

Similar Shapes with Algebra

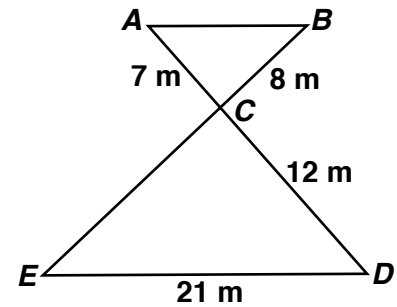
Starter

1. (Review of last lesson)

In the diagram, side AB is parallel to side ED .
 $AC = 7$ m, $BC = 8$ m, $CD = 12$ m and $ED = 21$ m.

Find:

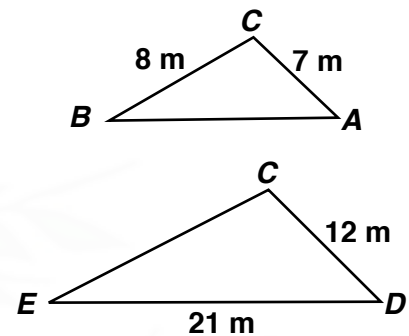
- (a) the length of CE
 (b) the length of AB



Working: Side AC corresponds to side CD
 because $\angle CAB$ corresponds to $\angle CDE$ (alternate angles)

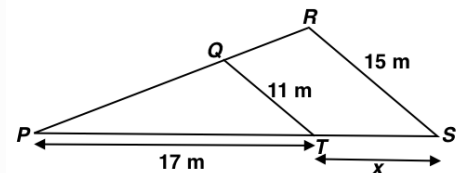
$$\begin{array}{c} 7 : 8 : AB \\ \times \frac{12}{7} \quad \times \frac{7}{12} \\ \hline 12 : CE : 21 \end{array}$$

- (a) $CE = 8 \times \frac{12}{7} = 13.7$ (3 s.f.)
 (b) $AB = 21 \times \frac{7}{12} = 12.25$



E.g. 1 In the diagram, side RS is parallel to side QT .
 Find the value of x .

Hint: We cannot work out x directly.
 But we can work out PS and then...



Working: 1. Length factor method

Small to big: length factor = $\frac{15}{11}$

$PS = 17 \times \frac{15}{11}$ *leave like this to avoid introducing rounding error*

Then $x = PS - PT = PS - 17 = 17 \times \frac{15}{11} - 17 = 6.18$ m

2. Ratio to equation method

11 (QT) corresponds to 15 (RS) $11 : 15$
 17 (PT) corresponds to $17 + x$ (PS) $17 : 17 + x$

Form an equation: $\frac{11}{17} = \frac{15}{17 + x}$

Cross multiply: $11(17 + x) = 15 \times 17$

Solve: $187 + 11x = 255$
 $11x = 68$
 $x = 6.18$

3. Length factor to equation method

Length factor small to big: from 11 to 15 is $\frac{15}{11}$

Length factor small to big: from 17 to $17 + x$ is $\frac{17 + x}{17}$

The length factors must be equal: $\frac{17 + x}{17} = \frac{15}{11}$

Cross multiply: $11(17 + x) = 15 \times 17$

Solve: $187 + 11x = 255$

$$11x = 68$$

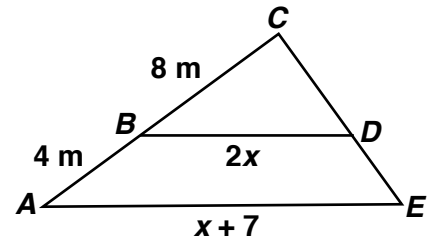
$$x = 6.18$$

E.g. 2 In the diagram, side BD is parallel to side AE .

$AB = 4 \text{ m}$ and $BC = 8 \text{ m}$

$BD = 2x$ and $AE = x + 7$.

Find the length of AE .



Working: 1. Length factor method

Small to big: length factor = $\frac{12}{8} = \frac{3}{2}$

$$AE = \frac{3}{2} \times BD$$

$$x + 7 = \frac{3}{2} \times 2x$$

$$x + 7 = 3x$$

$$7 = 2x$$

$$x = 3.5$$

$AE = x + 7$ so $AE = 10.5 \text{ m}$

2. Ratio to equation method

8 (BC) corresponds to 12 (AC)

$2x$ (BD) corresponds to $x + 7$ (AE)

$$8 : 12$$

$$2x : x + 7$$

Form an equation:

$$\frac{8}{2x} = \frac{12}{x + 7}$$

Cross multiply:

$$8(x + 7) = 12 \times 2x$$

Solve:

$$8x + 56 = 24x$$

$$56 = 16x$$

$$x = 3.5$$

$AE = x + 7$ so $AE = 10.5 \text{ m}$

3. Length factor to equation method

Length factor small to big: from 8 to 12 is $\frac{12}{8}$

Length factor small to big: from $2x$ to $x + 7$ is $\frac{x + 7}{2x}$

The length factors must be equal: $\frac{x + 7}{2x} = \frac{12}{8}$

Cross multiply:

$$8(x + 7) = 12 \times 2x$$

Solve:

$$8x + 56 = 24x$$

$$56 = 16x$$

$$x = 3.5$$

$AE = x + 7$ so $AE = 10.5 \text{ m}$

Video: [Similar shapes](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p450 M13.10 Qu 1-15
A*-G class textbook:	p404 M13.4 Qu 1-15
9-1 homework book:	p156 M13.10 Qu 1-9
A*-G homework book:	p114 M13.4 Qu 1-8

[Homework book answers \(only available during a lockdown\)](#)

