STUDY PLUS

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GCSE Prep Year FOUNDATION TIER

GEOMETRY WORKBOOK 33

Name: _____

Year Group: _____

Start Date: _____

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KNOWLEDGE ORGANISER - VOLUME & SURFACE AREA

What do I need to be able to do?

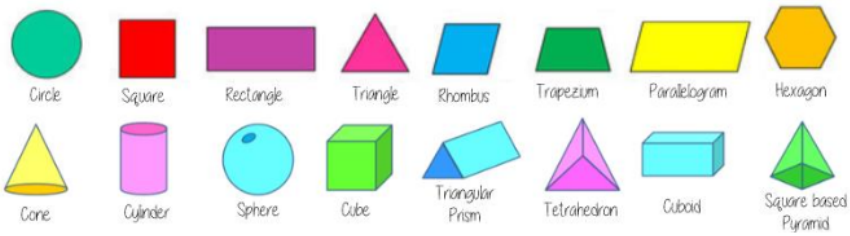
By the end of this unit you should be able to:

- Name 2D & 3D shapes
- Recognise Prisms
- Sketch and recognise nets
- Draw plans and elevations
- Find areas of 2D shapes
- Find Surface area for cubes, cuboids, triangular prisms and cylinders
- Find the volume of 3D shapes

Keywords

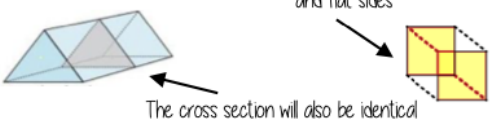
2D: two dimensions to the shape e.g. length and width
3D: three dimensions to the shape e.g. length, width and height
Vertex: a point where two or more line segments meet
Edge a line on the boundary joining two vertex
Face: a flat surface on a solid object
Cross-section: a view inside a solid shape made by cutting through it
Plan: a drawing of something when drawn from above (sometimes birds eye view)
Perspective: a way to give illustration of a 3D shape when drawn on a flat surface.

Name 2D & 3D shapes



Recognise prisms

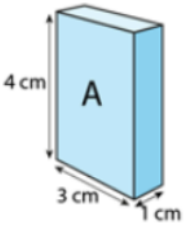
A solid object with two identical ends and flat sides

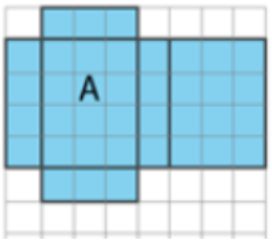


The cross section will also be identical to the end faces.

A cylinder although with very similar properties does not have flat faces so is not categorised as a prism

Nets of cuboids

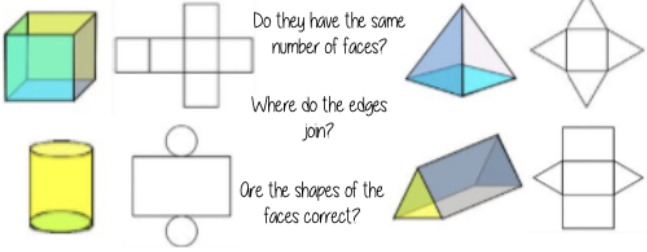




1cm grids help to draw accurately

Visualise the folding of the net
Will it make the cuboid with all sides touching

Sketch and recognise nets

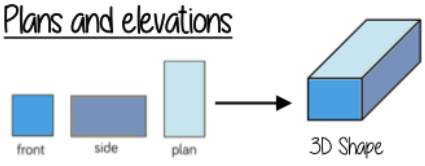


Do they have the same number of faces?

Where do the edges join?

Are the shapes of the faces correct?

Plans and elevations

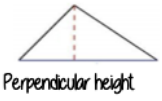


The direction you are considering the shape from determines the front and side views

Area of 2D shapes

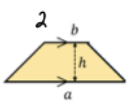
Rectangle
Base x Height

Triangle
½ x Base x Perpendicular height



Parallelogram/ Rhombus
Base x Perpendicular height

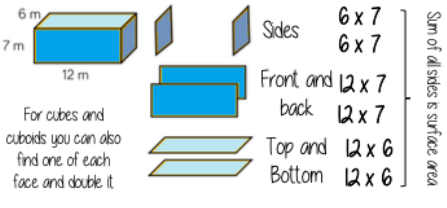
Area of a trapezium
$\frac{(a+b) \times h}{2}$



Area of a circle
π x radius^2

Surface area

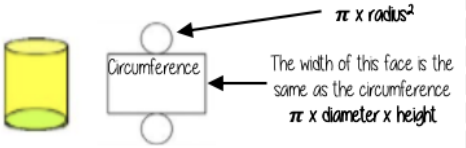
Sketching nets first helps you visualise all the sides that will form the overall surface area



For cubes and cuboids you can also find one of each face and double it

For other shapes - not all the sides are the same, so calculate the individually

Surface area - cylinders



2 x π x radius^2 + π x diameter x height

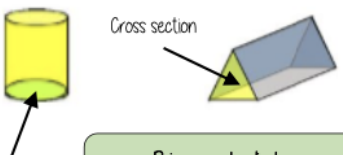
Volumes

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



Prisms and cylinders = area cross section x height

Height can also be described as depth

Areas – square units
Volumes – cube units

Areas and volumes can be left in terms of pi π

Knowledge Organiser: Area and Volume

What you need to know:

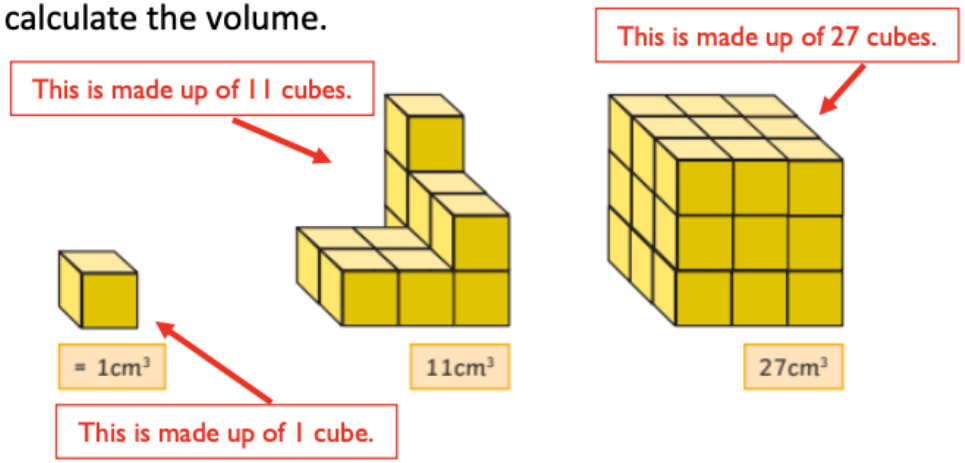
3D solids: They have 3 dimensions – length, width and depth. Here are the main 3D solids that you need to be familiar with.

Cube  6 square faces, 12 edges, 8 vertices	**Tetrahedron**  4 triangular faces, 6 edges, 4 vertices	**Sphere**  1 curved surface, 0 edges, 0 vertices
Cuboid  6 faces, 12 edges, 8 vertices	**Octahedron**  8 faces, 12 edges, 6 vertices	**Triangular prism**  5 faces, 9 edges, 6 vertices
Square-based pyramid  5 faces, 8 edges, 5 vertices	**Cone**  1 circular face, 1 curved surface, 1 curved edge, 1 apex	**Cylinder**  2 circular faces, 1 curved surface, 2 curved edges, 0 vertices

You especially need to know the names of these solids.

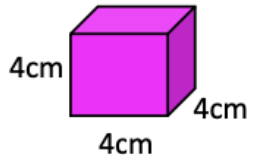
Volume

Volume: This is the amount of space that a 3D object occupies. Sometimes an object is made up of cubes, we can count them to calculate the volume.



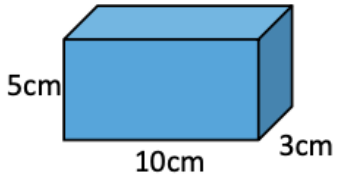
Cubes and cuboids: To calculate the volume of a cube and cuboid we use the following formula:

Volume = Length x Width x Height



Volume = 4 x 4 x 4 = 64cm³

The units are cubic for volume.



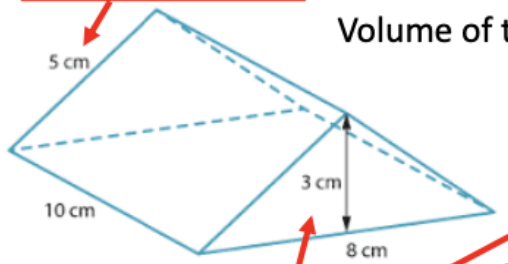
Volume = 10 x 3 x 5 = 150cm³

It doesn't matter which order you multiply in.

Prism: A prism is a solid object with identical ends and flat faces. The general formula for the volume of a prism is:

Volume = Area of the cross section x Length

We do not need this.



Volume of triangular prism = Area of a triangle x length

Area of triangle $= \frac{3 \times 8}{2} = 12$

Volume = 12 x 10 = 120cm³

Area of the cross section.

Multiply the area of the cross section by 10 which is the length.

Geometry and Measure (Foundation)

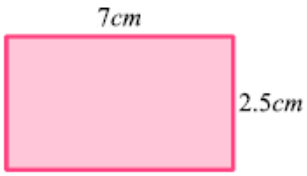
QUICK REVISION

Perimeter and area in rectangles

Given the rectangle below, calculate (stating the units):

a) The perimeter

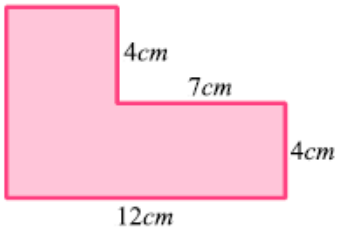
b) The area



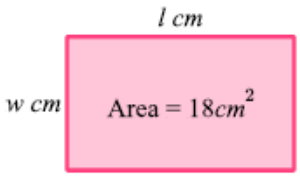
For the given shape, find:

a) Its perimeter

b) Its area

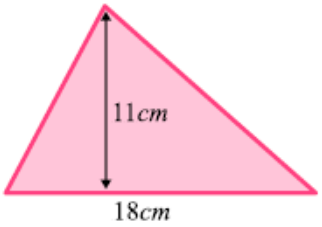


The length (l) and width (w) of this rectangle take integer values. Given that $l > w$, list the possible dimensions of the rectangle.

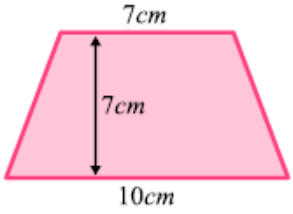


Area of simple shapes

Find the area of this triangle.



Determine the area of this trapezium.

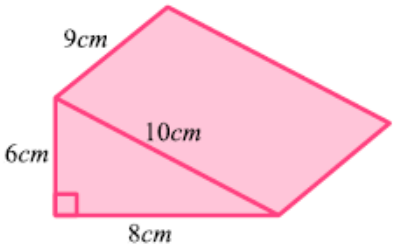


Volume and surface area

For this triangular prism, find:

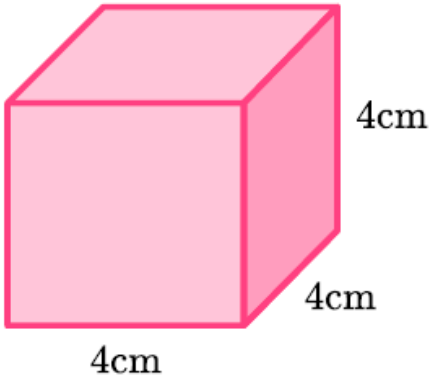
a) The volume

b) The surface area



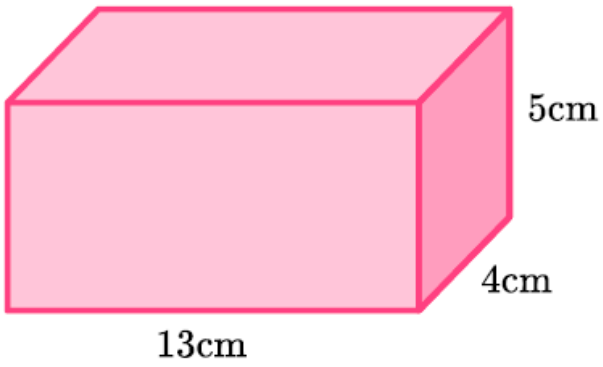
GCSE DIAGNOSTIC QUESTIONS
VOLUME & THE SURFACE AREA

1. Find the volume of this cube, stating the appropriate units:



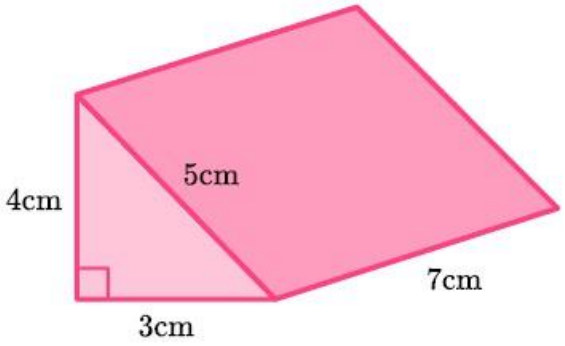
A) 16 cm^3	B) 12 cm^3
C) 64 cm^3	D) 48 cm^3

2. Find the volume of this cuboid, stating the appropriate units:



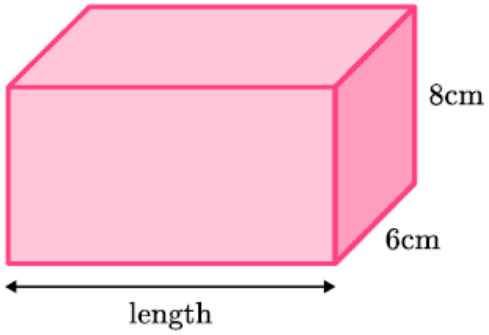
A) 52 cm^3	B) 130 cm^3
C) 274 cm^3	D) 260 cm^3

3. Find the volume of this triangular prism, stating the appropriate units:



A) $42\ cm^3$	B) $84\ cm^3$
C) $420\ cm^3$	D) $210\ cm^3$

4. The volume of this cuboid is $552\ cm^3$. Find the length of the base.



A) $404\ cm$	B) $39.4\ cm$
C) $23\ cm$	D) $11.5\ cm$

EXAM STYLE QUESTIONS

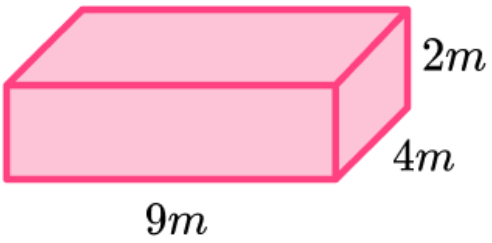
1) **(a)** Work out the surface area of a cube with side length $11cm$.

……

(b) Convert the surface area in (a) to m^2.

……

2) Work out the surface area of the cuboid.



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