Starter

1) Simplify $\frac{2}{y+4} + \frac{3}{y}$

$= \frac{2y}{y(y+4)} + \frac{3(y+4)}{y(y+4)} = \frac{2y+3(y+4)}{y(y+4)}$

$= \frac{5y+12}{y(y+4)}$

2) Multiply out and collect like terms: $(a + 5)(a - 1)^2$

$= (a+5)(a-1)(a-1)$

$= (a^2+4a-5)(a-1)$

$= a^3+4a^2-5a-a^2-4a+5$

$= a^3+3a^2-9a+5$

3) Solve $3m^2 - 7m - 6 = 0$ for m.

~~$(3m+6)(m-1)$~~ $\leftarrow$ 1, 6

$3m^2-3m+6m-6$

~~$(3m-6)(m+1)$~~ $\leftarrow$ 2, 3

$3m^2+3m-6m-6$

~~$(3m+3)(m-2)$~~

$3m^2-6m+3m-6$

~~$(3m-2)(m+3)$~~

$3m^2+9m-2m-6$

~~$(3m-2)(m-3)$~~

$-9m-2m+6$

$(3m+2)(m-3)$

Today's Learning:

To know the features of similar figures.

Similar Figures

In maths, similar figures are enlargements or reductions of each other. For 2 shapes to be similar, they must have:

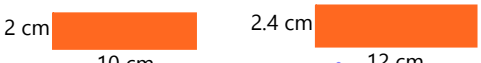
- corresponding lengths in the same ratio
- corresponding angles that are equal

e.g. Are the following similar?

1)

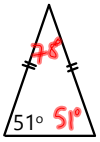
not similar, lengths not in the same ratio

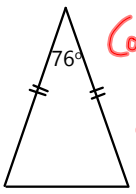
2)



Yes, corresponding angles equal, lengths in the same ratio.

3)

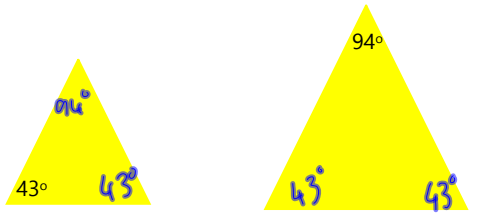




Corresponding Angles not equal ⇒ not similar

Triangles are special: if corresponding angles are the same their lengths will **always** be in the same ratio.

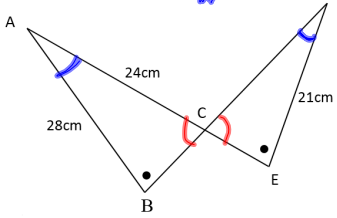
e.g. Are these isosceles triangles similar?



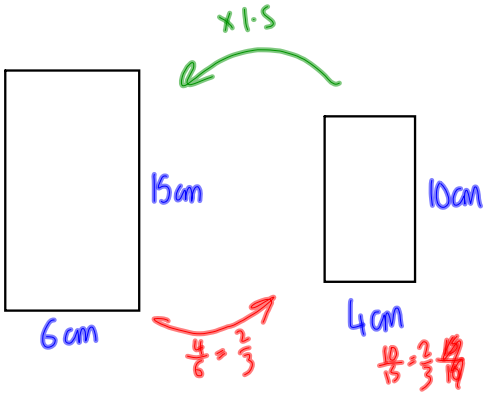
Corresponding Angles are equal ⇒ similar

In the diagram $\angle ABC = \angle CED$, AB = 28cm, AC = 24cm and ED = 21cm.

Explain why the triangles ABC and CDE are similar.



$m = 180 - a - c$



Scale Factor

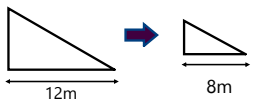
If 2 shapes are similar, one has had all its lengths enlarged or reduced by a **linear scale factor**.

enlargement SF = $\frac{\text{big}}{\text{small}}$ For enlargements, **SF > 1**.

reduction SF = $\frac{\text{small}}{\text{big}}$ For reductions, **SF < 1**.

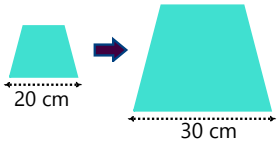
e.g. These are similar shapes. Find the SF of the enlargement or reduction:

1)



$SF = \frac{8}{12} = \frac{2}{3}$

2)



$SF = \frac{30}{20} = \frac{3}{2}$

Starter - NO Calculators

1) Find $\frac{3}{8}$ of £428. £160·50

2) Calculate 0.35 x 2.3

0.3^2

0·3 0·05
0·6 0·1
0·09 0·015
0·805

3) Calculate the area of a circle that has diameter 22 cm, taking π to be 3.14.

$A = \pi r^2$
$= 3.14 \times 11^2$
$= 3.14 \times 121$

100x3·14 = 314
20x3·14 = 62·8
1x3·14 = 3·14
379·94cm²

4) Solve for g: $3g^2 - 4g + 1 = 0$

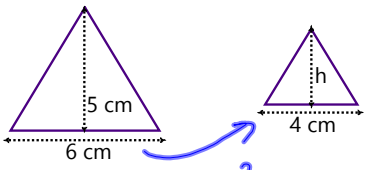
$(3g - 1)(g - 1)$
$g = \frac{1}{3}$ or 1

5) Express 18 as a percentage of 45.

$\frac{18}{45} = \frac{2}{5}$

40%

These shapes are **similar**. Use the SF to find h.



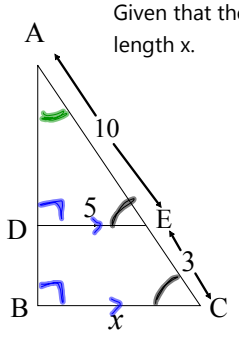
$SF = \frac{4}{6} = \frac{2}{3}$

$5 \times \frac{2}{3} = \frac{10}{3} = 3\frac{1}{3}$ cm

Today's Learning:

To practice working with linear scale factors.

Given that these triangles are similar, find the length x.

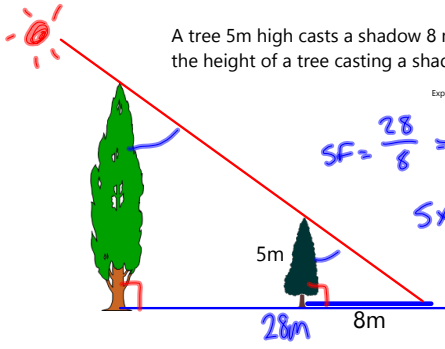


$SF = \frac{\text{big}}{\text{small}} = \frac{13}{10}$

$5 \times \frac{13}{10} = \frac{65}{10}$

$x = 6.5$ units

A tree 5m high casts a shadow 8 m long. Find the height of a tree casting a shadow 28 m long.

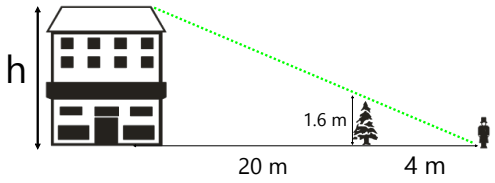


$SF = \frac{28}{8} = \frac{7}{2}$

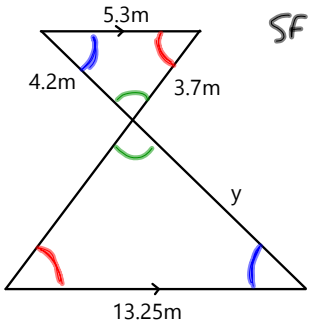
$5 \times \frac{7}{2} = \frac{35}{2}$

$= 17.5$ m

Find the height h:



Find the missing side y.



$SF = \frac{13.25}{5.3} = \frac{5}{2}$

$4.2 \times \frac{5}{2} = 10.5m$

Starter

1) Factorise fully:

a) $4g^2h + 14g^3$ $2g^2(2h+7g)$

b) $3m^2 - m - 2$ $(3m+2)(m-1)$

c) $4c^3 - 4c$ $4c(c^2-1)$ $4c(c+1)(c-1)$

2) Multiply out and simplify: $(3 - b)(b + 2)^2$

$= (3-b)(b+2)(b+2)$

$= (3b+6-b^2-2b)(b+2)$

$= (-b^2+b+6)(b+2)$

$= -b^3+b^2+6b-2b^2+2b+12$

$= -b^3-b^2+8b+2$

3) Calculate $3 - 2(4 - 3)^2 + 6$

$= 3-2(1)^2+6$

$= 3-2\times1+6$

$= 3-2+6 = 7$

4) Calculate $\frac{2}{7} + \frac{4}{18}$

$= \frac{18}{63} + \frac{28}{63} = \frac{46}{63}$

Today's Learning:

To use area scale factor with similar shapes.

Find the scale factor of the enlargement.

Find the area of each rectangle.

ASF = 9

The Area Scale Factor of the enlargement is $\frac{\text{bigger area}}{\text{smaller area}}$

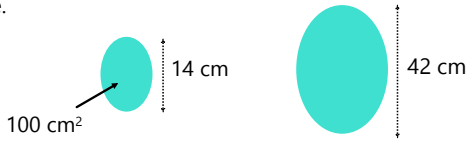
LSF = 3

How does the Area scale factor relate to the scale factor?

Area Scale Factor

Area Scale Factor = LSF²

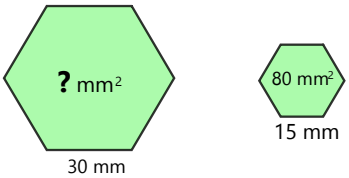
e.g.1) The two mirrors are similar. Find the area of the larger one.



$LSF = \frac{42}{14} = \frac{21}{7} = 3$ $ASF = 3^2 = 9$

$100 \times 9 = 900 cm^2$

e.g. 2)



Starter

1) Factorise fully: $3y^3 + 12y^2 - 63y$

2) Remove brackets and simplify: $(3 - y)^2(y + 1)$

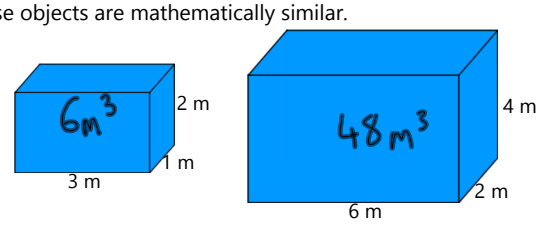
3) Solve the equation: $e^2 - 5e - 50 = 0$

4) Without a calculator, find 40% of 316.

Today's Learning:

To find how volume scale factors relate to linear scale factors and use this in calculations.

These objects are mathematically similar.



Calculate the linear scale factor of the enlgarment. LSF = 6/3 = 2

Volume scale factor = $\frac{\text{new volume}}{\text{old volume}}$. Calculate the VSF for this enlargment.

VSF = 48/6 = 8

How does VSF relate to LSF?

Similar Volumes

Volume Scale Factor = LSF³

1) These bottles are mathematically similar. Calculate the volume of the smaller bottle.

LSF = 18/30 = 9/15 = 3/5

VSF = $(\frac{3}{5})^3 = \frac{27}{125}$

$750 \times \frac{27}{125}$

$= \frac{750 \times 27}{125} = 6 \times 27$

$= 162$ ml