Use Similar Triangles to Solve Problems

Lesson objectives

- I know how to calculate the scale factor of similar triangles
- I know how to calculate the lengths of corresponding sides of similar triangles using proportional reasoning
- I know how to calculate the perimeter and area of similar triangles

1.1 Lesson objectives | Teachers' notes | Lesson notes

MHR Page 347 #s 1, 2, 5, 6bcd, 7, 8cd, 9, 12 & 19

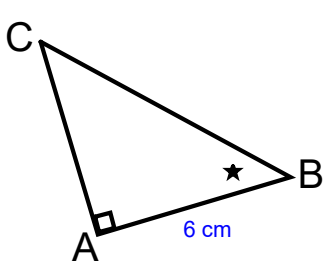
Similar Triangles

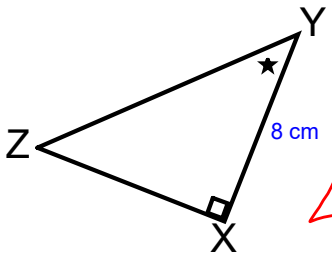
Once we know our triangles are similar, we can findthe scale factor, k between the triangles.

$$\text{Scale factor} = \frac{\text{Big}}{\text{Small}}$$

We have to find matching sides and determine the proportion between them.

Example - Find the scale factor between the triangles.



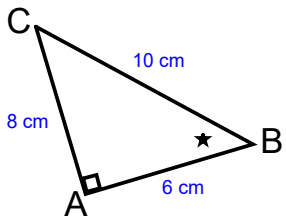


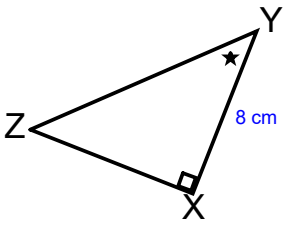
$\triangle ABC \sim \triangle XYZ$ (ASA)

$$\text{Scale factor} = \frac{\text{Big}}{\text{Small}}$$

$$k = \frac{8}{6} \Rightarrow k = \frac{4}{3}$$

Example - Find the length of the missing sides.





Either

$XZ = k(AC)$

$XZ = \frac{4}{3}(8)$

$XZ = 10\frac{2}{3}$ cm

$YZ = k(BC)$

$YZ = \frac{4}{3}(10)$

$YZ = 13\frac{1}{3}$ cm

Or

$\frac{XZ}{AC} = \frac{XY}{AB}$

$\frac{XZ}{8} = \frac{8}{6}$

$XZ = 8\left(\frac{8}{6}\right)$

$XZ = 10\frac{2}{3}$ cm

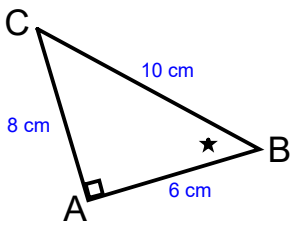
$\frac{YZ}{BC} = \frac{XY}{AB}$

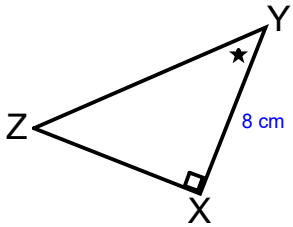
$\frac{YZ}{10} = \frac{8}{6}$

$YZ = 10\left(\frac{8}{6}\right)$

$YZ = 13\frac{1}{3}$ cm

Example - Find the perimeter and area of the ΔXYZ.





Since the lengths of ΔABC are 4/3 times bigger, the perimeter will also be 4/3 times bigger.

Perimeter ΔXYZ = k x Perimeter ΔABC

Perimeter ΔXYZ = 4/3 x (6 + 10 + 8)

Perimeter ΔXYZ = 4/3 x 24

Perimeter ΔXYZ = 32 cm

We can extend this to say that the area of ΔABC is $(4/3)^2$ times bigger than the area of ΔXYZ

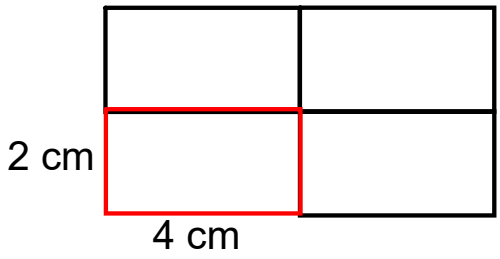
Area ΔXYZ = k^2 x Area ΔABC

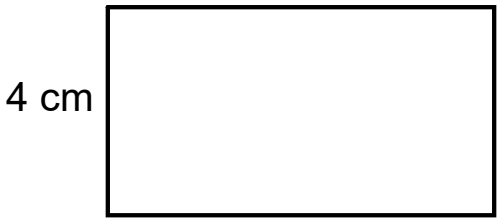
Area ΔXYZ = $(4/3)^2$ x (1/2 x 6 x 8)

Area ΔXYZ = 16/9 x 24

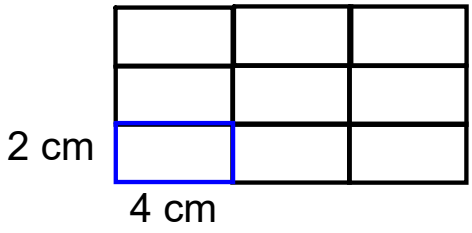
Area ΔXYZ = 42.666... cm^2

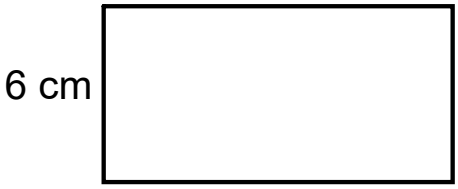
Why is the scale factor squared for area?





Scale factor = 8 ÷ 4 = 2 Area = 2^2 = 4 x bigger





Scale factor = 12 ÷ 4 = 3 Area = 3^2 = 9 x bigger

If we increase the number of rows by a factor of k then we also increase the number of columns by a factor of k, so the area is increased by a factor of k^2.