

Perimeter, area and volume

- Perimeter** – the distance around the outside of a shape
- Circumference** – the distance around the outside of a circle
- Area** – the amount of enclosed space inside a shape
- Surface area** – in a 3D solid the total area of all the faces
- Volume (capacity)** – the amount of space inside a 3D shape

2D Basic Formulas for Area and Perimeter

$\pi = 3.14$

- Square:** Area = $s \times s$, Perimeter = $4s$
- Rectangle:** Area = $l \times w$, Perimeter = $2l + 2w$
- Triangle:** Area = $\frac{1}{2}bh$, Perimeter = $a + b + c$
- Parallelogram:** Area = bh , Perimeter = $2a + 2b$
- Circle:** Area = πr^2 , Circumference = $2\pi r$
- Trapezoid:** Area = $\frac{1}{2}(b_1 + b_2)h$, Perimeter = $a + b + c + d$

Formula Sheet for Area of 2D Shapes www.cazoomaths.com

Shape	Name	Formula for Area
	Square	Base x Height
	Rectangle	Base x Height
	Triangle	Base x Perpendicular Height ÷ 2
	Trapezium	$\frac{1}{2}(a+b) \times \text{height}$
	Parallelogram	Base x Perpendicular Height
	Rhombus	Length x Height ÷ 2
	Kite	Length x Height ÷ 2

Example

How would I calculate the area of this shape?

105cm² + 20cm² = 125cm²

100cm² - 50cm² = 50cm²

105cm² + 20cm² = 125cm²

Why does this method have a subtraction and all the others are an addition?

Formula Sheet for Volume www.cazoomaths.com

Shape	Name	Formula for Volume
	Prism	Cross-sectional area x length
	Cone	$\frac{1}{3} \times \pi r^2 \times \text{height}$
	Pyramid	$\frac{1}{3} \times \text{length} \times \text{width} \times \text{height}$
	Sphere	$\frac{4}{3} \times \pi r^3$

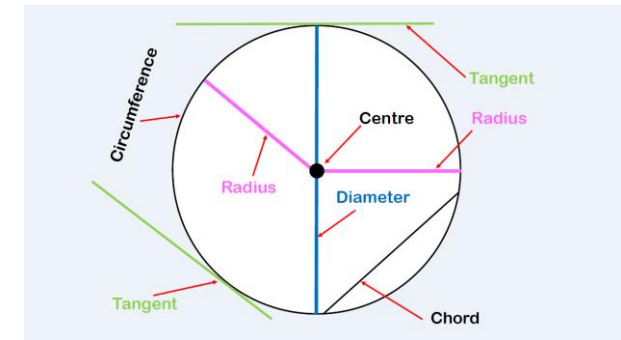
Surface area

Rectangular Prism – TSA Calculation

The "Total Surface Area" =

2 x (8 x 5) : Two Blues
 + 2 x (8 x 4) : Two Yellows
 + 2 x (4 x 5) : Two Reds

= 2x40 + 2x32 + 2x20
 = 184 cm² ✓



COMPOSITE SOLIDS

Composite solids can be formed by either

- combining two or more shapes.
- removing one solid from another.

Ex

A grain silo consists of a cylinder of diameter 6m and height 8m topped by a hemisphere.

For both cylinder & hemisphere $d = 6$ so $r = 3$.

Vol cylinder = $\pi r^2 h = 3.14 \times 3 \times 3 \times 8 = 226.08$

Vol h-sphere = $\frac{2}{3} \pi r^3 = 2 \times 3.14 \times 3 \times 3 \times 3 \div 3 = 56.52$

Total vol = $226.08 + 56.52 = 282.6 = 283\text{m}^3$

Higher tier only, sectors, circle theorems and gradient of a tangent

Area of Circle and Sector

area of circle = πr^2

If θ is measured in degrees then
 area of sector = $\frac{\theta}{360} \times \pi r^2$

If θ is measured in radians then
 area of sector = $\frac{1}{2} r^2 \theta$

Circle Theorems

Gradient of Tangent at a Point

Example 1: The circle with equation $x^2 + y^2 = 25$ passes through the point (3, 4). Find the equation of the tangent to the circle at that point.

As this circle has an equation of the form $x^2 + y^2 = r^2$, it has centre (0, 0)

The gradient of the radius connecting (0, 0) and (3, 4) is $\frac{4}{3}$

So the gradient, m , of the tangent at (3, 4) is $-\frac{3}{4}$

The equation of the tangent has the form $y - y_1 = m(x - x_1)$

At the point (3, 4), $x_1 = 3$ and $y_1 = 4$

So substituting these values gives $y - 4 = -\frac{3}{4}(x - 3)$

Expand brackets $y - 4 = -\frac{3}{4}x + \frac{9}{4}$

Add 4 to both sides to give the equation of the tangent in terms of y $y = -\frac{3}{4}x + \frac{25}{4}$

Key Stage 4 Maths Topics - Algebra