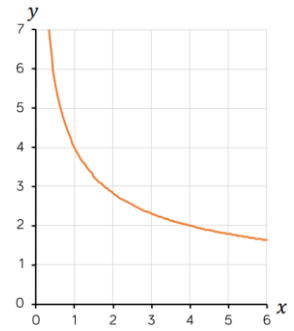
YEAR 11 – MULTIPLICATIVE REASONING

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Use scale factors		
• Understand direct proportion		
• Construct complex direct proportion equations (H)	199	Corbett
• Calculate with pressure & density	142	Corbett Corbett
• Understand inverse proportion		
• Construct inverse proportion equations (H)	199	Corbett
• Solve ratio problems		

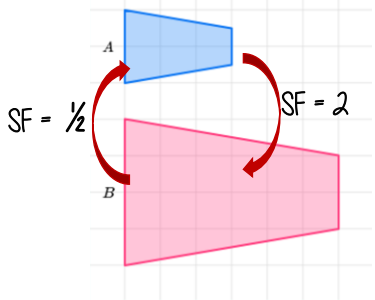


Keywords

Similar: same shape and angles, but a different size
Direct proportion: two quantities which remain in the same ratio at all times
Inverse proportion: a relationship in which one quantity increases as the other decreases
Linear: a direct proportion relationship – shown by a straight diagonal line on a graph
Varies directly: another was of saying 'direct proportion'
Constant of proportionality: the ratio between two quantities that are in proportion
Density: how much matter is in a particular volume of space, calculated as mass ÷ volume
Pressure: the effect of an object's weight on a surface, calculated as force ÷ area

Some (but not all) key points:

Scale factor



Direct proportion

$y \propto x$

Straight line

$y = kx$

Must pass through origin

Inverse proportion

$y \propto \frac{k}{x}$

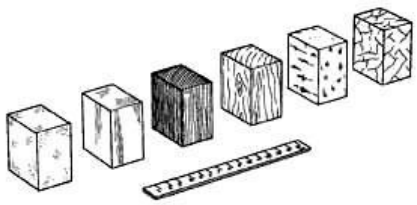
Same shape as a reciprocal graph

$y = \frac{k}{x}$

Doesn't touch the axes

The density of an object is calculated by:

mass ÷ volume



Density depends on what material the object is made from.

Units are usually g/cm^3 or kg/m^3.

y is inversely proportional to x. When x=3, then y=6. Find the value of y when x=8. (H)

$y \propto \frac{1}{x}$

$y = \frac{k}{x}$ ← constant of proportionality

Substitute x = 3 and y = 6

$6 = \frac{k}{3}$

×3 ( ) ×3

$18 = k$

Find the value of k

$y = \frac{18}{x}$ ← Re-write the equation of proportionality, using the found value of k

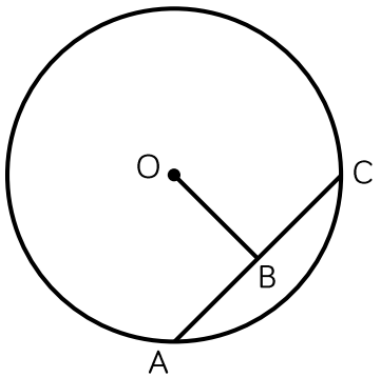
When x = 8: $y = \frac{18}{8}$

$y = \frac{9}{4}$

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

YEAR 11 – GEOMETRIC REASONING

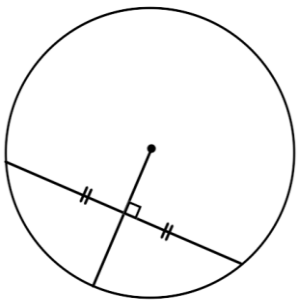
By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Use angles at a point (R)	45	Corbett
• Use angles in parallel lines & shapes (R)	120	Corbett
• Use interior & exterior angles in polygons (R)	123	Corbett
• Prove geometric facts		Corbett
• Solve problems involving vectors (R)	174 219	
• Use circle theorems (R) (H)		Corbett
• Circle theorem: Angle between radius & chord (H)		
• Circle theorem: Angle between radius & tangent (H)		
• Circle theorem: Two tangents from a point (H)		
• Circle theorem: Alternate segment theorem (H)		Corbett
• Pythagoras & trig ratios (H)	150b 168	Corbett Corbett Corbett



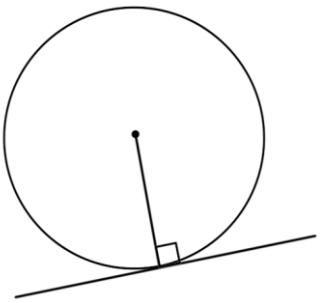
Keywords

Polygon: a 2D shape with straight sides
Regular: a shape with all side equal and all angles equal
Segment: the part of a circle cut off by a chord
Cyclic quadrilateral: put numbers in place of letters to find the value of an expression
Chord: a straight line connecting two points on a circles circumference
Bisect: cut into 2 equal parts
Tangent: a straight line which touches a circle at just one point
Hypotenuse: the side opposite the right angle in a right-angled triangle

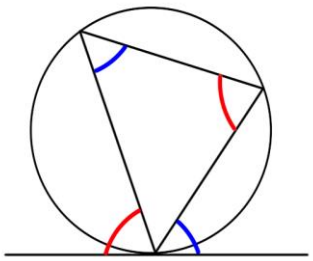
Some (but not all) key points:



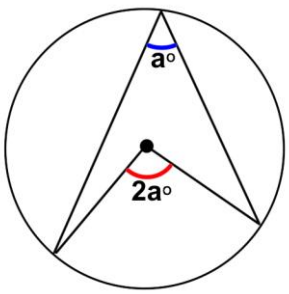
The perpendicular line from the center of a circle to a chord, bisects the chord



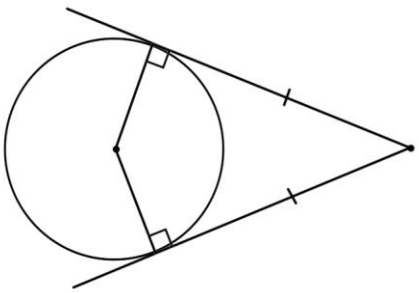
The angle between a tangent and the radius, at the point where the tangent touches the circle, is a right angle



The angle between a tangent and a chord is equal to the angle at the circumference in the alternate segment



The angle at the center of a circle is twice the angle at the circumference of the circle from the same arc



Two tangents drawn from a point to a circle are equal

YEAR 11 – ALGEBRAIC REASONING

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Simplify complex expressions		
• Find the rule for the nth term of a linear sequence (R)		Corbett
• Find the rule for the nth term of a quadratic sequence (R) (H)	213	Corbett
• Use rules for sequences		
• Solve linear simultaneous equations	162	Corbett
• Solve simultaneous equations with one quadratic (H)	211	Corbett
• Use formal algebraic proof (H)	193	Corbett
• Use inequalities in two variables (H)	198	Corbett

Solve
$5x + 3y = 38$
$3x + 2y = 24$

Keywords

Term: a single part of an expression, such as $2x$ or $3mp$ or 8
Expression: a combination of two or more terms separated by + or - signs, such as $3x + 2y$ or $5p^2 - 6$
Coefficient: the number in front of the variable in a term, e.g. the 4 in $4x^3$
Quadratic : straight lines that never meet (equal gradients)
Quadratic sequence: in which the second differences between consecutive terms are constant
Geometric sequence: has a constant ratio between consecutive terms
Fibonacci sequence: each term is the sum of the previous two terms
Region: the part of a graph which represents inequalities in two variables

Some (but not all) key points:

Algebraic expressions for proof

An even number: $2n$
An odd number $2n + 1$
A multiple of 3 $3n$
Two consecutive odd numbers $2n + 1$ & $2n + 3$
An even number squared $(2n + 1)^2$
Two different even numbers $2n$ & $2m$

Simultaneous equations with one quadratic (H)

Solve the simultaneous equations
① $y = 2x^2$
② $y = 20 - 3x$

Show clear algebraic working.

Sub ① into ②
$2x^2 = 20 - 3x$
$2x^2 - 3x - 20 = 0$
$(2x - 5)(x + 4) = 0$
$x = 5/2$, $x = -4$
$y = 25/2$, $y = 32$

At this stage, you might need to use the quadratic formula to solve if it won't factorise

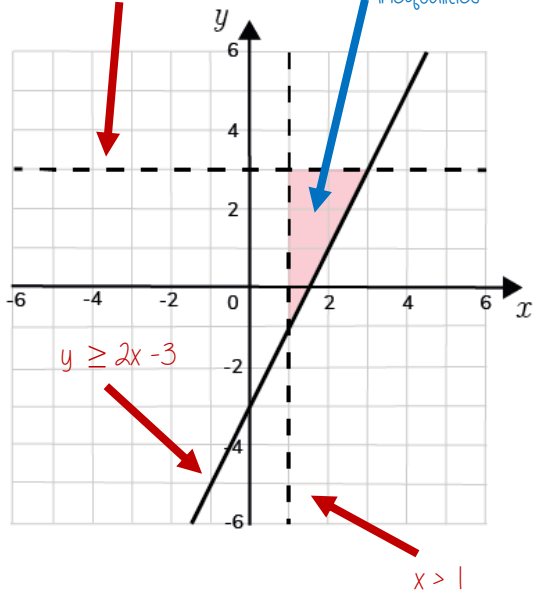
These coordinates are the points where the line $y = 20 - 3x$ intersects the curve $y = 2x^2$

$(\frac{5}{2}, \frac{25}{2})$ or $(-4, 32)$

Inequalities in two variables (H)

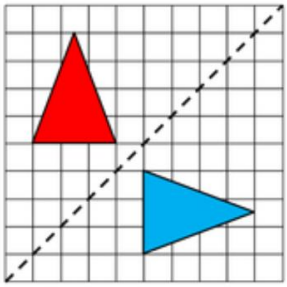
$y < 3$ dashed line because < not ≤

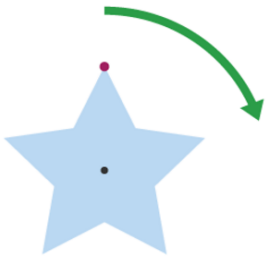
This shaded region satisfies all three inequalities



YEAR 11 — TRANSFORMING & CONSTRUCTING

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Perform & describe line symmetry & reflection	48	Corbett Corbett
• Perform & describe rotation/rotational symmetry	49	Corbett Corbett
• Perform & describe translations of shapes	50	Corbett Corbett
• Perform & describe enlargements of shapes (R)	148	Corbett Corbett
• Perform & describe negative enlargements of shapes (R) (H)	181a 181b	Corbett
• Identify transformations of shapes		
• Perform & describe a series of transformations of shapes	182	
• Identify invariant points & lines (H)		Corbett
• Perform standard constructions using ruler & protractor/compasses (R)	145a 145b	Corbett Corbett
• Solve loci problems	146	Corbett Corbett Corbett
• Understand & use trig graphs (H)	195a 195b	
• Sketch and identify translations of a graph of a given function (H)	122 196b	Corbett
• Sketch and identify reflections of a graph of a given function (H)	122 196b	Corbett

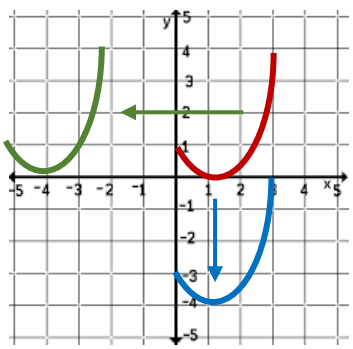




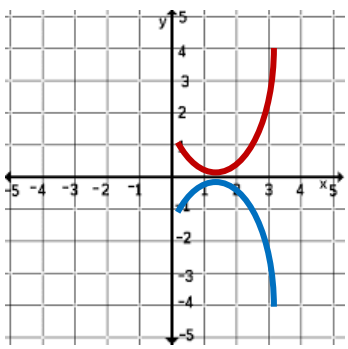
Keywords

Vertex: a corner of a shape
Line symmetry: when a shape can be divided into two identical halves by a mirror line
Order of rotational symmetry: the number of times a shape looks identical to the original, when rotated 360°
Translation: moving a shape side to side or up and down, without changing the shape's appearance
Invariant: points or lines on a shape which do not move when a particular transformation is applied
Construct: draw accurately, using compasses and/or a protractor.
Angle bisector: a line that splits an angle into two equal angles
Perpendicular bisector: a line passing through the midpoint between two points and perpendicular to the line between them
Locus/loci: the set of points whose position is determined by one or more rules
Equidistant: the same distance
Period: the distance it takes on a graph for a function to repeat itself. For example the period of a cos graph is 360°

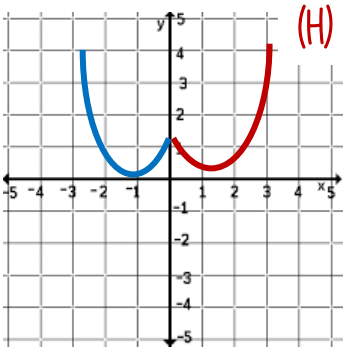
Some (but not all) key points:



$y = f(x)$
$y = f(x + 5)$ 5 to the left
$y = f(x) - 5$ 5 down



$y = f(x)$
$y = -f(x)$ Reflected in x-axis



(H)

$y = f(x)$
$y = f(-x)$ Reflected in y-axis

YEAR 11 – LISTING & DESCRIBING

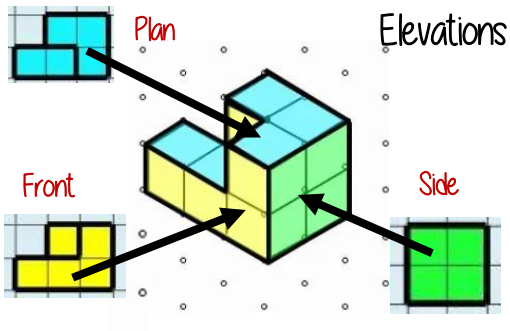
By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• Work with organised lists	69	
• Use sample spaces & probability (R)		Corbett Corbett
• Use the product rule for counting (H)		Corbett
• Complete & use venn diagrams (R)	185 127b (H)	Corbett
• Construct & interpret plans & elevations (R)	51	Corbett
• Use data to compare distributions (R)		
• Interpret scatter diagrams (R)	129	Corbett

Starters	Mains
Soup	Chicken
Prawn Cocktail	Beef
Melon	Pizza

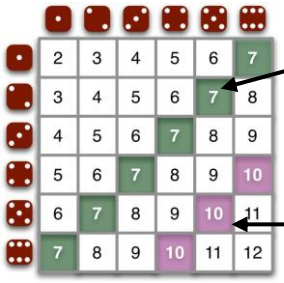
Keywords

Sample space: the set of all possible outcomes
Event: an outcome in probability e.g. rolling a six on a dice is an event
Systematic: careful and methodical
Product rule: a way of finding the total number of outcomes for two or more events by multiplying the number of outcomes for each event together.
Intersection: the crossover part of a venn diagram which represents elements that are in both set A and set B
Union: elements that are in either set A or set B or both.
Elevation: the view of a 3D shape when looked at from the side or front
Plan view: the view of a 3D shape from above
Isometric: a drawing of a 3D shape from an angle which allows the top, side and front of the shape to be visible.
Hypothesis: ta statement which might be true and can then be tested by statistical data
Range: the difference between the greatest and least values in a set of numbers
Outlier: a piece of data which is much greater or less than the rest of the data
Interquartile range: a measure of the spread of data - the difference between the upper and lower quartile values
Correlation: a way to describe whether two values, such as height and weight, are related
Causation: one event causes another to occur
Interpolate: using a line of best fit on a scatter graph to estimate a value from inside a set of data points
Extrapolate: estimating a value from outside a set of data points by extending a line of best fit on a scatter graph

Some (but not all) key points:



Sample space for adding two dice

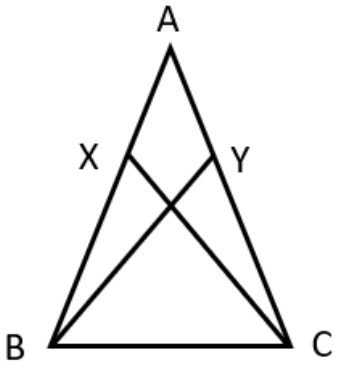


Probability (total is 7) = 6/36

Probability (total is 10) = 3/36

YEAR 11 – SHOW THAT

By the end of this unit you should be able to:	MathsWatch clip	Video tutorial
• 'Show that' with number		
• 'Show that' with algebra	193	Corbett
• 'Show that' with shape		Corbett
• 'Show that' with angles		
• 'Show that' with data		
• 'Show that' with vectors (H)	219	Corbett
• 'Show that' with congruent triangles		
• Use formal proof with congruent triangles (H)	166	



Keywords

Surd: a number that can't be simplified to remove a square root, such as $\sqrt{3}$
Term: a single part of an expression, such as $2x$ or $3mp$ or 8
Expression: a combination of two or more terms separated by + or - signs, such as $3x + 2y$ or $5p^2 - 6$
Identity: an equation that is always true, no matter what values are substituted for the variable, such as $4x \equiv 3x + x$
Similar: same shape and angles, but a different size
Congruent: identical in shape and size
Corresponding: a pair of matching angles or sides which are in the same position in two different similar or congruent shapes
Colinear: three or more points which lie on the same straight line

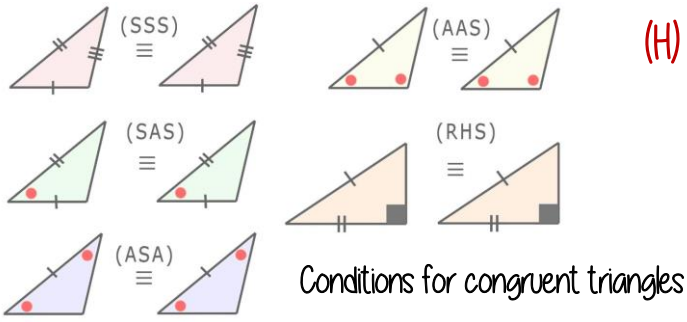
Some (but not all) key points:

Show that $\frac{7}{10} < \frac{5}{6}$

Put both fractions over a common denominator then compare

$\frac{7}{10}$ $\quad$ $\frac{5}{6}$

$\frac{21}{30}$ $<$ $\frac{25}{30}$



Conditions for congruent triangles