**Chapter summary**

### Conversion of units

Length

$$\times 1000 \quad \times 100 \quad \times 10$$

km $\quad$ m $\quad$ cm $\quad$ mm

$$\div 1000 \quad \div 100 \quad \div 10$$

Area
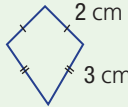
$$\times 1000^2 \quad \times 100^2 \quad \times 10^2$$

km$^2$ $\quad$ m$^2$ $\quad$ cm$^2$ $\quad$ mm$^2$

$$\div 1000^2 \quad \div 100^2 \quad \div 10^2$$

Volume

$$\times 1000^3 \quad \times 100^3 \quad \times 10^3$$

km$^3$ $\quad$ m$^3$ $\quad$ cm$^3$ $\quad$ mm$^3$

$$\div 1000^3 \quad \div 100^3 \quad \div 10^3$$

### Perimeter
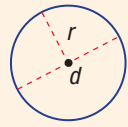
The distance around the outside of a shape.

2 cm

3 cm

$$P = 2 \times 2 + 2 \times 3$$
$$= 10 \text{ cm}$$
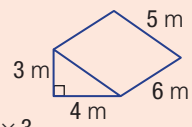
### Circumference

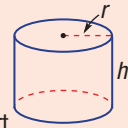The distance around the outside of a circle.

$C = 2\pi r$ or $C = \pi d$

$r$

$d$

### Total surface area

Draw a net and sum the surface areas.

*Triangular prism*

5 m

3 m

6 m

4 m

$$TSA = 2 \times \tfrac{1}{2} \times 4 \times 3$$
$$+ 6 \times 4 + 6 \times 3 + 6 \times 5$$
$$= 84 \text{ m}^2$$

*Cylinder* ⭐

$$TSA = 2\pi r^2 + 2\pi rh$$

2 ends $\quad$ curved part

$r$

$h$

### Measurement

### Area of basic shapes

Square: $A = l^2$

Rectangle: $A = lw$

Triangle: $A = \tfrac{1}{2}bh$

Rhombus: $A = \tfrac{1}{2}xy$

Parallelogram: $A = bh$

Trapezium: $A = \tfrac{1}{2}(a + b)h$

### Area of a circle

$$A = \pi r^2$$
$$= \pi \times 3^2$$
$$= 28.27 \text{ m}^2 \text{ (to 2 d.p.)}$$

3 m

### Volume

*Rectangular prism* $\qquad$ *Cylinder*

$V = lwh$ $\qquad\qquad\quad$ $V = \pi r^2 h$

Capacity: 1 L = 1000 mL
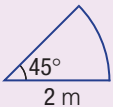
$\qquad\qquad$ 1 cm$^3$ = 1 mL

### Accuracy ⭐

Accuracy depends on any error associated with the measuring instruments and how they are used.

Limits of accuracy are usually $\pm 0.5 \times$ the smallest unit.
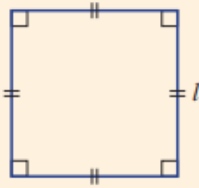
### Area of sectors

$$A = \tfrac{45}{360} \times \pi r^2$$
$$= \tfrac{1}{8} \times \pi \times 2^2$$
$$= 1.57 \text{ m}^2 \text{ (to 2 d.p.)}$$

45°

2 m

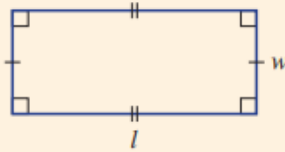The **area** of a two-dimensional shape is the number of square units contained within its boundaries.
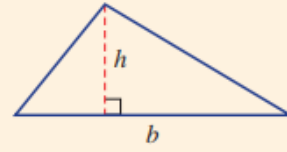
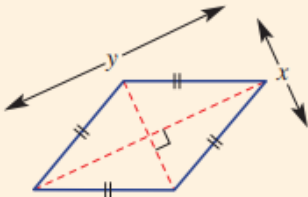Some of the common area formulas are as follows.

### Square

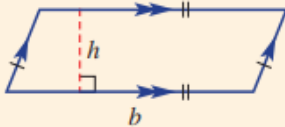Area = $l^2$

### Rectangle

Area = $lw$

### Triangle

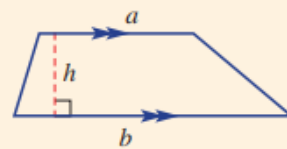Area = $\frac{1}{2}bh$

### Rhombus

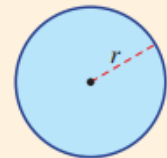Area = $\frac{1}{2}xy$

### Parallelogram

Area = $bh$

### Trapezium

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

The 'height' in a triangle, parallelogram or trapezium should be **perpendicular** (at 90°) to the base.

The formula for finding the area ($A$) of a circle of radius $r$ is given by the equation: $A = \pi r^2$.

When the diameter ($d$) of the circle is given, determine the radius before calculating the area of the circle: $r = d \div 2$.
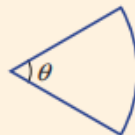
A **sector** is a portion of a circle including two radii.

$A = \pi r^2$

The angle of a sector of a circle determines the fraction of the circle. A full circle is $360°$.

- This sector is $\frac{\theta}{360}$ of a circle.

- The area of a sector is given by $A = \frac{\theta}{360} \times \pi r^2$

### Triangular
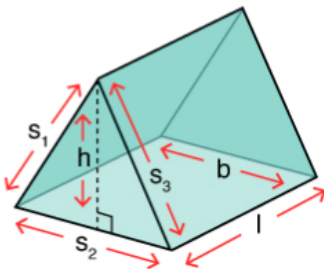
**Surface Area (SA)**
$= b \times h + (s_1 + s_2 + s_3) \times l$

*here,*
$s_1$, $s_2$, & $s_3$ = base edges,
$b = s_2$, l = length, h = height

### Rectangular

**Surface Area (SA)**
$= 2(lw + wh + lh)$

*here,*
l = length, w = width,
h = height

### Square

**Surface Area (SA)**
$= 2a^2 + 4al$

*here,*
a = base edge, l = length

A **cylinder** is a solid with a circular **cross-section**.

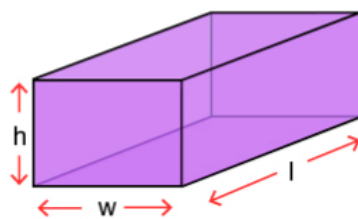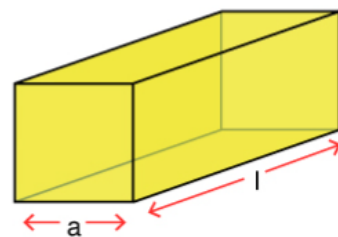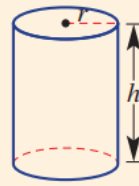- The net contains two equal circles and a rectangle. The rectangle has one side length equal to the circumference of the circle.
- TSA = 2 circles + 1 rectangle

$$= 2\pi r^2 + 2\pi rh$$

- Another way of writing $2\pi r^2 + 2\pi rh$ is $2\pi r(r + h)$.

**Diagram**    **Net**
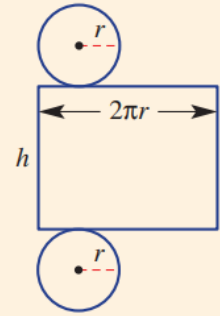
**Volume** is the amount of three-dimensional space within an object.

The volume of a solid with a uniform cross-section is given by $V = A \times h$, where:
- $A$ is the area of the cross-section.
- $h$ is the perpendicular (at 90°) height.

**Rectangular prism**                **Cylinder**
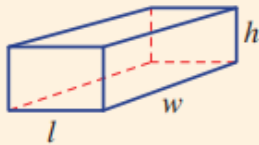
$V = lwh$

$$V = \pi r^2 h$$

**Capacity** is the volume of a given object measured in litres or millilitres.

Units for capacity include:
- $1\,L = 1000\,mL$
- $1\,cm^3 = 1\,mL$

# Measurement Summary Notes

## Use decimals in Measurement

### Converting LENGTH Units

x 1000    x 100    x 10

Km    m    cm    mm

÷ 1000    ÷ 100    ÷ 10

### Converting AREA Units

AREA consists of Square Units, so we need to SQUARE all our Lengths.

x $1000^2$    x $100^2$    x $10^2$

$Km^2$    $m^2$    $cm^2$    $mm^2$

÷ $1000^2$    ÷ $100^2$    ÷ $10^2$

$5 km^2$ = ? $m^2$   Need to x $1000^2$    5 x 1000 x 1000 = 5 000 000 $m^2$ ✓

$1200 cm^2$ = ? $m^2$   Need to ÷ $100^2$    1200 ÷ 100 ÷ 100 = 0.12 $m^2$ ✓
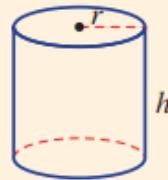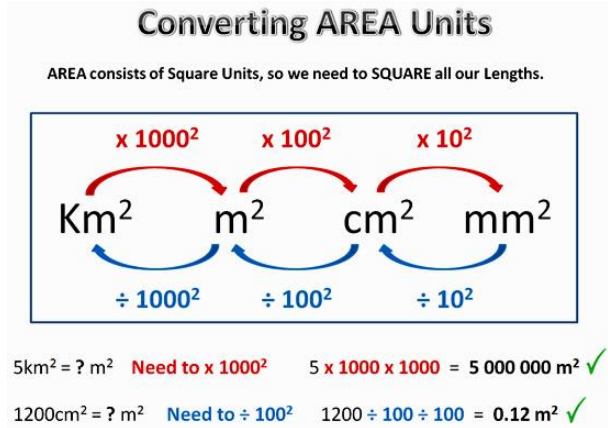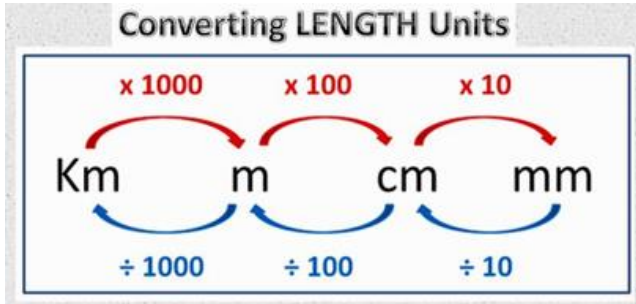
## Finding Circumference

$C = 2\pi r$

C – CIRCUMFERENCE
$\pi \approx 3.14$
r – RADIUS

$C = \pi d$

C – CIRCUMFERENCE
$\pi \approx 3.14$
d – DIAMETR

Circumference
Diameter
Radius
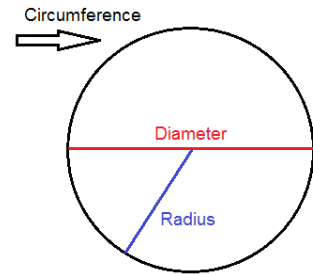
## Area of 2D shapes

**trapezoid**
Surface = $\frac{b1+b2}{2}$ x h

**parallelogram**
Surface = b x h

**rectangle**
Surface = b x h

**square**
Surface = b x h = $s^2$

**triangle**
Surface = $\frac{b \times h}{2}$

**circle**
Surface = $\pi \times r^2$

**Volume of 3D shapes**

$V = L \times W \times H$
L = length
W = width
H = height

$V = \pi r^2 \times H$
r = radius
H = height

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

$V = \frac{1}{3} L \times W \times H$
L = length
W = width
H = height

$V = \frac{1}{3}\pi r^2 \times H$
r = radius
H = height

## Surface Area of 3D Shapes

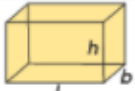| Name of the Solid | Figure | Total Surface Area | Nomenclature |
|---|---|---|---|
| Cube | | $6a^2$ | a : side of cube |
| Cuboid | | $2(lb + bh + hl)$ | l : length<br>b : breadth<br>h : height |
| Cone | | $\pi r(l+r)$ | r : radius of base<br>h : height<br>l : slant height |
| Cylinder | | $2\pi r(r+h)$ | r : radius of base<br>h : height |
| Sphere | | $4\pi r^2$ | r : radius |

Nets

Cube          Cuboid

Square-based Pyramid          Triangular Prism

Cone          Cylinder
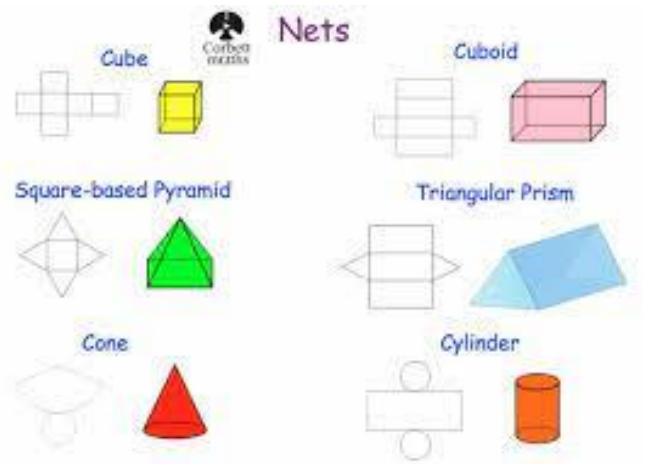
## Pythagoras Theorem

$c$

$a$

$b$
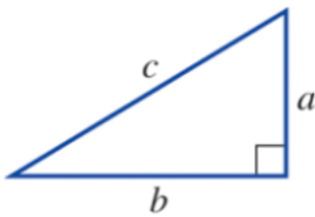
**Label a, b, c**

**C** is the Hypotenuse—the longest side

1. Hypotenuse **unknown**: c= √(a²+b²)

2. The shorter side **unknown**: a= √(c² −b²)  Or  b= √(c² −a²)

**Formula to use Scientific calculator**

On your calculator:

√     (a² + b²)     =

On your calculator:

√     (c² − b²)     =

## Trigonometry

**SOH**

O

S | H

$$\sin(x) = \frac{O}{H}$$

**CAH**

A

C | H

$$\cos(x) = \frac{A}{H}$$

**TOA**

O

T | A

$$\tan(x) = \frac{O}{A}$$

### Parallel lines



transversal

$a = b$ corresponding angles
$b = c$ alternate angles
$c + e = 180$ cointerior angles
$a = c$ vertically opposite angles

### Triangles

Angle sum $= 180°$

Scalene    Isosceles    Equilateral



Acute    Obtuse    Right



Exterior angles
$x = a + b$



### Congruent triangles

Equal in size and shape

Tests: SSS, SAS, AAS, RHS

A congruence statement:
$\triangle ABC \equiv \triangle DEF$

### Similar triangles

Equal in shape and sides are in the same ratio

Tests: SSS, SAS, AAA, RHS

A similarity statement:
$\triangle ABC \;|||\; \triangle DEF$

### Geometry

### Quadrilaterals

Angle sum $= 360°$

Special types include:
• parallelogram
• square
• rectangle
• rhombus
• kite
• trapezium

### Applications of similarity

When $\triangle ABC \;|||\; \triangle DEF$, then:
• Scale factor $= \dfrac{DE}{AB}$ or $\dfrac{DF}{AC}$ or $\dfrac{EF}{BC}$
• Length ratio $a : b$, Scale factor $= \dfrac{b}{a}$ ⭐
• Area ratio $a^2 : b^2$, Scale factor $= \dfrac{b^2}{a^2}$ ⭐
• Volume ratio $a^3 : b^3$, Scale factor $= \dfrac{b^3}{a^3}$ ⭐

### Polygons ⭐

Angle sum, $S = 180° \times (n - 2)$

Regular polygons have:
• equal side lengths
• equal angles