



Study Support  
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## Geometry

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### Common shapes and their characteristics



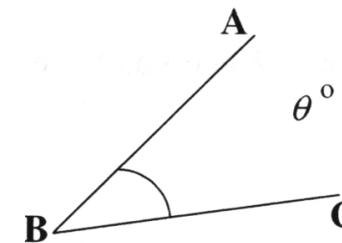
Geometry was the first of the mathematical sciences to be developed. Geometry means measuring the world and involves either one, two or three dimensions.

Typically:

- ▶ a point has no dimensions and is an infinitely small dot in space;
- ▶ a line has one dimension and connects two points;
- ▶ a surface has two dimensions; and
- ▶ a solid has three dimensions.

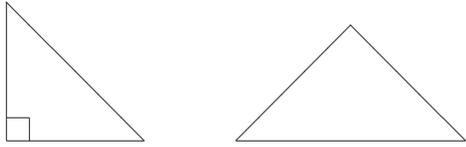
Knowledge of some basic shapes and their properties becomes important. Some of these shapes and properties are sure to be familiar. Area measures the amount of space that a figure takes up in two dimensions. The basic unit of measurement of area is a length measurement squared, for example metres squared ( $m^2$ ).

### Common shapes and their characteristics — Angles



- ▶ Angles are often measured in degrees, an alternative measure is called radians.
- ▶ Angles are symbolised using a Greek letter such as  $\theta$  or sometimes by three letters,  $\angle ABC$ .
- ▶ When an angle is  $90^\circ$  we call it a **right angle** and the two lines that make that angle we say are **perpendicular**.
- ▶ An angle that produces a straight line is  $180^\circ$ .

## Common shapes and their characteristics — Triangles



- ▶ Triangles are figures with three sides.
- ▶ If two sides are the same length they are called **isosceles triangles**.
- ▶ If three sides are the same length they are called **equilateral triangles**.
- ▶ If one of the angles is  $90^\circ$  it is called a **right angled triangle**, symbolized by a small square in the angle that is  $90^\circ$ .
- ▶ The sum of all the angles in a triangle is  $180^\circ$ .
- ▶ The area of a triangle equals half the base times the perpendicular height ( $A = \frac{1}{2}b \times h$ ).
- ▶ The perimeter of a triangle is the sum of the lengths of the sides.

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## Common shapes and their characteristics — Squares



- ▶ Squares are four sided figures where all sides are of equal length and all angles are  $90^\circ$ .
- ▶ The area of a square is the product of two sides,  $A = s^2$ .
- ▶ The perimeter of a square is the sum of the sides,  $P = 4s$ .

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## Common shapes and their characteristics — Rectangles



- ▶ Rectangles are four sided figures where the opposite sides are equal and every angle is  $90^\circ$ .
- ▶ The area of a rectangle is the product of the two sides,  $A = l \times w$ , where  $l$  is the length and  $w$  is the width.
- ▶ The perimeter of a rectangle is the sum of the sides,  $P = 2l + 2w = 2(l + w)$ .

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## Common shapes and their characteristics — Parallelograms & Trapeziums



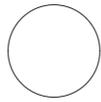
- ▶ A parallelogram is a four sided figure in which the opposite sides are parallel and are of equal length.
- ▶ This also means that the opposite angles are equal.



- ▶ A trapezium is a four sided figure in which only two sides are parallel

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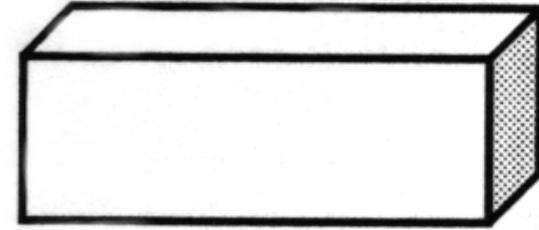
## Common shapes and their characteristics — Circles



- ▶ Circles are shapes as shown, where the diameter is the length of a line touching each side and passing through the centre.
- ▶ The radius is half the diameter.
- ▶ The area of a circle is  $A = \pi r^2$ , where  $r$  is the radius.
- ▶ The perimeter of a circle (the circumference) is pi times the diameter,  $P = \pi d = 2\pi r$ .

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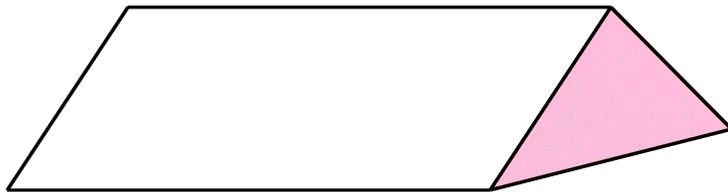
## Common shapes and their characteristics — Rectangular Prisms



- ▶ This shape is a box with a rectangular base and sides.
- ▶ The volume equals the product of its length, width and height.
- ▶ A **cube** is a rectangular prism in which all sides are squares.

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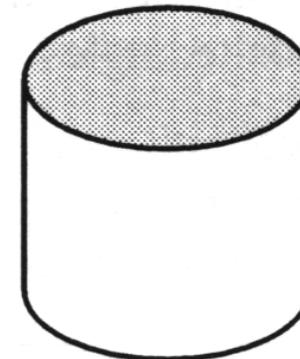
## Common shapes and their characteristics — Triangular prism



- ▶ This shape is a box in which the base is a triangle.
- ▶ The volume is the area of the triangle times the perpendicular height.

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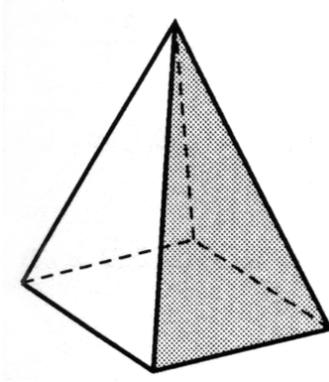
## Common shapes and their characteristics — Cylinder



- ▶ A cylinder is like a prism but has a circular base.
- ▶ The volume of a cylinder is the area of the circular base times the height.

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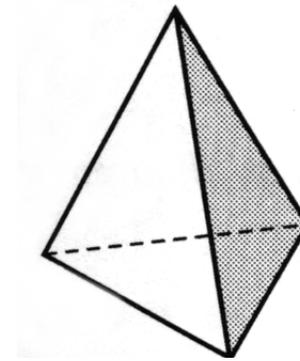
## Common shapes and their characteristics — Pyramid



- ▶ This shape has a rectangular base with triangles as all the other sides.
- ▶ It has one third the volume of a rectangular prism of the same base.

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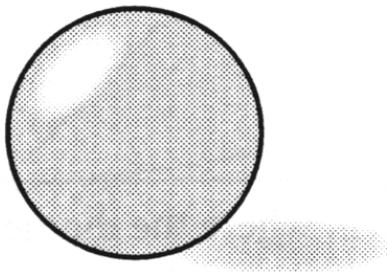
## Common shapes and their characteristics — Tetrahedron



- ▶ This shape is sometimes called a triangular pyramid, as it has a triangular base with triangles as the other sides.
- ▶ Note that this means that all four sides are triangles.

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## Common shapes and their characteristics — Sphere



- ▶ A sphere is a ball shaped figure.
- ▶ The volume of a sphere is given by the formula

$$V = \frac{4}{3}\pi r^3.$$

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