

Shape, Space & Measures SKE

Topics

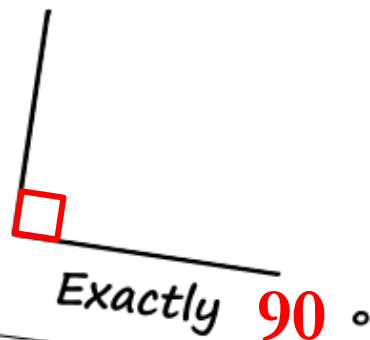
- Types of Angles
- Angle Facts
- Rotational Symmetry
- Congruency & Similarity
- Area & Perimeter
- Pythagoras' Theorem
- Area & Circumference of Circles
- 3D shapes
- Surface Area & Volume
- Converting Length Measurements
- Converting Compound Measures
- Metric & Imperial Conversions

Types of Angles

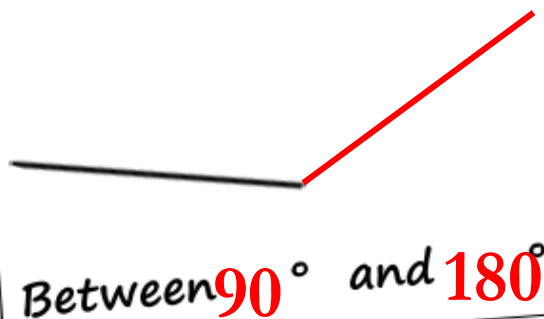
Acute Angle



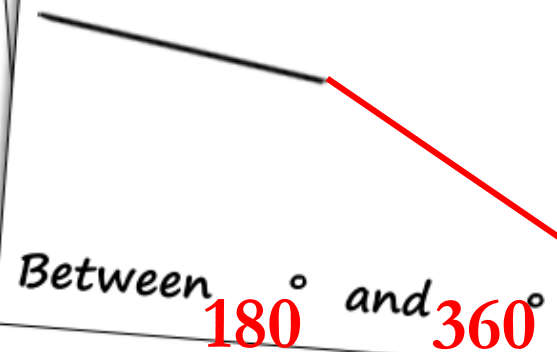
Right Angle



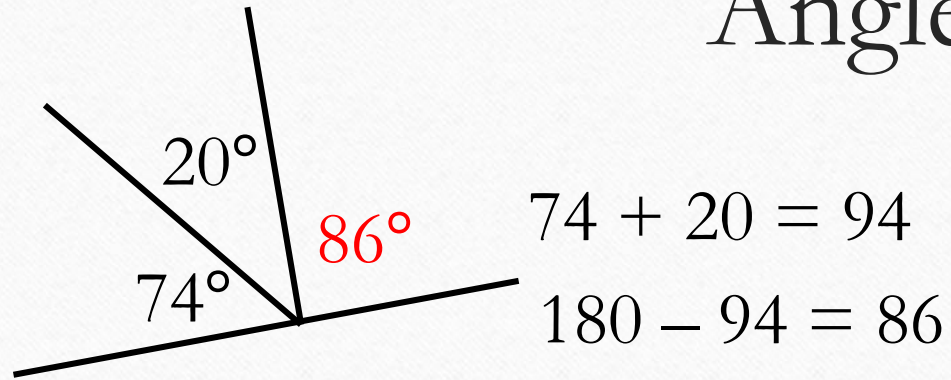
Obtuse Angle



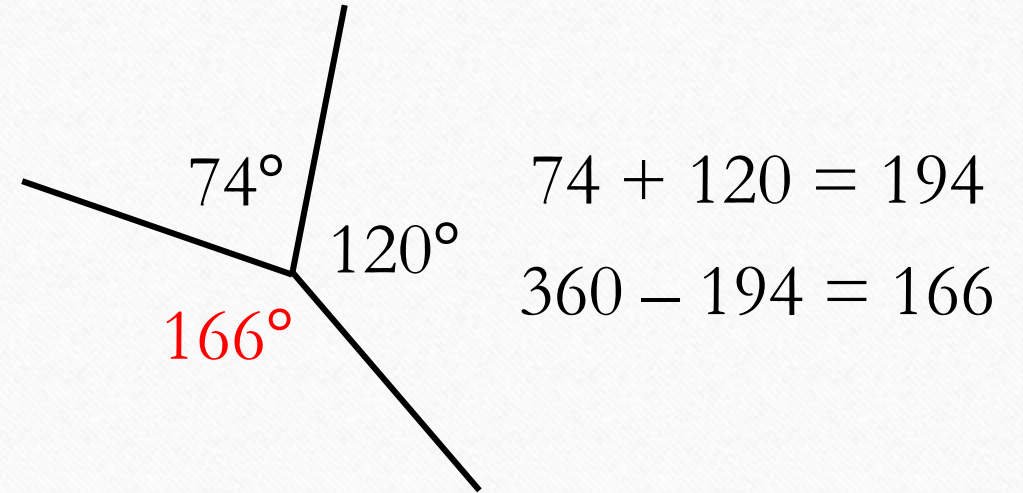
Reflex Angle



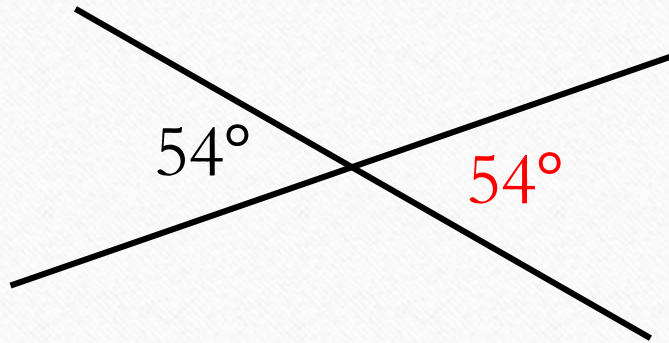
Angle Facts



Angles on a straight line add to 180° .

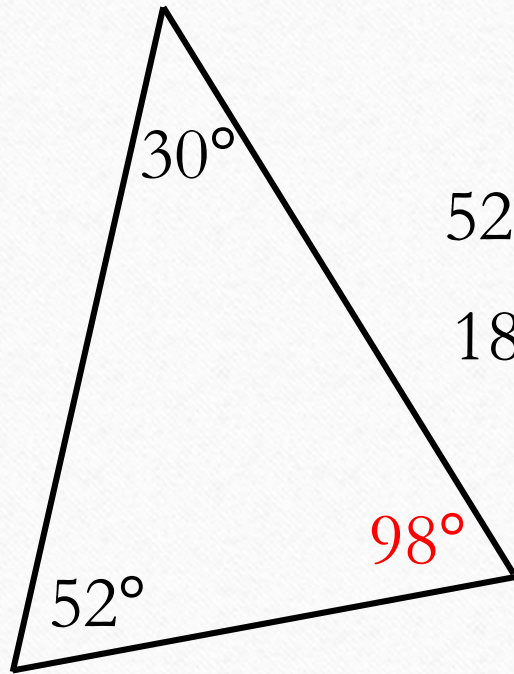


Angles around a point add to 360° .



Opposite angles are equal.

Angle Facts

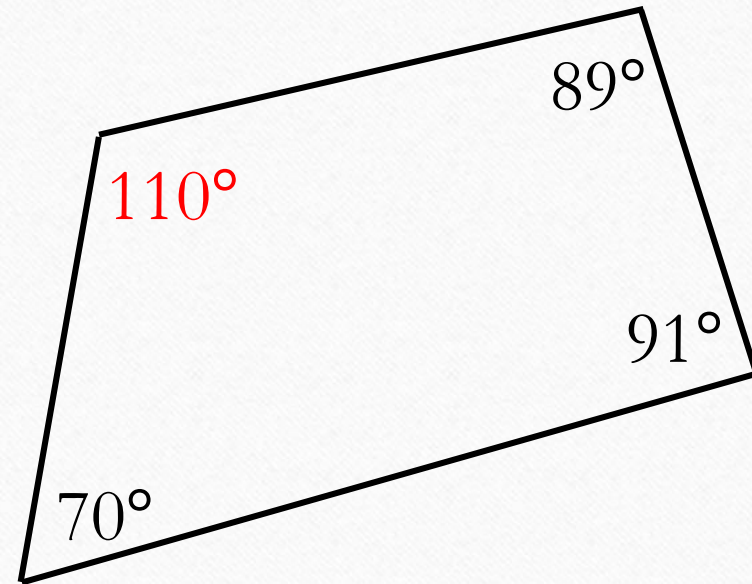


$$52 + 30 = 82$$

$$180 - 82 = 98$$

Angles in a triangle add to 180°.

Angles in a quadrilateral add to 360°.

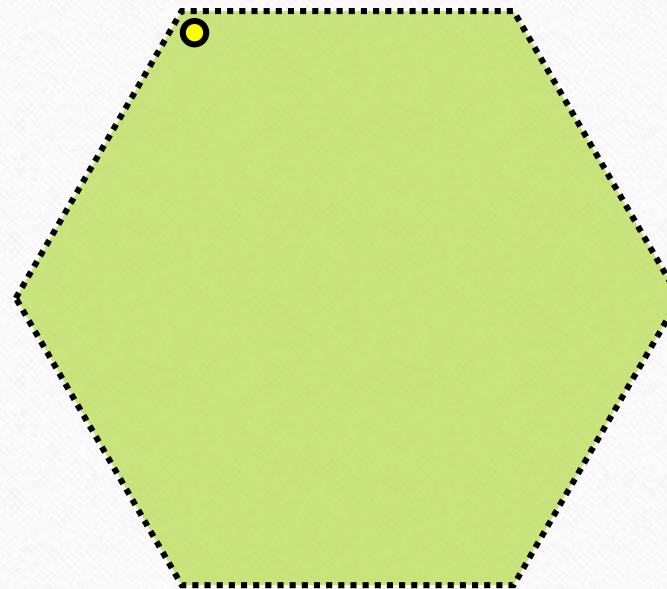
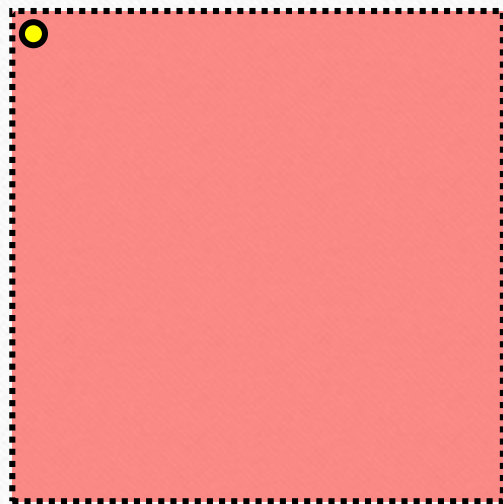


$$70 + 89 + 91 = 250$$

$$360 - 250 = 110$$

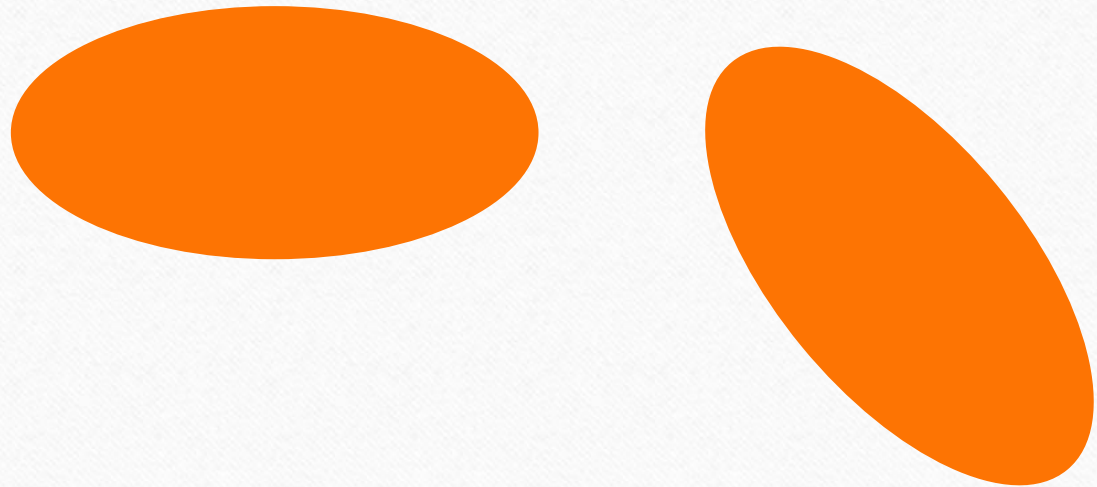
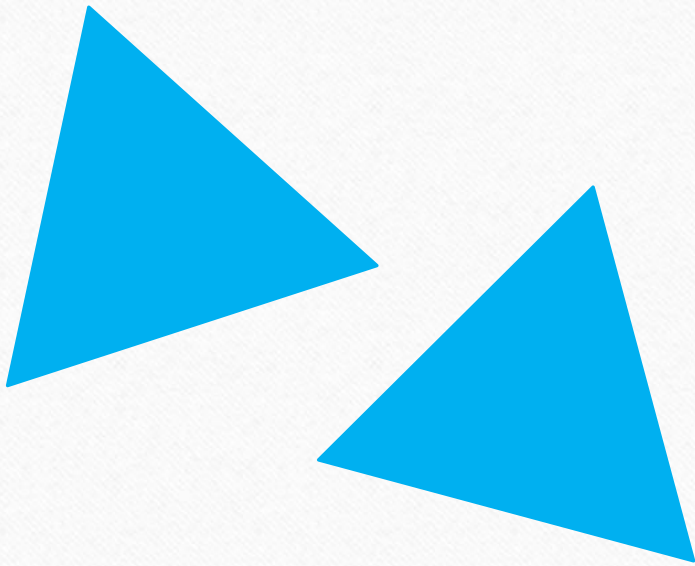
- Order of rotational symmetry is how many times a shape appears the same when turned through 360° .

Rotational Symmetry



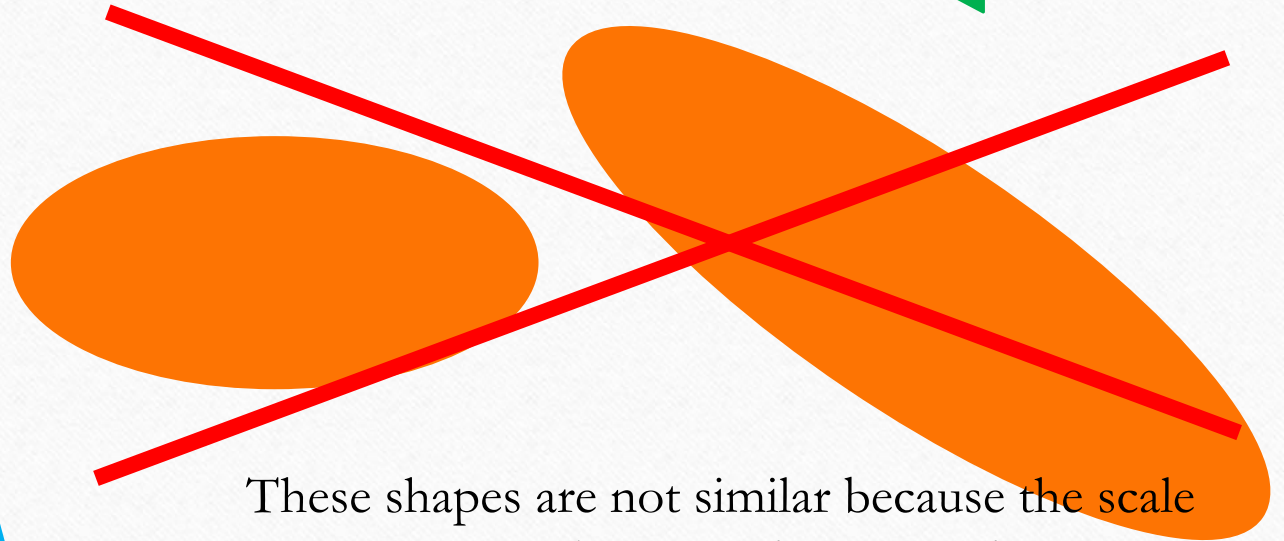
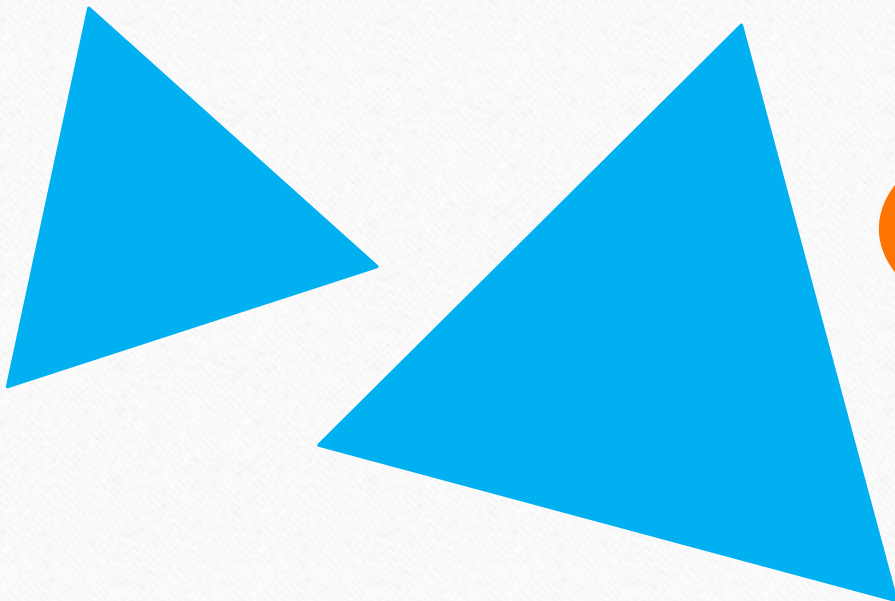
- Congruent shapes are shapes which are exactly the same shape and size.
- They can be reflected, rotated or translated.

Congruent Shapes



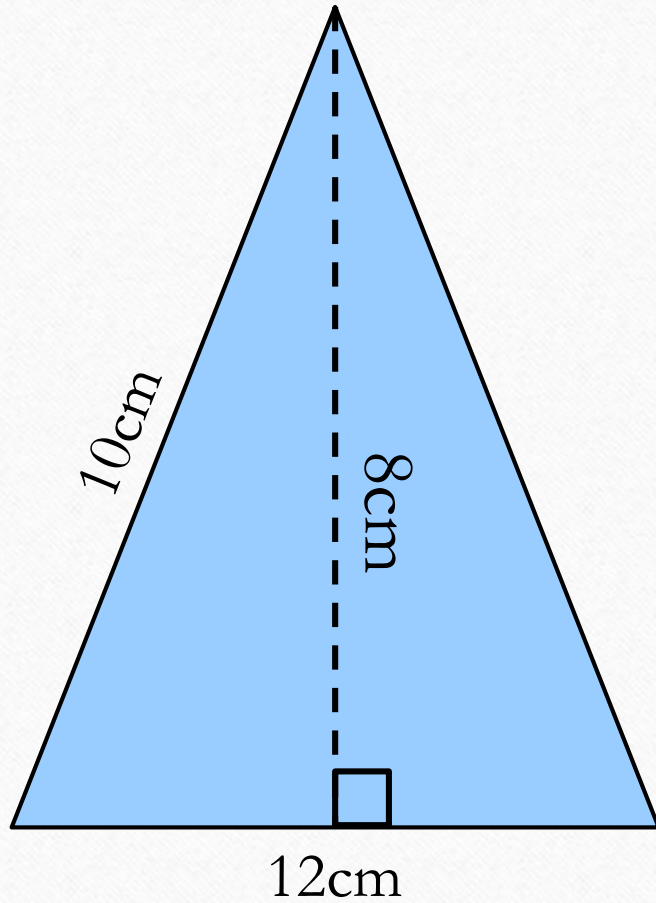
- Similar shapes are shapes which have been enlarged by a scale factor.
- They can also be reflected, rotated or translated.

Similar Shapes



These shapes are not similar because the scale factor has not been applied in every direction.

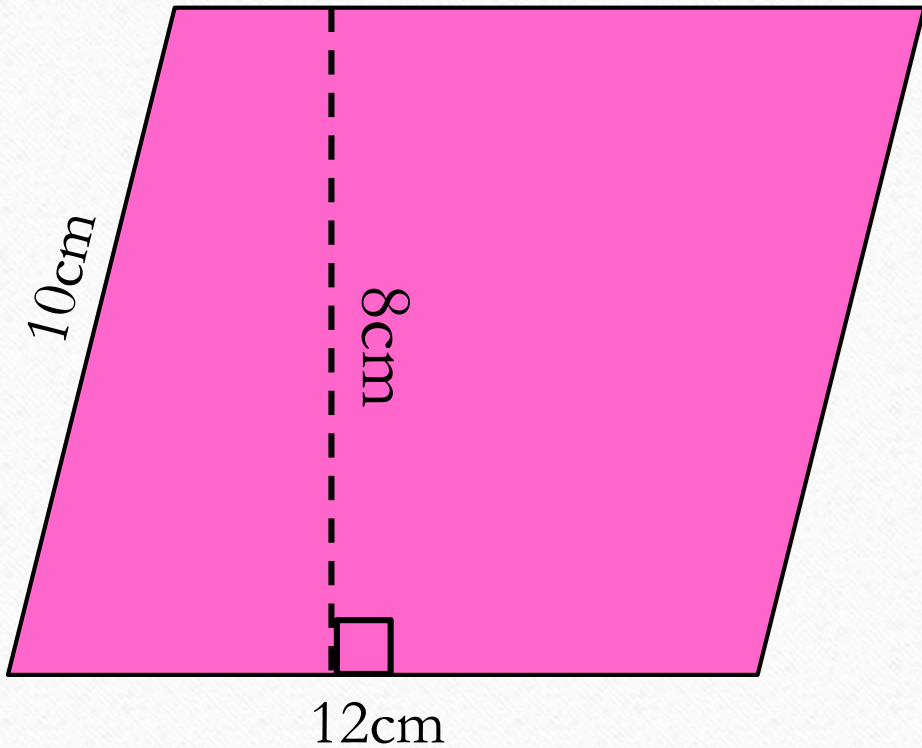
Area



$$Area = \frac{base \times perpendicular\ height}{2}$$

$$Area = \frac{12 \times 8}{2} = 48cm^2$$

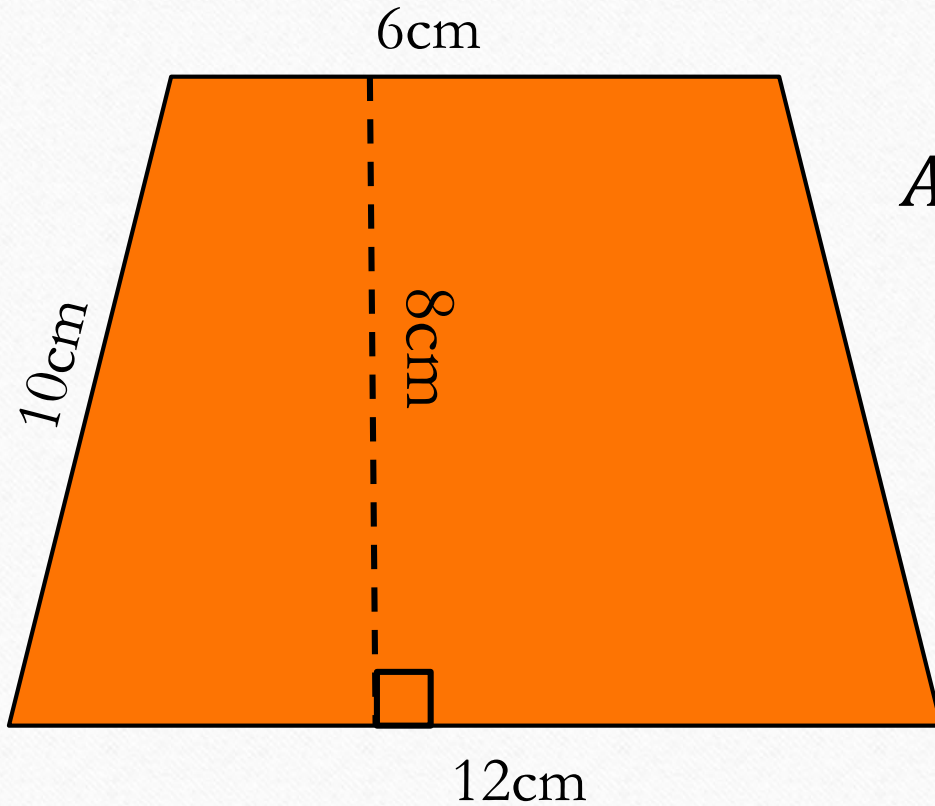
Area



Area = base \times perpendicular height

$$Area = 12 \times 8 = 96cm^2$$

Area



$$Area = \frac{a + b}{2} \times \text{perpendicular height}$$

$$Area = \frac{6 + 12}{2} \times 8 = 80cm^2$$

- Compound shapes are made up of two or more shapes.

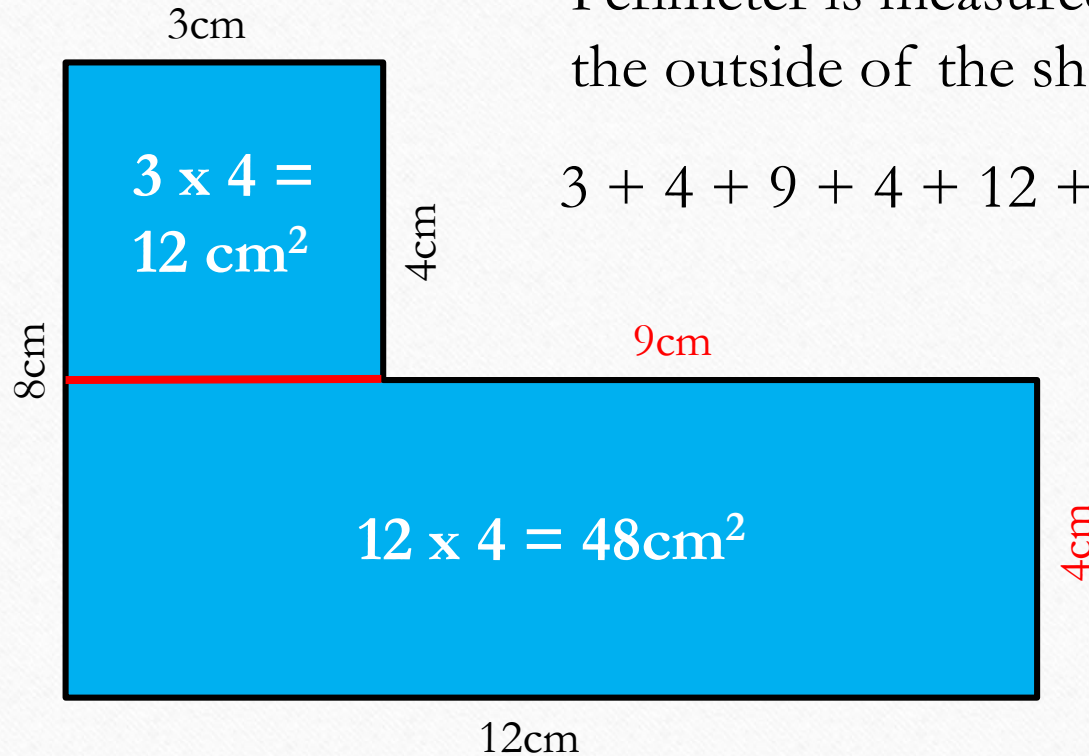
To calculate area the shape needs to be split into shapes that are familiar and then added together.

$$12 + 48 = 60\text{cm}^2$$

Compound Shapes

Perimeter is measured around the outside of the shape.

$$3 + 4 + 9 + 4 + 12 + 8 = 40\text{cm}$$

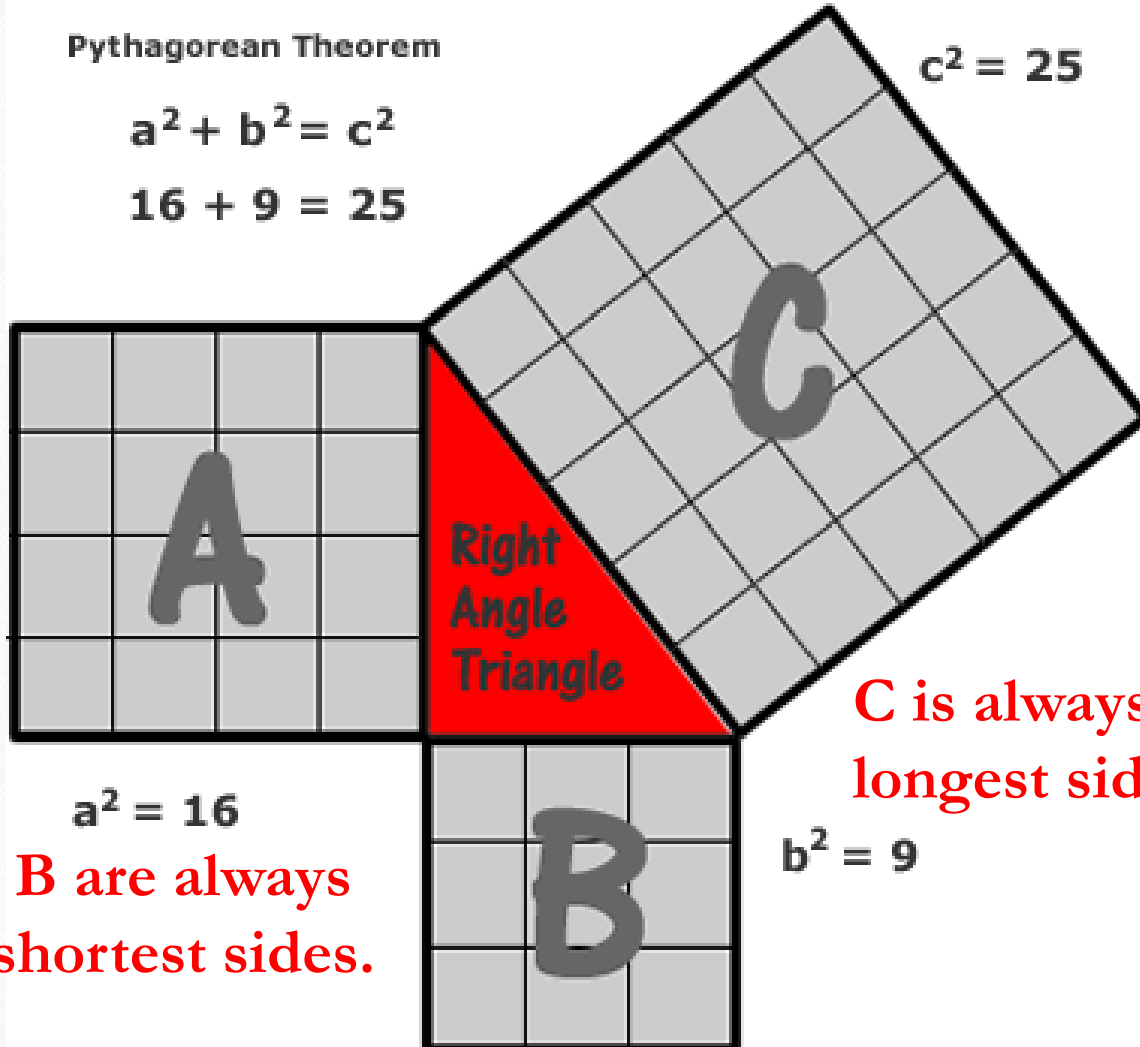


Pythagoras Theorem

Pythagorean Theorem

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

$$16 + 9 = 25$$



A & B are always the shortest sides.

C is always the longest side.

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

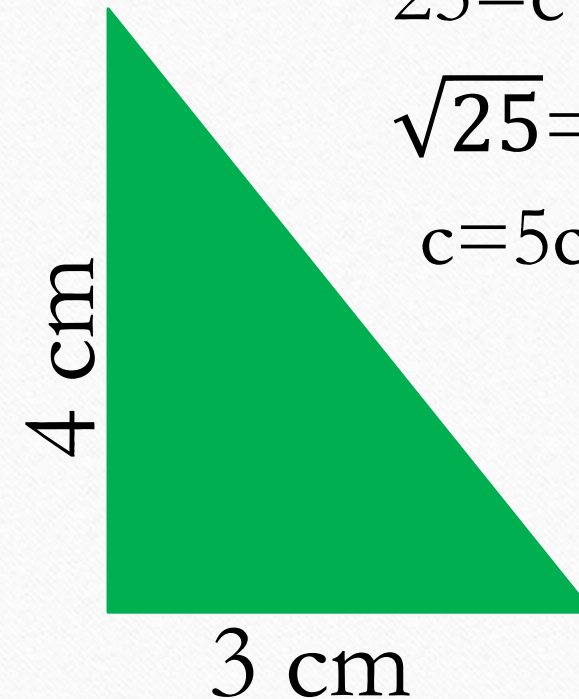
$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

$$\sqrt{25} = c$$

$$c = 5\text{cm}$$

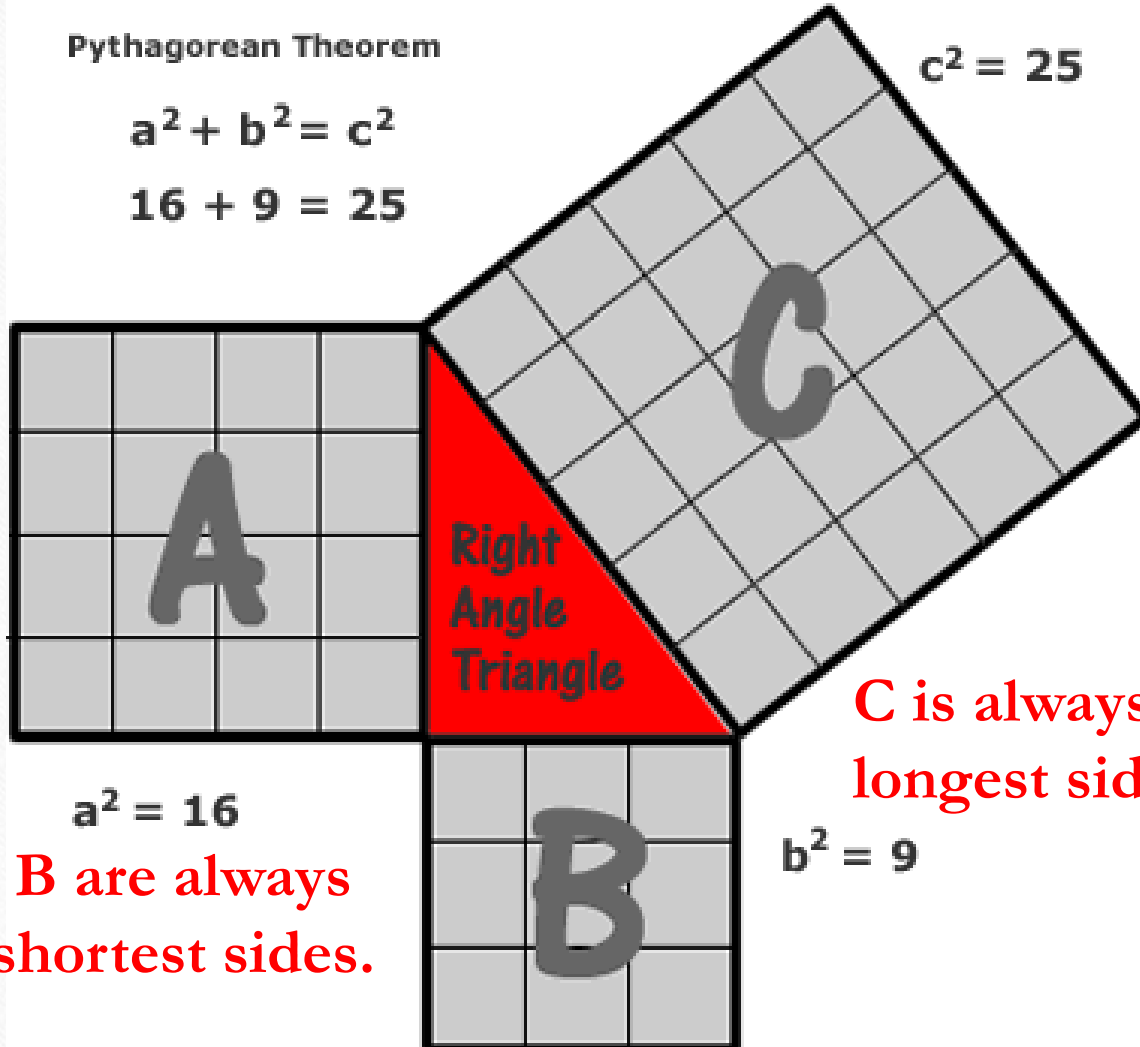


Pythagoras Theorem

Pythagorean Theorem

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

$$16 + 9 = 25$$



$$c^2 = 25$$

$$a^2 = 16$$

$$b^2 = 9$$

A & B are always the shortest sides.

C is always the longest side.

$$c^2 - b^2 = a^2$$

$$10^2 - 6^2 = a^2$$

$$100 - 36 = a^2$$

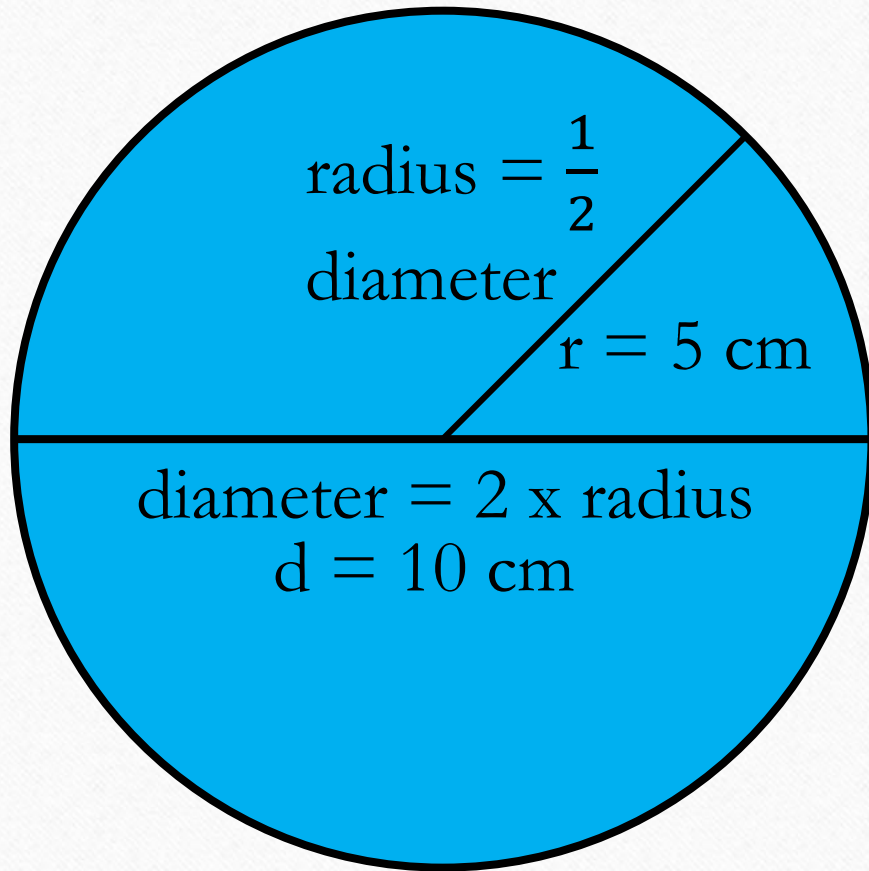
$$64 = a^2$$

$$\sqrt{64} = a$$

$$a = 8\text{cm}$$



Circles



$$\pi = 3.14\dots$$

Pi is the number of times and diameter can fit inside a circumference.

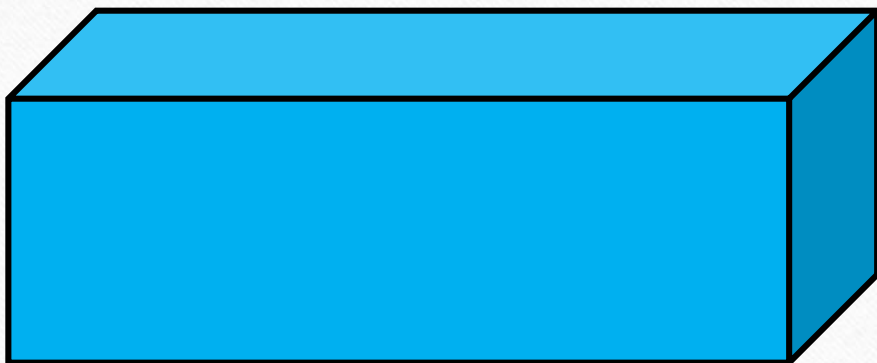
$$\text{Circumference} = \pi d$$

$$\pi \times 10 = 31.42\text{cm}$$

$$\text{Area} = \pi r^2$$

$$\pi \times 5^2 = 78.54\text{cm}^2$$

3D Shapes



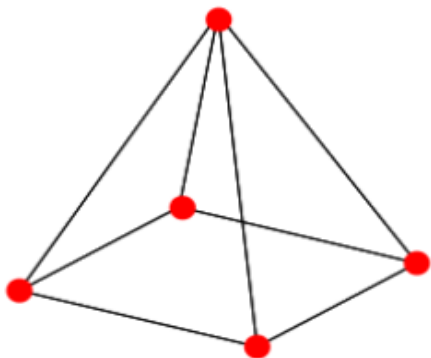
Faces:

Edges:

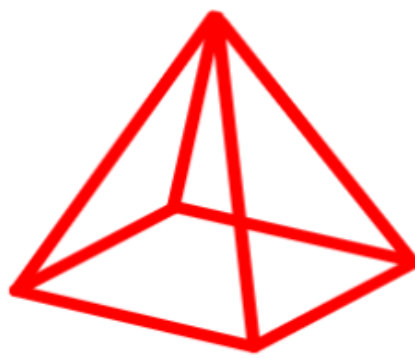
Vertices:

A square-based pyramid has:

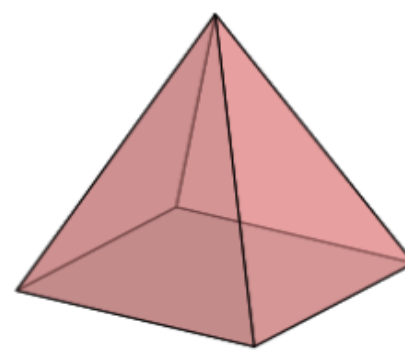
5 vertices



8 edges

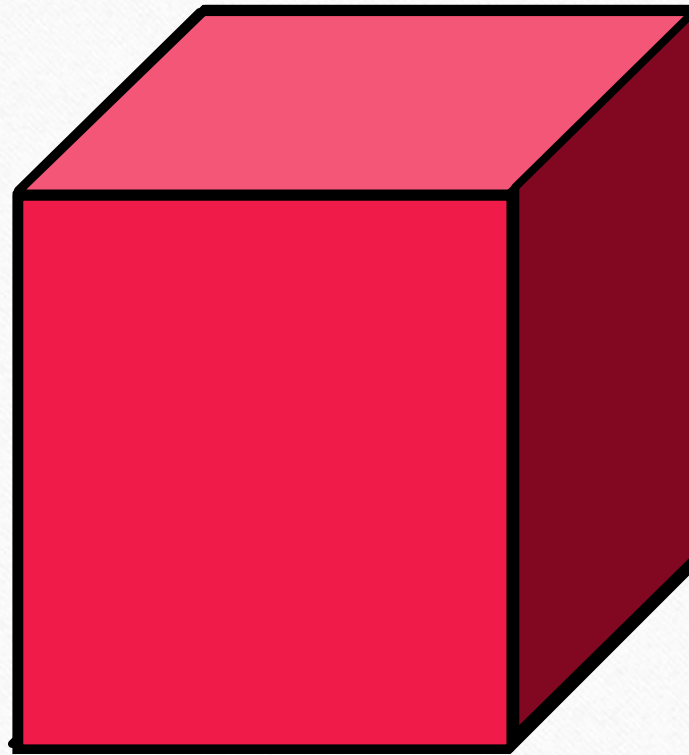


5 faces

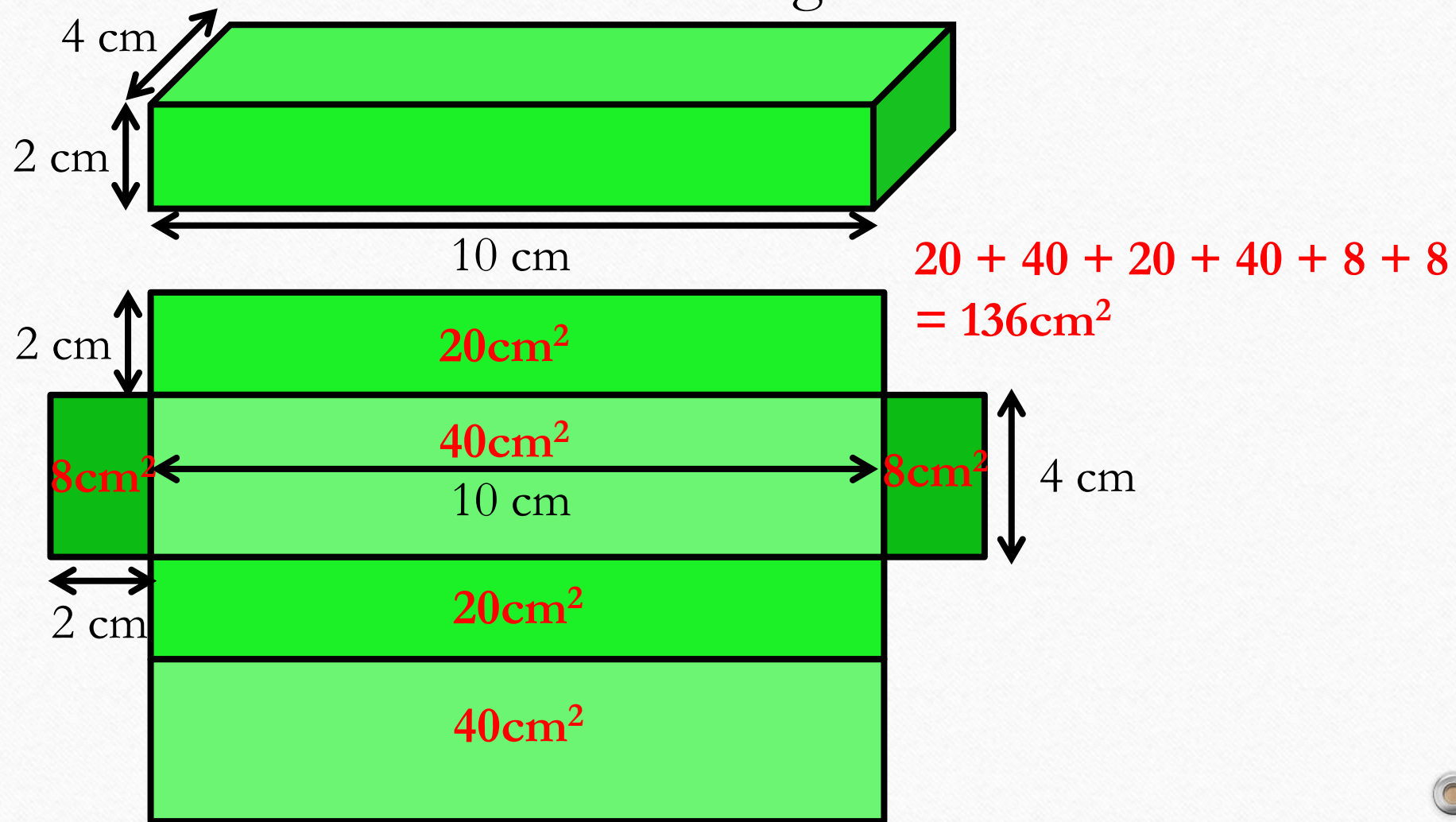


- Surface area is the area of all of the faces of a 3D shape.
- Volume is the space inside of a 3D shape.

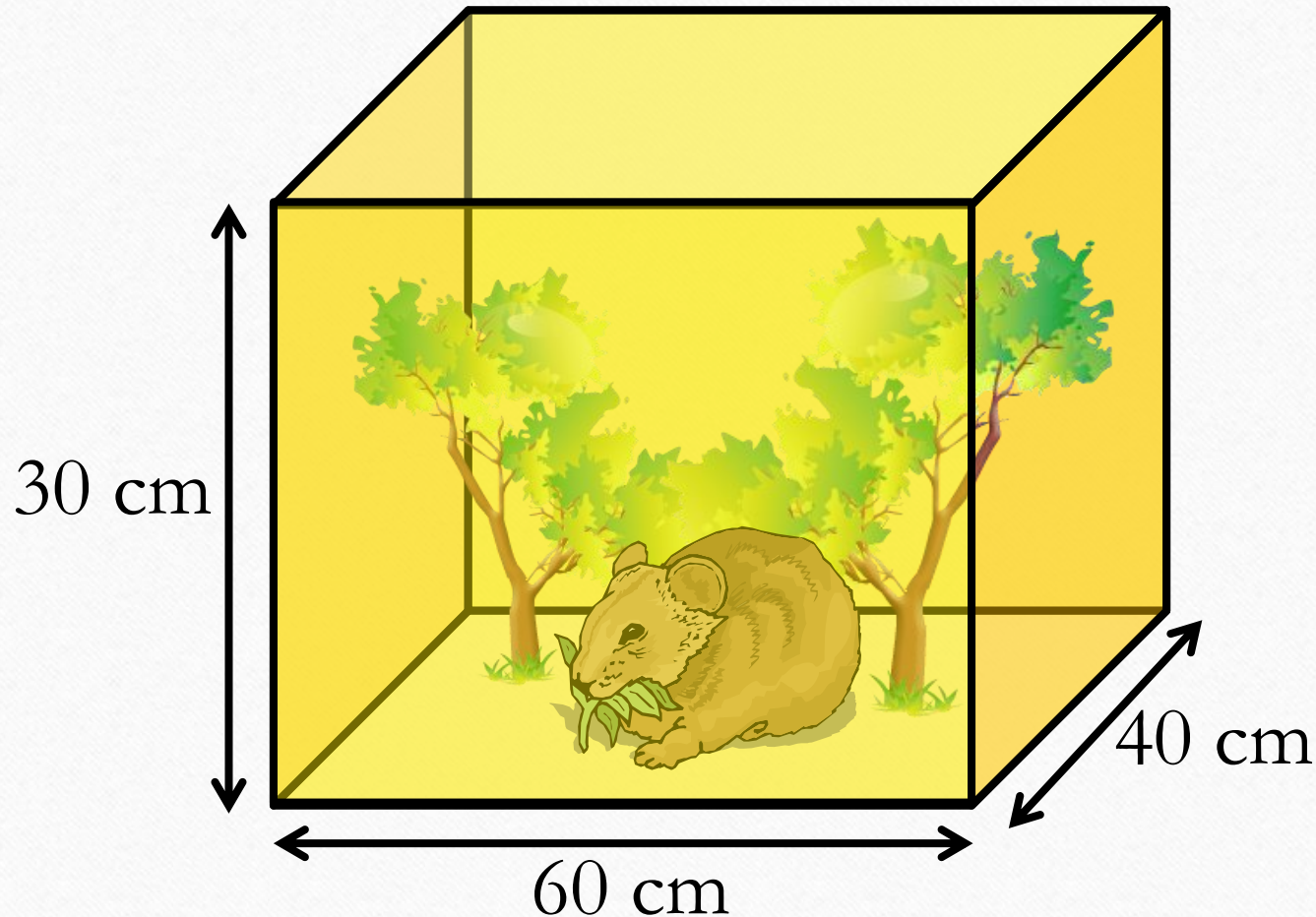
Surface Area & Volume



To calculate surface area, the area of each face needs to be calculated and added together.



To calculate volume, find the area of a face and multiply by the depth.



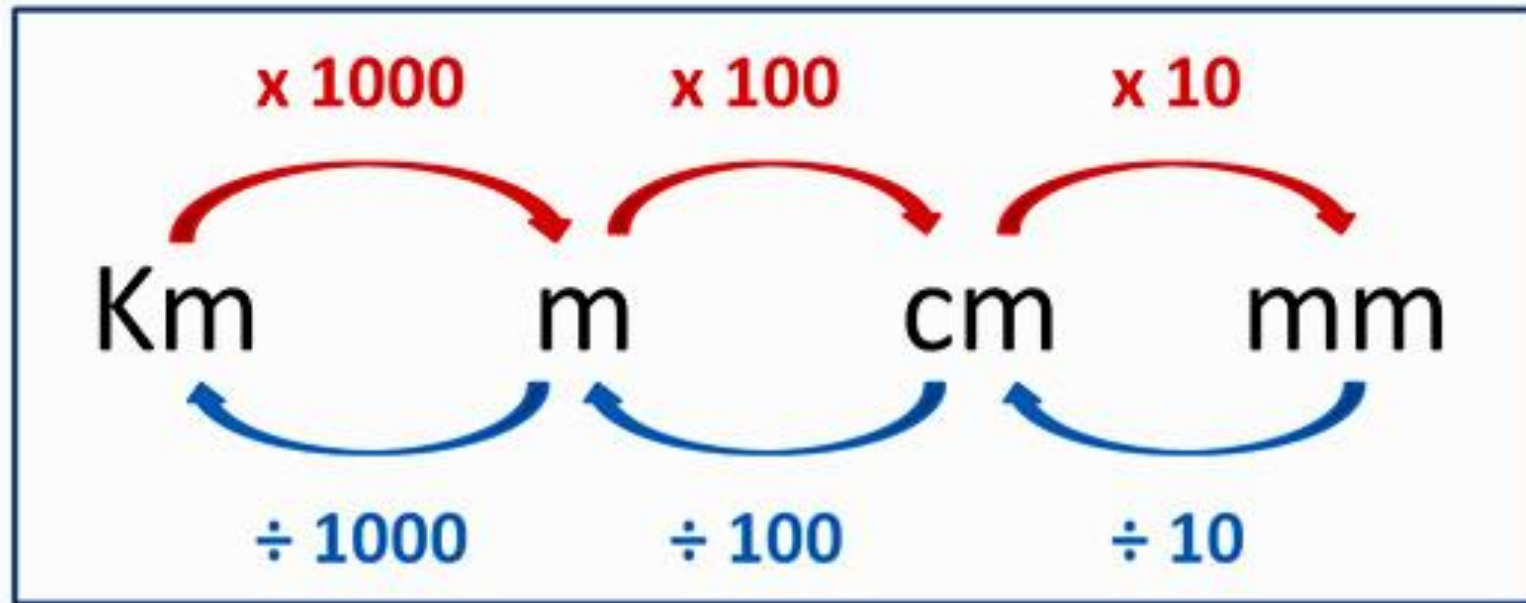
$$60 \times 30 = 1800\text{cm}^2$$

$$1800 \times 40 = 72000\text{cm}^3$$

$$0.6 \times 0.3 = 0.18\text{m}^2$$

$$0.18 \times 0.4 = 0.072\text{m}^3$$

Converting Length Measurements



5km = ? m **Need to $\times 1000$**

5 $\times 1000$ = 5000m ✓

120cm = ? m **Need to $\div 100$**

120 $\div 100$ = 1.2m ✓

Converting Compound Measures

- A compound measure is a combination of measurements.
- Eg. speed = distance \div time

$$\frac{m}{s} \text{ into } \frac{km}{hr}$$

$$1000m = 1km$$

$$\text{so } 1m = \frac{1}{1000}km$$

$$3600s = 1hr$$

$$\text{so } 1s = \frac{1}{3600}hr$$

$$\frac{\frac{1}{1000}}{\frac{1}{3600}} = \frac{1}{1000} \div \frac{1}{3600}$$

$$\frac{1}{1000} \times \frac{3600}{1} = \frac{3600}{1000}$$

$$10 \frac{m}{s} \text{ into } \frac{km}{hr}$$

$$10 \times 3600 = 36000$$

$$36000 \div 1000 = 36 \frac{km}{hr}$$

Converting Compound Measures

- A compound measure is a combination of measurements.
- Eg. speed = distance \div time

$$\frac{m}{min} \text{ into } \frac{km}{hr}$$

$$1000m = 1km$$

$$\text{so } 1m = \frac{1}{1000}km$$

$$60min = 1hr$$

$$\text{so } 1min = \frac{1}{60}hr$$

$$\frac{\frac{1}{1000}}{\frac{1}{60}} = \frac{1}{1000} \div \frac{1}{60}$$

$$\frac{1}{1000} \times \frac{60}{1} = \frac{60}{1000}$$

$$10^m/min \text{ into } km/hr$$

$$10 \times 60 = 600$$

$$600 \div 1000 = 0.6^{km/hr}$$

Metric & Imperial Conversions

Metric	Imperial
2.5 cm	1 inch
8 km	5 miles
1 m	39 inches
30 cm	1 foot
1 kg	2.2 pounds
4.5 litres	1 gallon
1 litre	1.75 pints