95 = 0.07 \times 45.95$, changing the percent to its decimal form $= 3.2165$ Thus, 70/0of 45.95 is 3.2165. 3. 7.5 is 200/0of what number? Let the unknown number be x and write the question as: $7.5 = 200/0$ of x Use the decimal form of the percent $7.5 = 0.20 \times x$ Solve for x by dividing both sides of the equation by 0.20. $7.5 - 0.20 \times 0.20 = 0.20$ $37.5 = x$ Thus, 7.5 is 200/0of 37.5.
perimeter:	the distance around a closed figure; see square, rectangle, triangle, and circle
period:	the length of the shortest part of the graph that repeats, measured along the horizontal axis; see Tutorials 5.1, 5.2, 5.3, and 5.4
periodic data:	data that contain cycles that repeat at regular intervals; see Tutorial 5.1

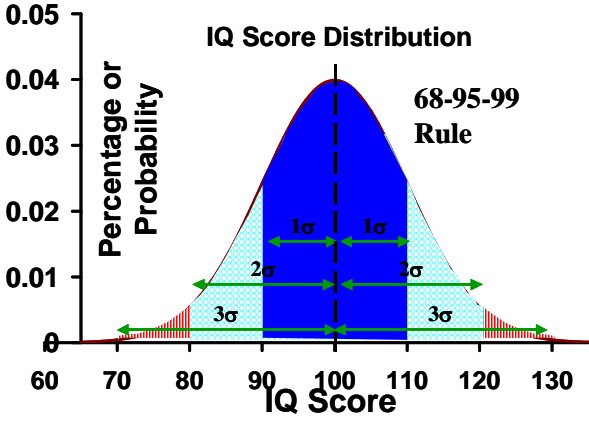
permutation	<p>An ordered arrangement of different objects.</p> <p>If all quantity 'n' of some different objects are arranged there is 'n!' ('n factorial') ways to arrange them.</p> <p>If only a sub-quantity 'r'; where $r < n$, of the possible n objects are selected then there are ${}_n P_r$ ways to arrange the objects where:</p> ${}_n P_r \equiv \frac{n!}{(n-r)!}$ <p>Examples:</p> <p>a. Five different bingo dabbers; arrange all five of them in front of you in a line. The number of ways is</p> $5 * 4 * 3 * 2 * 1 \text{ or } n! \text{ or } {}_5 P_5 \equiv \frac{5!}{(5-5)!} = 120$ <p>b. Five different bingo dabbers, but you are only going to put three of them in front of you. How many arrangements?</p> $5 * 4 * 3 \text{ or } {}_5 P_3 \equiv \frac{5!}{(5-3)!} = \frac{5 * 4 * 3 * 2 * 1}{2 * 1} = 60$
perpendicular:	at right angles Two lines are perpendicular if their slopes are negative reciprocals of one another.
phenotype:	the appearance of a genetic trait
pi (n):	the ratio of the circumference of a circle and its diameter; $n \sim 3.1416$
pictorial diagram:	a two dimensional representation of a three dimensional figure drawn from one perspective
polygon:	a closed figure that consists of line segments that only intersect at their endpoints The above figures are polygons. The table below gives the names of some common polygons. 6 8 10 Quadrilateral Pentagon Hexagon Octagon Decagon n-gon
population:	the entire set of objects, people, or processes being studied
positive number:	a number greater than 0
power:	see exponent
pressure:	a measure of the amount of force acting on a unit area of a surface; calculated by dividing the force acting on a surface by the area of the surface If a force of 20 N is acting on a surface whose area is 4 m ² , what is the pressure on the surface? Pressure = Force/area $p = \frac{20}{4} = 5 \text{ N/m}^2$
prime numbers:	a whole number with exactly two factors, itself and 1; for example, 3, 5, 7, 11, 29, 31, and, 43
principal:	the original amount of a loan or investment Suppose you invest \$5000 at 7%, compounded annually, for 5 years. The principal is \$5000.
prism:	a solid with two congruent and parallel faces (bases), all other faces are parallelograms 10cm Area = 6 cm ² The volume of a prism

	is the area of the base multiplied by the height. Volume =(Area of base)(Height) $V=A \times h$ For the prism shown $V =(6 \text{ cm}^2)(10\text{cm}) =60 \text{ cm}^3$
probability:	an indication of the likelihood of an event occurring; if the outcomes of an experiment are equally likely, it is the ratio of the number of favourable outcomes to the total number of outcomes Find the probability of getting a 5 in a single roll of one die. There are 6 outcomes, only one of which is favourable (getting a 5), so the probability is $\frac{1}{6}$.
probability distribution:	a probability distribution gives the theoretical probability for each outcome of an experiment. It can also shows the percentage of the occasions that one can expect some variable or measurement to take on a certain value 
property taxes:	property owners pay tax to their municipal government; the amount of property tax is calculated using the formula Assessed value \times Mill rate \div 1000 Determine the property taxes for a property that has a fair market value of \$265 000 if the assessed value is 75% of the fair market value and the mill rate is 18 mills. Assessed value $=0.75 \times 265000 =\$198 750$
proportion:	a statement that two ratios are equal To solve for an unknown quantity within a proportion, first clear the fraction by multiplication. $\frac{12}{5} = \frac{x}{5}$ $12 \times 5 = 5x$ $12 \times 5 = 5x$ $60 = 5x$ $60 \div 5 = x$ $12 = x$
PunnettSquare:	a table showing the sample space for the possible genotypes of the offspring of parents with given genotypes
pyramid:	a solid with one face that is a polygon (base) and other faces that are triangles with a common vertex The formula to calculate the volume, v , of a pyramid is: Volume = $\frac{1}{3}$ (Basearea)(Height) Forthe pyramid shown: $V= \frac{1}{3}(8 \text{ cm} \times 10\text{cm})(12\text{cm}) = 320\text{cm}^3$
Pythagorean Theorem:	for any right triangle, the area of the square on the hypotenuse is equal to the sum of the areas of the squares on the other two sides $a^2 + b^2 = c^2$. Using the values for the right triangle shown, substitute into the above formula.
quadrant:	one of the four regions into which the coordinate axes divide the

	plane, usually numbered as shown in the diagram y 11 I x 0 III IV
quadrilateral:	a four-sided polygon; see polygon
radian:	a unit for angle measure; the measure of the central angle of a sector with arc length of the sector equal to the radius; see Tutorial 5.2 1radians = 180.
radical:	the root of a number y'S, ~, v'26
radius:	the distance from the centre of a circle to any point on the circumference; also, a line segment joining the centre of a circle to any point on the circumference The radius of a circle is half the length of its diameter. 0
random sample:	a sampling in which all members of the population have an equal chance of being selected
range:	the difference between the highest and the lowest data values For the data set {5, 12, 8, 7, 3, 5, 3, 10, 5}, the range is $12 - 3 = 9$.
range of a function or a relation:	the set of output numbers of a function or a relation
rate:	a certain quantity of one thing considered in relation to one unit of another Speed is the rate at which distance traveled changes in relation to one unit of time. The slope of a line is the rate at which the line rises for one unit of horizontal run.
ratio:	a comparison of two or more quantities with the same unit A rectangular box has length 18 cm, width 5 cm, and height 8 mm. To give the ratio of the lengths of its sides, first change all lengths to the same units, mm, then reduce by dividing by common factor: $180 : 50 : 8 = 90 : 25 : 4$
rational numbers:	see number systems
real numbers:	see number systems
recessive trait:	in genetics, both alleles must be recessive for the trait to be expressed
rectangle:	a quadrilateral that has four right angles 5cm 12cm Perimeter = $2 \times \text{Length} + 2 \times \text{Width}$ $P = 2l + 2w$ Area = $\text{Length} \times \text{Width}$ $A = lw$ For the rectangle shown: $P = 2(12 \text{ cm}) + 2(5 \text{ cm}) = 24 \text{ cm} + 10 \text{ cm} = 34 \text{ cm}$
rectangular prism:	a prism that has rectangular faces; see prism $A = (12 \text{ cm})(5 \text{ cm}) = 60 \text{ cm}^2$
recursively generated sequence:	a sequence in which each term, after the first, is generated using the terms that come before it
Registered Retirement Savings Plan (RRSP):	a savings plan for individuals who earn income, where funds contributed and interest earned are not taxed until the funds are withdrawn
regression:	a process by which a curve or line of best fit is fitted to a set of data using a least squares process

regular polygon:	a polygon with all sides and all angles equal The polygons below are regular polygons.
relation:	a rule that produces one or more output numbers for every valid input number Here are two relations: $25 = x^2 + y^2$ and $f(x) = 3x - 7$.
reliability:	for a sample statistic, if nearly the same result is obtained in subsequent studies; for a test, if, when the test is repeated, the results are nearly the same
remove fractions from an equation:	to make an equation easier to simplify by getting rid of the fractions
residual:	the vertical distance between a plotted point and a line of best fit
residual value:	the value of a leased item at the end of the lease period; see Tutorial 4.4
resultant:	the vector that results from adding two or more vectors; see Tutorial 7.2
revenue:	money brought in from the sale of goods or services The sale of 158 tickets for a show costing \$20 each produces revenue of \$3160.
rhombus:	a parallelogram with four equal sides
right angle:	a 90° angle L
right triangle:	a triangle with one right angle
rise:	the vertical distance between two points; see slope
rough sketch:	a drawing that is not accurate, but is representative of the data being considered
row matrix:	a matrix with only one row; see Tutorial 2.1
Rule of 72:	the number of years it takes money to double in value is approximately $\frac{72}{\text{interest rate}}$ Susan invests a sum of money at 10%ja. She will double her money in about $\frac{72}{10}$ or 7.2 years.
run:	the horizontal distance between two points; see slope
SI system:	see metric system; SI stands for Systeme Internationale des unites
salary:	a fixed amount of money earned by an individual over a specific amount of time
sample:	part of a population chosen to represent the total population in a study
sample mean	The statistical mean of a sample. The sample mean is represented by the symbol \bar{x} or \bar{x} . The sample mean is calculated as:
sample space:	the list of all possible outcomes in an experiment; see Tutorial 1.2
sample statistic:	a numerical value that is used to describe a sample, such as the mean
sampling:	the process used to choose part of a population to represent the total population in a study
scalar:	a constant; see Tutorials 2.1 and 7.3
scalar quantities:	quantities that can be described by specifying their magnitude only; see Tutorial 7.1
scale:	for a map, model, or diagram, the ratio of the distance between two

	points to the distance between the actual locations; also the numbers on the coordinate axes
scale break:	a small zig-zag mark on a graph's scale to indicate a break in the scale
scale drawing:	a drawing which either enlarges or reduces the original by a particular factor; see scale factor
scale factor:	the ratio of corresponding sides on similar figures The triangles in the diagram are similar. To find the scale factor, find the ratio of the corresponding sides. Scale factor = $\frac{195\text{cm}}{325\text{cm}} = 0.6$
scatter plot:	a graph of data that are a series of points $80 \sim 0$ $70 \sim 60 \dots 50$ 0 150 160 170 180 Height(cm)
scientific notation:	a number expressed as the product of a number greater than -10 and less than -1, or greater than 1 and less than 10, and a power of 10 $47000 = 4.7 \times 10^4$, and $-26 = -2.6 \times 10^1$
sector:	the figure formed by an arc of a circle, the radii at the ends of the arc, and all the enclosed points; see Tutorial 5.2
sector angle:	the angle at the centre of the circle between two radii; see central angle; see Tutorial 5.2
self-selected sample:	a sample in which only interested members of the population will participate
self-similarity:	a part of an object is geometrically similar to the whole object; see Tutorial 6.3
semicircle:	half a circle
significant digits:	the meaningful (non-zero) digits of a number The measurement 120.7cm has 4 significant digits. The measurement 0.004 mm has 1 significant digit; the zeros are acting as placeholders.
similar figures:	figures that have the same shape but are not necessarily the same size 8cm Y When two figures are similar, their corresponding angles will have equal measures, and their corresponding sides are in proportion (all have the same scale factor). The symbol \sim is used to indicate two figures are similar. To find an unknown side of one similar figure, use a proportion. $9 - 8 - 6$ $6-y-x$ Scale factor = $\frac{3}{2} = 3:2$ To find x, solve the following proportion. $3 - 6$ $2-x$ $2x:12 = 3:6$ $2x = 12 \times \frac{2}{3}$ $2x = 8$ $x = 4$ To find y, solve the following proportion. $3 - 8$ $2-y$ 3 8 $2y$ $x - 2 = 2y$ $x - Y$ $3y = 16$ $y = \frac{16}{3}$ 5.33
similar objects:	objects that have the same shape but are not necessarily the same size Althea corresponding angles will have equal measures and all dimensions will be proportional.
simple interest:	see interest (simple)
sine:	for an acute angle LA in a right triangle, the ratio of the length of the opposite side to the length of the hypotenuse
Sine Law:	a trigonometric law used to solve triangles Use the Sine Law in an oblique triangle where 2 angles and one side are known. A B a C In any triangle ABC: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ Use the Sine Law to find the length of AB. B A C 4.0 12 b -

	$C \sin B - \sin C$ $4.0 C \sin 102' = \sin 30' 4.0 \times \sin 30' - \sin 102' - C$ $2.0'; c$
sinusoid:	see sinusoidal function
sinusoidal data:	periodic data that, when graphed, looks like a sine curve; see TutorialS.]
sinusoidal function:	functions of curves that can be described by an equation of the form $y = a \sin (bx + c) + d$; see TutorialS.3
sinusoidal regression:	determining the equation of the sinusoid of best fit for given data; see Tutorial S.5
68-95-99 rule:	<p>about 68% of the population are within 1 standard deviation of the mean; about 95% of the population are within 2 standard deviations of the mean; about 99.7% of the population are within 3 standard deviations of the mean.</p> 
slope:	<p>a measure of the steepness of a line; the tangent of the angle made by the line with the x-axis The slope of a line segment joining $A(x_A, y_A)$ and $B(x_B, y_B)$ is: $\text{Slope} = \frac{y_B - y_A}{x_B - x_A}$</p> <p>slope, y-intercept form: the equation of a line in the form $y = mx + b$, where m is the slope of the line and b is the y-intercept of the line; see linear equation and its graph .. The equation $y = 3x + 5$ is that of a line with a slope of 3 and a y-intercept of 5.</p>
solve a linear system:	<p>to find all the ordered pairs that satisfy both equations in the linear system Solve the system: $2x + y = 5$ and $4x - y = 7$ @ $2x + y = 5$ Add the two equations. $+ 4x - y = 7$ $2x + 4x = 5 + 7$ $6x = 12$ $x = 2$ Substitute $x = 2$ in either of the original equations. $4(2) - Y = 7$ $8 - y = 7$ $8 - 7 = y$ $1 = y$ Therefore, $(2, 1)$ solves the system.</p>
solve an equation:	<p>to determine the value(s) of the unknown that, when substituted for the unknown in the equation, result(s) in a true statement Solve the equation $3x + 5 = 5x - 4$. Use inverse operations to move all the terms in the variable to one side of the equation. $3x + 5 - 3x = 5x - 4 - 3x$ Subtract $3x$ from both sides. Rearrange to collect like terms. Simplify. Isolate the term in x; add 4 to both sides. Simplify. Isolate x; divide both sides by 2. $3x - 3x + 5 = 5x - 3x - 4$ $5 = 2x - 4$ $5 + 4 = 2x - 4 + 4$ $9 = 2x$ $9 - 2x = 2x - 4.5 = x$</p>
speed:	see average speed

sphere:	the set of points in space that are a given distance (radius) from a fixed point (centre) Surface Area, $S = 4\pi r^2$ Volume, $V = \frac{4}{3}\pi r^3$																																				
spreadsheet:	a computer-generated arrangement of data in rows and columns, where a change in one value can result in appropriate calculated changes in the other values																																				
square:	a rectangle with four equal sides																																				
square matrix:	a matrix with the same number of rows as columns; see Tutorial 2.1																																				
square root:	a number which, when multiplied by itself, results in the given number 5 and -5 are the square roots of 25, since $5^2 = 25$ and $(-5)^2 = 25$. The notation $\sqrt{25}$ is reserved for the positive square root only.																																				
standard deviation:	<p>A measure of variability or dispersion.. A measure of the extent to which data cluster around the mean.</p> <table border="1"> <caption>Shoe Sizes vs Gender</caption> <thead> <tr> <th>Shoe Size</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr><td>4</td><td>1</td><td>5</td></tr> <tr><td>5</td><td>4</td><td>7</td></tr> <tr><td>6</td><td>10</td><td>8</td></tr> <tr><td>7</td><td>16</td><td>10</td></tr> <tr><td>8</td><td>20</td><td>10</td></tr> <tr><td>9</td><td>19</td><td>9</td></tr> <tr><td>10</td><td>15</td><td>9</td></tr> <tr><td>11</td><td>9</td><td>8</td></tr> <tr><td>12</td><td>3</td><td>7</td></tr> <tr><td>13</td><td>2</td><td>5</td></tr> <tr><td>14</td><td>1</td><td>4</td></tr> </tbody> </table>	Shoe Size	Male	Female	4	1	5	5	4	7	6	10	8	7	16	10	8	20	10	9	19	9	10	15	9	11	9	8	12	3	7	13	2	5	14	1	4
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11	9	8																																			
12	3	7																																			
13	2	5																																			
14	1	4																																			
standard form:	for the equation of a line, the standard form is $Ax + By + C = 0$, where A, B, and C are integers; see equation of a line																																				
standard normal distribution:	a normal distribution with mean 0 and a standard deviation of 1; the bell-shaped graph is symmetrical about the mean; obeys the 68-95-99 rule; see Tutorial 3.4																																				
start point of a sine curve:	the middle point on the increasing portion of the sine curve closest to the y-axis; see Tutorial 5.4																																				
statistic:	a quantity used to describe a set of data; see Tutorial 3.2																																				
statistics:	the branch of mathematics that deals with the collection, organization, and interpretation of data																																				
steady state:	the probability matrix does not change when multiplied by the transition matrix; in other words, $P_{n+1} = P_n$; see Tutorial 2.4																																				
strata:	the non-overlapping subgroup obtained when a population is separated into subpopulations																																				
stratified random sample:	a sample in which all members of different segments of the population have an equal chance of being selected																																				
substituting into	in an algebraic expression, replacing the letters with the indicated																																				

an expression:	numbers or expressions each time they occur and simplifying according to the order of operations Substitute $r = 4.5$ and $t = 2$ into the expression $8,2 - 2t$. $8,2 - 2t = 8(4.5)2 - 2(2) = 8(20.25) -$
supplementary angles:	two angles whose sum is 180. IL L1 and L2 are supplementary.
surface area:	a measure of the area on the surface of a three-dimensional object; see cube, cylinder, and sphere
survey:	an investigation of a topic to find out people's views
systematic sample:	a sample in which every n th member of a population is selected

tail-to-tail:	two vectors are drawn tail-to-tail if they have the same start point; see Tutorial 7.2
tangent:	for an acute LA in a right triangle, the ratio of the length of the opposite side to the length of the adjacent side
template:	a pattern used to create spreadsheets or documents; see Tutorial 4.]
term deposit:	an account whose rate of interest is guaranteed for a specified term where withdrawal before the end of the term may result in the loss . of interest
theoretical probability:	probability determined using the sample space; see Tutorial].]
three-dimensional:	having length, width, and depth or height
Toronto Stock Exchange 300 Composite Index (TSE300):	tracks the composite price of 300 of the largest companies traded on the Toronto Stock Exchange; see Tutorial 4.3
transition matrix:	a square matrix that shows how the probability of one event is dependent on the probability of another event occurring; see Tutorial 2.4
translation:	a transformation that moves a point or a figure in a straight line to another position in the same plane; see Tutorial 5.3
tree diagram:	a branching diagram used to show all possible outcomes of an experiment This tree diagram shows all the outcomes of an experiment in which a die is rolled and a coin is tossed.
triangle:	a three-sided polygon C B A $c = 20\text{cm}$

	<p>Perimeter= Sumof the three sides $=a+b+c = 10 \text{ cm} + 18\text{cm} + 20 \text{ cm}$ $=48\text{cm}$ Area = t (Base)(Height) =tbh =t $(20 \text{ cm})(9 \text{ cm}) =90 \text{ cm}^2$ The interior angles in any triangle add up to 180.. If the measures of two angles within a triangle are known, the third can be calculated by adding the measures of the two known angles and subtracting the resultfrom 180.. If LA = 35. and LB = 48., then LC = 180. - (35. + 48.) = 97.</p>
triangle method of vector addition:	a method for finding the sum of two vectors arranged head-totail; see Tutorial 7.2
trigonometric ratios:	see cosine, sine, and tangent
two-dimensional:	having length and width, but no thickness, height, or depth
uniform distribution:	a probability distribution in which all the probabilities are equal; see Tutorial 3.]
unit price:	the price of one item, or the price for a particular mass or volume of an item
validity:	an indicator of how well a test really measures what it is suppose to measure; a sample statistic is valid if it closely approximates the quantity for the population
variability	In statistics; the amount of spread that data have about (or clustered around) the mean (or average). Also called dispersion. There are several ways to measure variability.
variable:	a letter or symbol used to represent a quantity that can vary
vector quantities:	quantities that are described by specifying both magnitude and direction; see Tutorial 7.1
velocity:	a vector quantity describing the speed and direction of a moving object; see"Tutorial 7.1
Venn diagram:	a diagram where the sample space is represented by a rectangle, and event sets are represented by closed curves

	within the rectangle; see Tutorials 1.2, 1.4, and 1.5
vertex:	the corner of a figure or solid vertex
Vertical intercept:	the vertical coordinate of the point at which the graph of the line or function intersects the vertical axis; see intercepts
volume:	the amount of space occupied by an object; see cone, cube, cylinder, prism, pyramid, sphere I I I I
wage:	monies that are earned hourly, daily, or by piecework; this may include gratuities or overtime pay
whole numbers:	see number systems
wholesale price:	the price paid by a retailer to purchase an item for resale
x-axis:	the horizontal number line on a coordinate grid
x-intercept:	the x-coordinate where the graph of a line or function intersects the x-axis; see intercepts and horizontal intercept
y-axis:	the vertical number line on a coordinate grid
y-intercept:	the y-coordinate where the graph of a line or function intersects the y-axis; see intercepts and vertical intercept
zero vector:	a vector with zero magnitude; parallel to any vector; the result of adding a vector and its opposite; see Tutorial 7.2
zeros of a function:	the values of x for which a function $y = f(x)$ has the value 0
z-score:	<p>the number of standard deviations a datum is from the mean in a normal distribution; The z-score is used so that probabilities and percentages can be looked up in tables. The calculation for the z-score is:</p> $z = \frac{x - \bar{x}}{\sigma} \text{ or } z = \frac{x - \mu}{\sigma} \text{ depending on}$ <p>whether the complete population mean, μ, is known or not.</p>