

**GCSE - Numeracy and Mathematics**

**Topic:** Relationship between the ratios of lengths, areas and volumes within shapes.

**Tier:** Higher

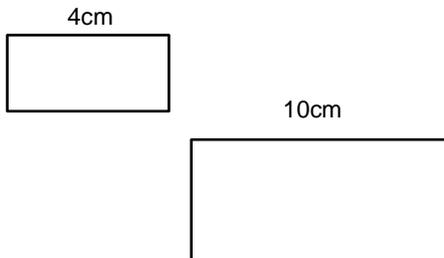
**Grade:**

A\*/A

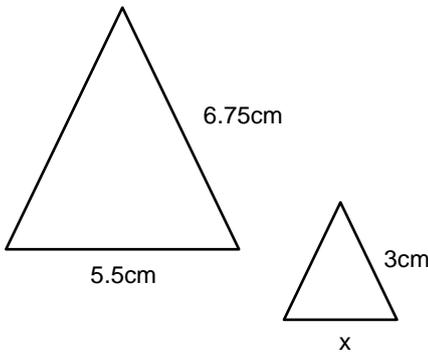


**Skills:**

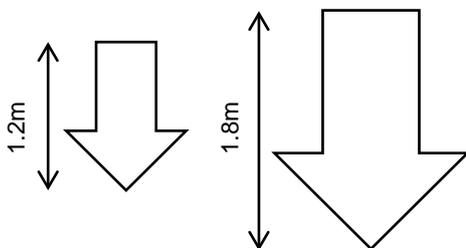
- 1) Find a multiplier that describes the ratio between the sides on these two similar shapes.



- 2) Find the length marked  $x$ . The shapes are similar.



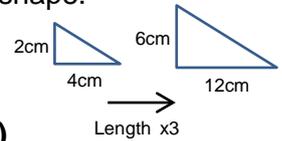
- 3) It takes 2.3L of paint to paint the smaller of these two shapes. How much paint is required to paint the larger shape? The shapes are similar. Round your answer to the nearest tenth of a litre.



**Top Tips!**

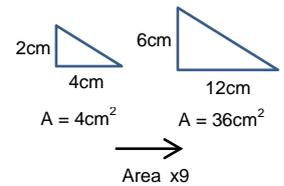
When two shapes are **similar**, any lengths are in the same ratio. There is a **multiplier** that can be used to find lengths of one shape from the corresponding sides of the other shape.

E.g. Here, the bases of the triangles are 12cm and 4cm. So the multiplier is  $\frac{12}{4} = 3$ .  
(Also works with the other two sides  $\frac{6}{2} = 3$ )



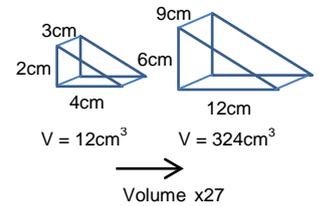
For **area**, the multiplier is **squared**.

E.g. length multiplier = 3,  
**area multiplier =  $3^2 = 9$** .  
i.e. When the lengths are 3 times bigger the area is 9 times bigger.



For **volume**, the multiplier is **cubed**.

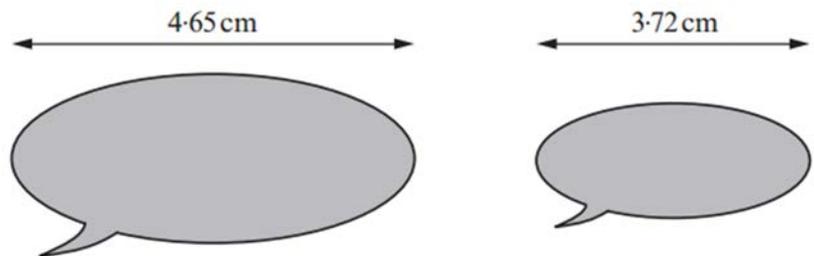
E.g. length multiplier = 3,  
**volume multiplier =  $3^3 = 27$** .  
i.e. When the lengths are 3 times bigger the volume is 27 times bigger.



**Examination Question:**

2013 Summer Link Applications U2 Higher Q11

A company produces coloured speech bubble stickers.



*Diagram not drawn to scale*

The two coloured speech bubble stickers shown above are similar.

One of the company's printer cartridges contains sufficient ink to produce 24 500 of the larger coloured speech bubble stickers. A printer cartridge costs £25.

Calculate the cost of buying enough printer cartridges to print 15 million of the smaller coloured speech bubble stickers.

**Assessment for Learning**

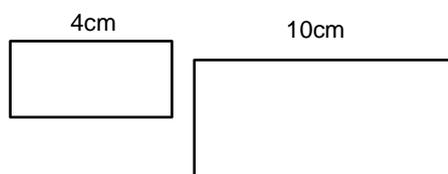
**Video / QR code**

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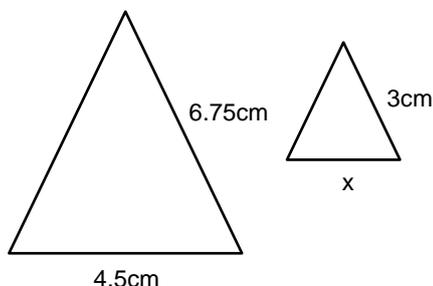
- 1) Find a multiplier that describes the ratio between the sides on these two similar shapes.



$$10/4 = 2.5$$

$$\text{Or } 4/10 = 0.2$$

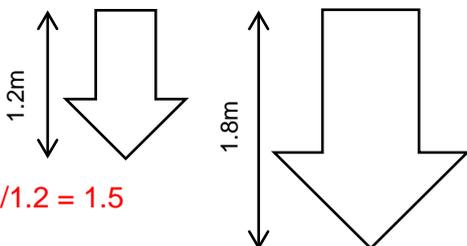
- 2) Find the length marked  $x$ .  
The shapes are similar.



$$3/6.75 = 4/9, 4/9 \times 4.5 = 2$$

$$\text{Or } 6.75/3 = 2.25, 4.5 \div 2.25 = 2$$

- 3) It takes 2.3L of paint to paint the smaller of these two shapes.  
How much paint is required to paint the larger shape?  
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Round your answer to the nearest tenth of a litre.



$$1.8/1.2 = 1.5$$

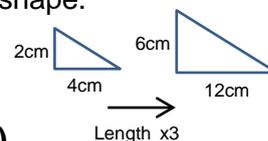
$$\text{Area multiplier} = 1.5^2 = 2.25$$

$$\text{So, } 2.3 \times 2.25 = 5.175 = 5.2 \text{ (1.d.p)}$$

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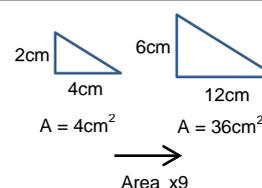
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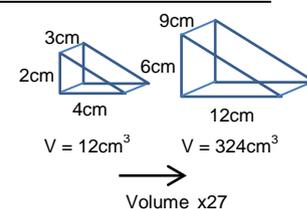
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Calculate the cost of buying enough printer cartridges to print 15 million of the smaller coloured speech bubble stickers.

$$\text{Length Multiplier } 4.65/3.72 = 1.25 \text{ (or } 3.72/4.65=0.8)$$

$$\text{Area Multiplier} = 1.25^2 = 1.5625 \text{ (or } 0.8^2=0.64)$$

$$\text{Will print } 24500 \times 1.56 = 38281.25 \text{ small bubble stickers (24500/0.64)}$$

$$\text{Cartridges needed for 15million } 15000000 \div 38281.25 = 391.836... \text{ So, } 392$$

$$\text{Costs } 392 \times 25 = \text{£}9800$$

**Assessment for Learning****Video / QR code**