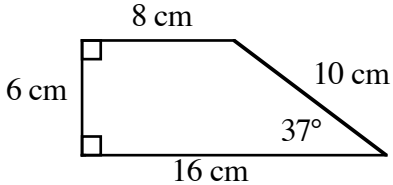
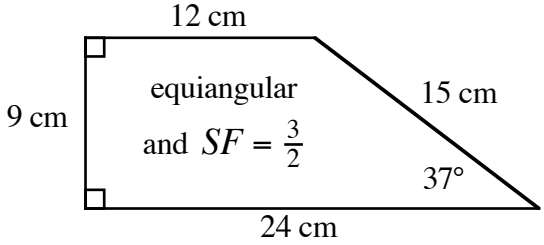
CHAPTER 7: SIMILAR SHAPES

Shapes are similar if they are enlargement or reductions of each other.

(1) the angles remain unchanged - the shapes are **equiangular**.
and (2) the sides are enlarged or reduced by some **scale factor** (SF).



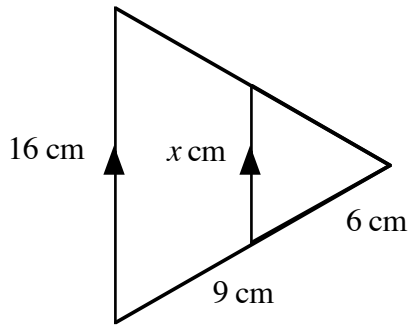


Triangles are special:
Enlarge or reduce sides by some scale factor and the two triangles will be equiangular.
If triangles are equiangular then they are similar.

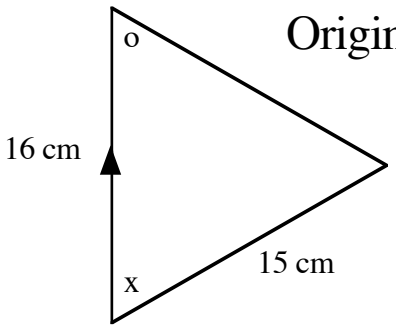
SCALING LENGTH

length scale factor, $SF = \dfrac{\text{image side}}{\text{original side}}$

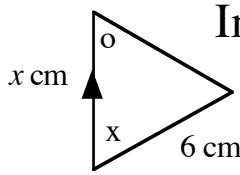
enlargement if $SF > 1$
reduction if $0 < SF < 1$



Find the value of x.



Δs equiangular and so similar



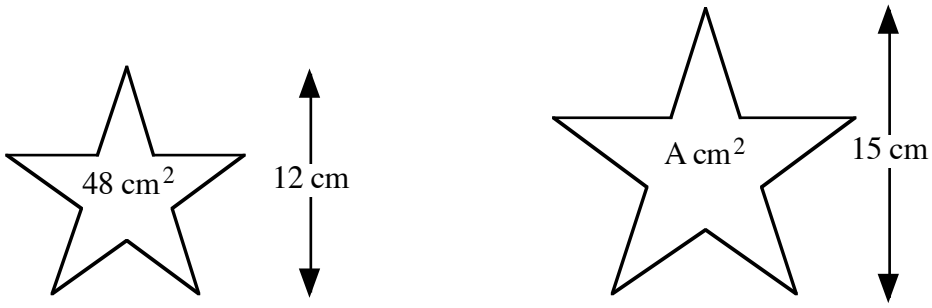
shape with the unknown side

$SF = \dfrac{image}{original} = \dfrac{6}{15} = \dfrac{2}{5}$ *0 < SF < 1 as expected for a reduction*

$x = \dfrac{2}{5} \times 16 = 6 \cdot 4$ *smaller than 16 as expected for a reduction*

SCALING AREA for a 2D shape both length and breadth must be scaled.

length SF = n
area SF = n^2



Given that the two shapes shown are similar, find the area of the larger shape.

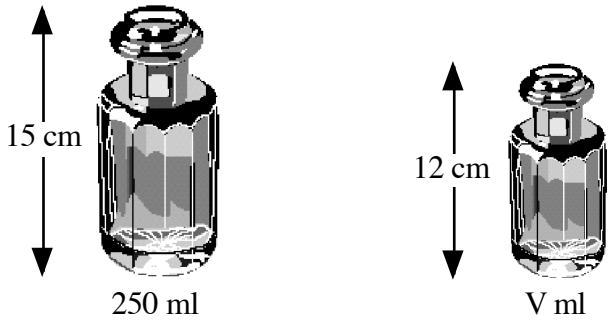
$$\textit{length SF} = \frac{\textit{image}}{\textit{original}} = \frac{15}{12} = \frac{5}{4}$$ *SF > 1 as expected for an enlargement*

$$\textit{area SF} = \frac{5}{4} \times \frac{5}{4} = \frac{25}{16}$$

$$A = \frac{25}{16} \times 48 = 75$$ *bigger than 48 as expected for an enlargement*

SCALING VOLUME for a 3D shape length, breadth and height must be scaled.

length SF = n
volume SF = n^3



Given that the two solids shown are similar find the volume of the smaller solid.

$$\textit{length SF} = \frac{\textit{image}}{\textit{original}} = \frac{12}{15} = \frac{4}{5}$$ *0 < SF < 1 as expected for a reduction*

$$\textit{volume SF} = \frac{4}{5} \times \frac{4}{5} \times \frac{4}{5} = \frac{64}{125}$$

$$V = \frac{64}{125} \times 250 = 128$$ *smaller than 250 as expected for a reduction*