
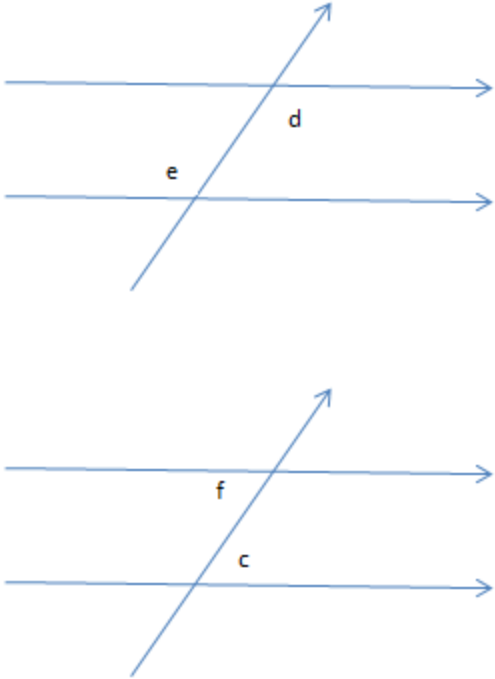
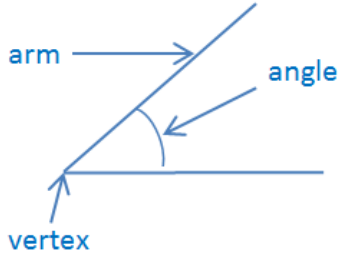
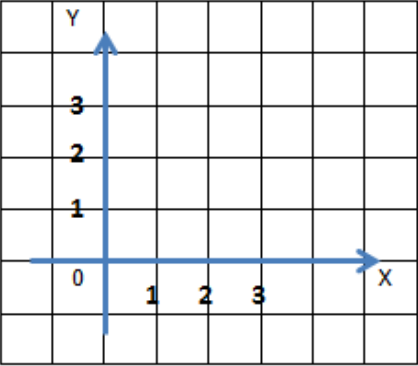
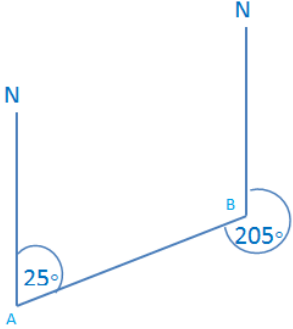


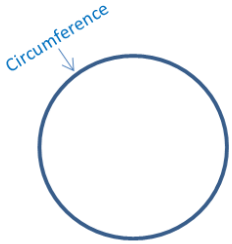


Angle, symmetry and transformation

Terms	Illustrations	Definition
Acute angle		An angle greater than 0° and less than 90° .
Alternate angles		Where two straight lines are cut by a third, as in the diagrams, the angles d and e (also c and f) are alternate. Where the two straight lines are parallel, alternate angles are equal.


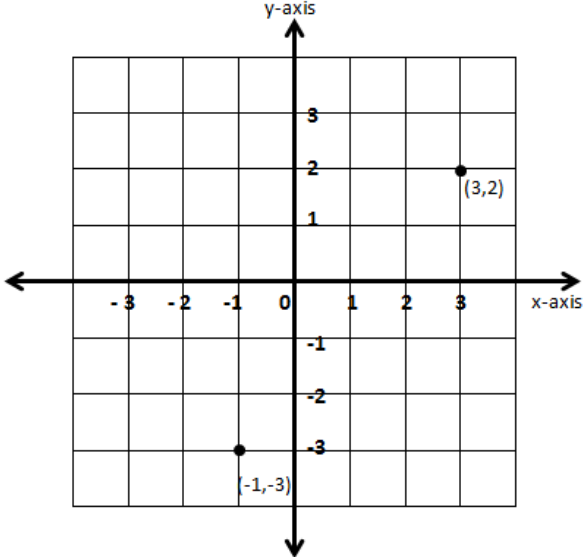
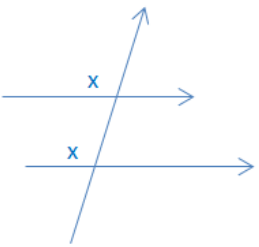
Angle, symmetry and transformation

<p>Angle</p>	 <p>The diagram shows an acute angle formed by two rays meeting at a common point. The point where they meet is labeled 'vertex'. One of the rays is labeled 'arm'. The space between the two rays is labeled 'angle'.</p>	<p>An angle measures the amount of 'turning' between two straight lines that meet at a vertex (point). Angles are classified by their size e.g. can be obtuse, acute, right angle etc. They are measured in degrees ($^{\circ}$) using a protractor.</p>
<p>Axis</p>	 <p>The diagram shows a coordinate grid with a vertical Y-axis and a horizontal X-axis. The Y-axis is labeled 'Y' at the top and has tick marks labeled 1, 2, and 3. The X-axis is labeled 'X' at the right and has tick marks labeled 0, 1, 2, and 3. The origin is marked with '0'.</p>	<p>A fixed, reference line from which locations, distances or angles are taken. Usually grids have an x axis and y axis.</p>
<p>Bearings</p>	 <p>The diagram shows two vertical lines representing North (N). A point A is at the bottom of the left North line, and a point B is at the bottom of the right North line. A line segment connects A and B. At point A, an angle of 25° is marked between the North line and the line segment AB. At point B, an angle of 205° is marked between the North line and the line segment BA, measured in a clockwise direction.</p>	<p>A bearing is used to represent the direction of one point relative to another point. It is the number of degrees in the angle measured in a clockwise direction from the north line.</p> <p>In this example, the bearing of NBA is 205°. Bearings are commonly used in ship navigation.</p>

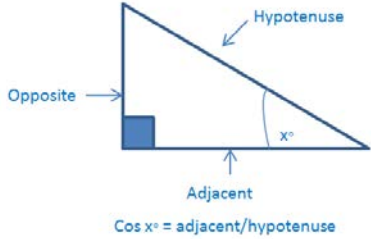

Angle, symmetry and transformation

Circumference		The distance around a circle (or other curved shape).
Compass (in directions)		An instrument containing a magnetised pointer which shows the direction of magnetic north and bearings from it. Used to help with finding location and directions.
Compass points		Used to help with finding location and directions. North, South, East, West, (N, S, E, W), North East (NE), South West (SW), North West (NW), South East (SE) as well as: <ul style="list-style-type: none">• NNE (north-north-east),• ENE (east-north-east),• ESE (east-south-east),• SSE (south-south-east),• SSW (south-south-west),• WSW (west-south-west),• WNW (west-north-west),• NNW (north-north-west)

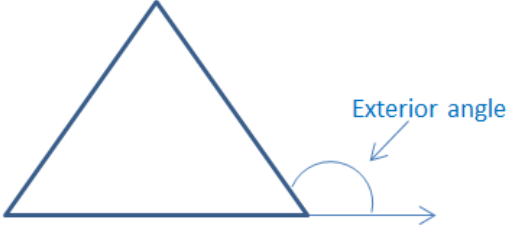
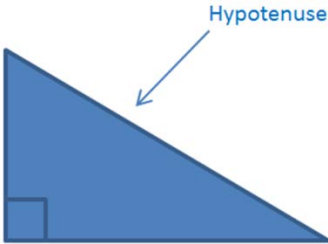
Angle, symmetry and transformation

<p>Complementary angles</p>		<p>Two angles which add together to 90°. Each is the 'complement' of the other.</p>
<p>Coordinate system</p>		<p>A system which uses one or more numbers, or coordinates, to determine the position of a point in space e.g. (4,8) on a grid with a horizontal and vertical axis.</p> <p>The y axis is vertical and the x axis is horizontal.</p>
<p>Corresponding angles</p>		<p>When two lines are crossed by another line (which is called the transversal), the angles in matching corners are called corresponding angles. When the two lines are parallel corresponding angles are equal.</p>

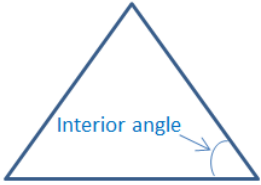

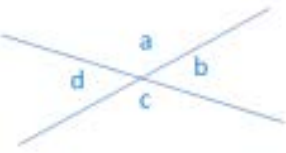
Angle, symmetry and transformation

<p>Cosine function in trigonometry</p>		<p>$\text{Cos}(x) = \text{Adjacent} / \text{Hypotenuse}$</p>
<p>Degree</p>		<p>The most common unit of measurement for angles. One whole turn is equal to 360 degrees, written 360°</p>
<p>Directional language</p>		<p>Use a variety of words to help with directions such as;</p> <ul style="list-style-type: none"> • left, right, up, down, forwards, backwards, sideways, across, close, far, along, to, from, over, under • direction, near, through, towards, away from, underneath, quarter turn, half turn, three quarter turn, whole turn, journey, route, clockwise, anti-clockwise, North, South, East, West, (N, S, E, W) • map, plan, compass point, north, south, east, west, (N, S, E, W) • horizontal, vertical, diagonal, clockwise, anti-clockwise, North, South, East, West, (N, S, E, W), North East (NE), South West (SW), North West (NW), South East (SE). • NNE (north-north-east), ENE (east-north-east), ESE (east-south-east), SSE (south-south-east), SSW (south-south-west), WSW (west-south-west), WNW (west-north-west), NNW (north-north-west)

Angle, symmetry and transformation

Exterior angle		<p>In a polygon, exterior angles are formed outside between one side and the adjacent side. This is the angle that has to be turned at the vertex if you are travelling around a shape.</p>
Grid References		<p>Helps identify position relative to a scale in the horizontal and vertical directions on a page or screen. The scale can use letters or numbers or a combination of both. In this example here, the grid references are in brackets.</p> <p>The first number in the grid reference refers to the position on the x axis and the second number refers to the position on the y axis.</p>
Half turn		Rotation through 180°
Hypotenuse		<p>The longest side of a right-angled triangle. It is the side opposite the right angle.</p>

Angle, symmetry and transformation

Interior angle	 <p>A diagram of a triangle with a blue outline. A small arc is drawn at the bottom-right vertex, and a blue arrow points to it from the text 'Interior angle' written in blue.</p>	At a vertex of a shape, the angles that lie within it.
Obtuse angle	 <p>Two diagrams of obtuse angles. The first shows a horizontal line segment on the left and another segment extending upwards and to the right from its right end, with an arc and 'x°' between them. The second shows a diagonal line segment on the left and a horizontal line segment extending to the right from its top end, with an arc and 'x°' between them.</p>	An angle which is more than 90° but less than 180° .
Opposite angles	 <p>Two intersecting lines forming four angles. The top angle is labeled 'a', the bottom angle is labeled 'c', the left angle is labeled 'd', and the right angle is labeled 'b'.</p>	Angles formed where two line segments intersect. In the diagram 'a' is opposite 'c' and 'b' is opposite 'd'. Also called vertically opposite angles.

Angle, symmetry and transformation

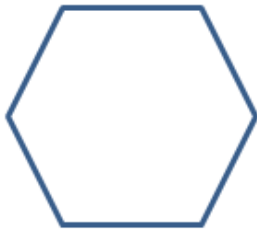
Order (in symmetry)



No rotational symmetry



Order 3 symmetry



Order 6 symmetry



Order 16 symmetry

The number of times a shape can be rotated and fit exactly on top of its original position within a complete turn.

Parallel lines

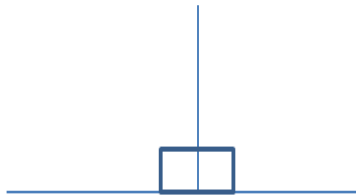


Lines are parallel if they are always the same distance apart (called "equidistant"), and will never meet. Here 'm' and 'n' are parallel

Angle, symmetry and transformation

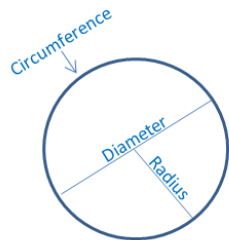


Perpendicular lines



Lines that are at right angles (90°) to each other.

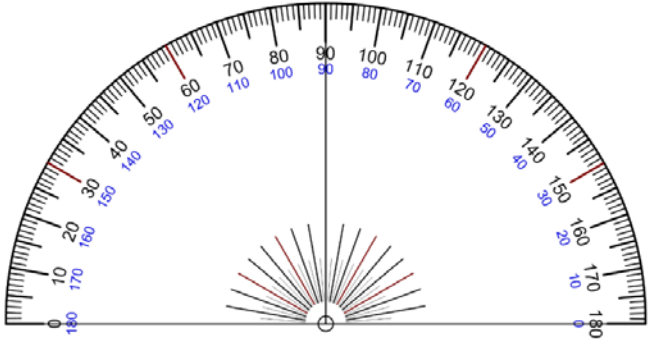
Pi



$$\pi = \text{circumference} \div \text{diameter}$$

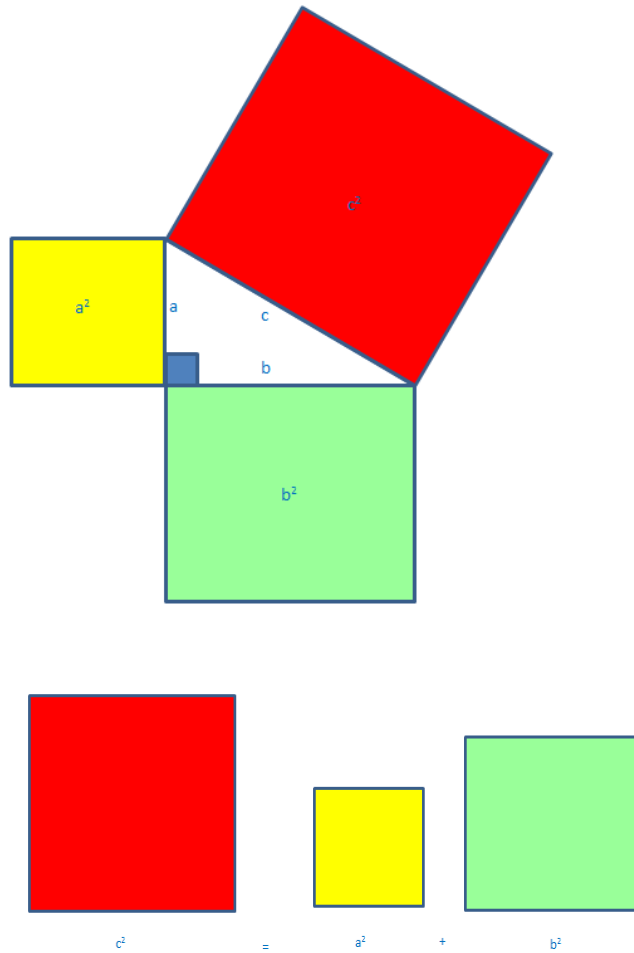
The ratio of a circle's circumference to its diameter. Equal to 3.14159265358979323846... (the digits go on infinitely without repeating). Pi is often rounded to 2 decimal places to 3.14

Angle, symmetry and transformation

Positional language		Use a variety of words to help describe position such as; <ul style="list-style-type: none">• over, under, above, below top, bottom, side on, in, outside, inside• around, in front, behind , front, back, before, after, beside, next to, middle• opposite, apart , between, edge, corner etc.
Protractor		An instrument for measuring or drawing angles, usually in the form of a semi-circle marked with degrees along the curved edge.

Angle, symmetry and transformation

Pythagoras' Theorem

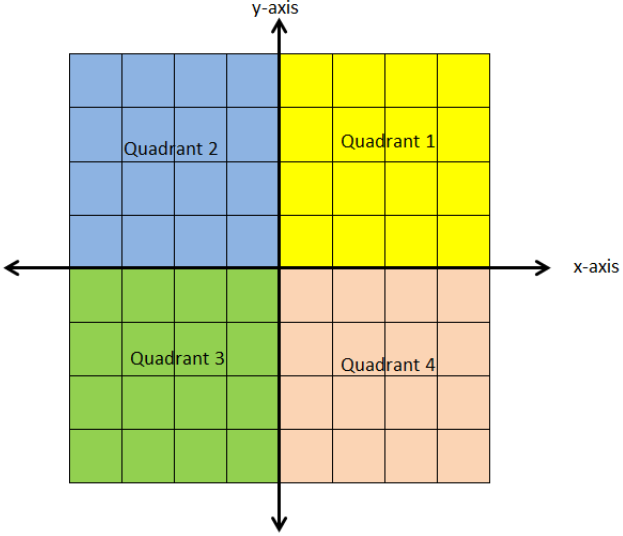


In a right angled triangle, the square of the long side (**hypotenuse**) is equal to the sum of the squares of the other two sides. It is stated in this formula:

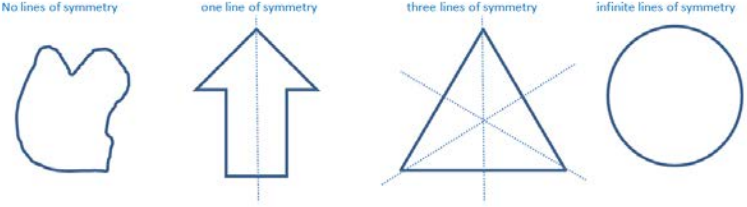
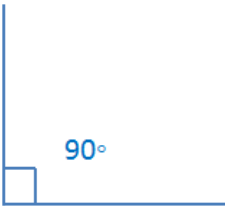

$$a^2 + b^2 = c^2$$

Pythagoras' Theorem was founded by Pythagoras of Samos, a Greek philosopher and mathematician.

Angle, symmetry and transformation

<p>Quadrant (in a graph)</p>		<p>Any of the 4 areas made when we divide up a graph by an x and y axis.</p>
<p>Quarter Turn</p>		<p>A rotation through 90°. This can be in any direction; clockwise or anti-clockwise.</p>
<p>Ratio</p>		<p>A ratio shows the relative sizes of two or more values. Ratios can be shown in different ways. Using the ":", or as a single number by dividing one value by the total.</p> <p><i>E.g. if there is 1 boy and 3 girls you could write the ratio as:</i></p> <p><i>1:3 (for every one boy there are 3 girls)</i></p> <p><i>1/4 are boys and 3/4 are girls</i></p> <p><i>0.25 are boys (by dividing 1 by 4)</i></p> <p><i>25% are boys (0.25 as a percentage)</i></p>

Angle, symmetry and transformation

<p>Reflective Symmetry or Line Symmetry</p>	<p style="text-align: center;"> No lines of symmetry one line of symmetry three lines of symmetry infinite lines of symmetry </p> 	<p>When an image or object has a 'mirror image', each side is equal.</p> <p>Symmetry goes beyond simple shapes to explore real images and different forms of symmetry e.g. rotational symmetry.</p>
<p>Right angle</p>		<p>An angle of 90°</p>
<p>Rotational Symmetry</p>		<p>A shape has rotational symmetry when it still looks the same after a rotation.</p> <p>How many times it appears is called the Order.</p> <p>This star shape has 'Order 5 symmetry'.</p>

Angle, symmetry and transformation

Scale



The ratio of the length in a drawing (or model) to the length of the real thing. Ratios are used to enlarge or reduce an image, drawing, model etc.

E.g. this model car is built in the ratio 1:43 meaning the real car is 43 times bigger.

Scale drawings



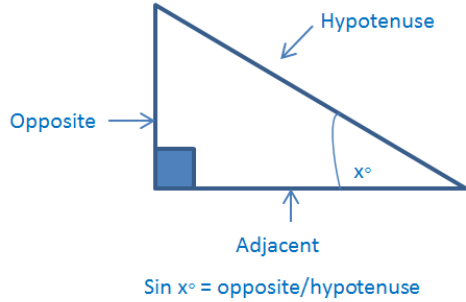

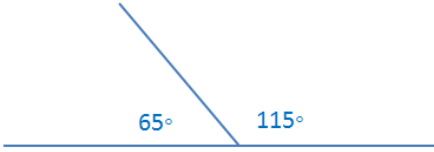
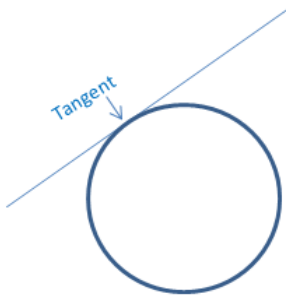
A drawing that shows a real object with accurate sizes reduced or enlarged by a certain amount.

E.g. this floorplan for a house giving accurate measurements as well as the correct proportions for the actual house.

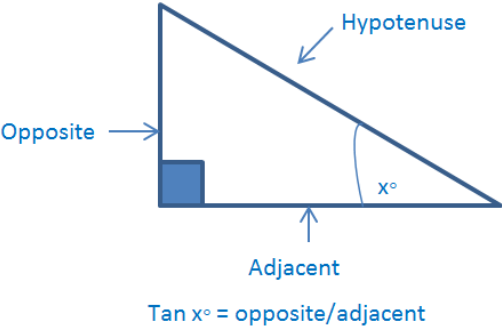

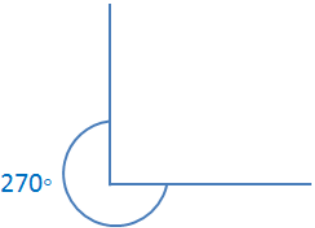
Similarity (in modelling)

Being able to calculate and use a scale factor that connects two similar figures. This helps when making scale models e.g. *models of windmills*.

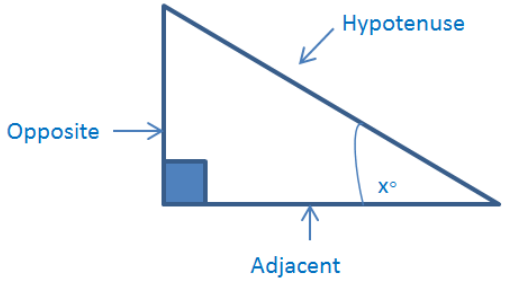
Angle, symmetry and transformation

<p>Sine function</p>	 <p style="text-align: center;">$\sin x^\circ = \text{opposite/hypotenuse}$</p>	<p>$\sin(x) = \text{Opposite} / \text{Hypotenuse}$</p>
<p>Straight angle</p>		<p>An angle of 180 degrees. A straight angle is a straight line.</p>
<p><u>Supplementary angles</u></p>		<p>Angles which add up to 180 degrees.</p>
<p><u>Tangent</u></p>		<p>A tangent is a straight line that touches the diameter of a circle at one point only.</p>

Angle, symmetry and transformation

<p>Tangent function in trigonometry</p>	 <p style="text-align: center;">$\text{Tan } x^\circ = \text{opposite/adjacent}$</p>	<p>$\text{Tan}(x) = \text{Opposite} / \text{Adjacent}$</p>
<p><u>Tessellation</u> or Tiling</p>		<p>A pattern made of identical shapes where the shapes fit together without any gaps and the shapes do not overlap.</p>
<p>Three quarter turn</p>		<p>A rotation through 270° This is the same as three right angles ($3 \times 90^\circ$).</p>
<p><u>Transformation</u></p>		<p>Changing a shape using rotation (turns), reflection (flips), translation (slides) or resizing it.</p>
<p><u>Translation</u></p>		<p>Otherwise known as 'sliding' a shape by moving it without</p>

Angle, symmetry and transformation

		rotating or flipping it. The shape still looks exactly the same, just in a different place.
<u>Trigonometry</u>	 <p>The diagram shows a right-angled triangle with a right angle symbol at the bottom-left corner. The vertical side is labeled 'Opposite', the horizontal side is labeled 'Adjacent', and the slanted side is labeled 'Hypotenuse'. An angle of x° is indicated at the bottom-right vertex.</p>	Trigonometry is the study of triangles. It can help find out unknown values of a triangle's sides or angles if other values are known. Many formulae are used to help with this. The functions of trigonometry are known as sine, cosine, and tangent.
Vertex (singular) or vertices (plural)		A 'corner' or corners on a 3D object. A point(s) where two or more straight lines meet.
Whole turn		A rotation through 360 degrees – a full turn.