



Year 8 Knowledge Organiser - Shape and Measures

Objectives

- Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference
- Calculate perimeters of 2D shapes, including circles
- Calculate areas of circles and composite shapes
- Know the formulae for Pythagoras' theorem, $a^2 + b^2 = c^2$, and apply it to find lengths in right-angled triangles in two dimensional figures
- Calculate the volume of prisms and cylinders
- Interpret plans and elevations of 3D shapes

Key Vocabulary

- Area - the space inside a 2D object
- Composite - A figure (or shape) that can be divided into more than one of the basic figures
- Perimeter - length around the outside of a 2D object
- Radius - a straight line from the centre of the circle to its circumference
- Diameter - a straight line through the centre of the circle, touching both sides of its circumference
- Circumference - the distance (perimeter) around the outside of a circle
- Chord - a straight line through a circle, touching the circumference
- Sector - a part of the circle enclosed by two radii and an arc
- Pi (π) - the ratio of a circle's circumference to its diameter
- Hypotenuse - the longest side of a right-angled triangle, opposite the right angle
- Prism - a solid 3D shape with two identical (congruent) ends and flat faces

Volumes

Volume is the 3D space it takes up - also known as capacity if using liquids to fill the space



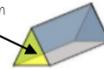
Counting cubes
Some 3D shape volumes can be calculated by counting the number of cubes that fit inside the shape.

Cubes/ Cuboids - base x width x height

Remember multiplication is commutative



Cross section

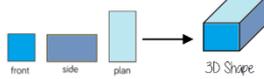


Cross section

Prisms and cylinders - area cross section x height

Height can also be described as depth

Plans and elevations



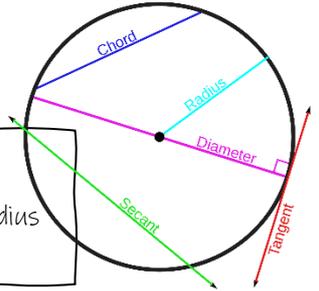
The direction you are considering the shape from determines the front and side views

Volume of prisms = Area of cross section x depth

Volume = $l \times w \times d$

Volume = $\pi r^2 \times \text{depth}$

Volume = $\frac{1}{2} \text{base} \times p.\text{height} \times d$



Circumference = $\pi \times \text{diameter}$

Area of a circle = $\pi \times \text{radius} \times \text{radius}$
 πr^2

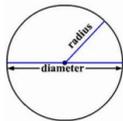
Area of a circle (Calculator)



SHIFT $\times 10^{-1}$

How to get π symbol on the calculator

Area of a circle $\pi \times \text{radius}^2$

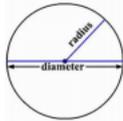


It is important to round your answer suitably - to significant figures or decimal places. This will give you a decimal solution that will go on forever

Area of a circle (Non-Calculator)

Read the question - leave in terms of π or if $\pi \approx 3.14$ (provides an estimate for answers)

Area of a circle $\pi \times \text{radius}^2$



Diameter = 8cm
 \therefore Radius = 4cm
 $\pi \times \text{radius}^2$
 $= \pi \times 4^2$
 $= \pi \times 16$
 $= 16\pi \text{ cm}^2$

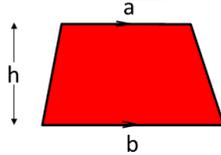
Find the area of one quarter of the circle

Radius = 4cm
Circle Area = $16\pi \text{ cm}^2$
Quarter = $4\pi \text{ cm}^2$

Area of semi-circle = $(\pi r^2) \div 2$

Area of quarter-circle = $(\pi r^2) \div 4$

Area of trapezium



Area = $\frac{1}{2} (a + b) \times h$

Area of composite shapes...

- Split the composite shape into recognisable shapes
- Find the area of each smaller shape
- Add these areas together to find the total

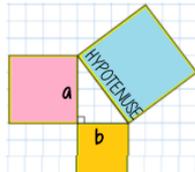
Area of triangle = $\frac{1}{2} \text{base} \times p.\text{height}$

Area of rectangle/square = length x width

Area of parallelogram = base x p.height

Pythagoras theorem

Hypotenuse² = $a^2 + b^2$



This is commutative - the square of the hypotenuse is equal to the sum of the squares of the two shorter sides

Places to look out for Pythagoras

- Perpendicular heights in isosceles triangles
- Diagonals on right angled shapes
- Distance between coordinates
- Any length made from a right angles

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

If $a = 5\text{cm}$ and $b = 7\text{cm}$...
 $a^2 = 5^2 = 25$
 $b^2 = 7^2 = 49$
 $a^2 + b^2 = 74$
 $c = \sqrt{74}$
 $c = 8.60 \text{ cm (2dp)}$