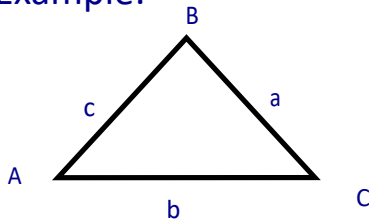


1.2 Similar Triangles

Labelling Non-Right Triangles

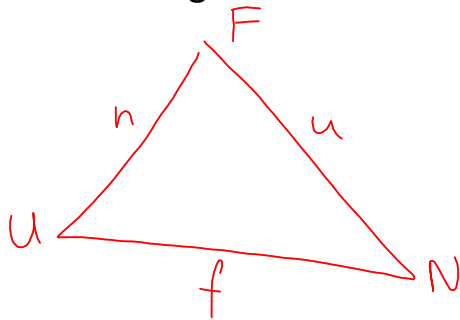
- Angles are denoted by capital letters
- Sides are denoted by lowercase letters

Example:

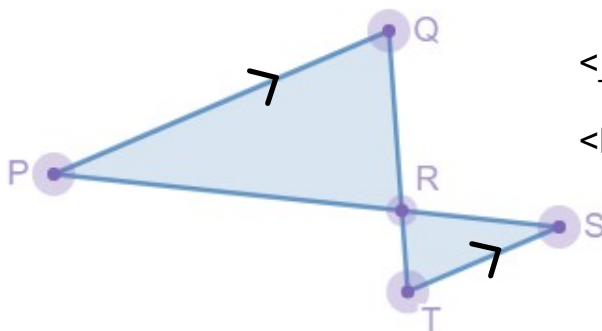


- side 'a' is opposite angle A
- the smallest angle is opposite the smallest side
- the largest angle is opposite the longest side
- the sum of the 2 smaller sides must be greater than the 3rd side

1. Draw triangle FUN. Label the sides and angles.



2.



"Similar"

$$\triangle RST \sim \triangle RPQ$$

$$\angle PQR = \angle \underline{STR}$$

$$\angle \underline{QPR} = \angle TSR$$

$$\angle PRQ = \angle \underline{SRT}$$

$$\frac{PQ}{ST} = \frac{?}{RS} \quad RP$$

$$\frac{TR}{QR} = \frac{TS}{?} \quad QP$$

$$\frac{RQ}{?} = \frac{PR}{SR} \quad RT$$

When 2 triangles are similar, we say that $\triangle ABC \sim \triangle DEF$.

The order of the letters means that:

$$\angle A = \angle D$$

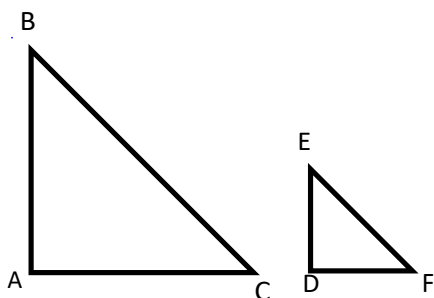
$$\angle B = \angle E \quad \text{and}$$

$$\angle C = \angle F$$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

Ex. 1 Complete the statements about the pair of similar triangles.

a)



$$\triangle ABC \sim \triangle DEF$$

$$\angle A = \angle D$$

$$\angle B = \angle E$$

$$\angle C = \angle F$$



These are
CORRESPONDING
ANGLES

$$\begin{array}{l} \text{big } \triangle \rightarrow \frac{AB}{DE} = \frac{BC}{EF} \leftarrow \text{big } \triangle \\ \text{small } \triangle \rightarrow \end{array}$$

$$\begin{array}{l} \text{big } \triangle \rightarrow \frac{BC}{EF} = \frac{AC}{DF} \leftarrow \text{big } \triangle \\ \text{small } \triangle \rightarrow \end{array}$$

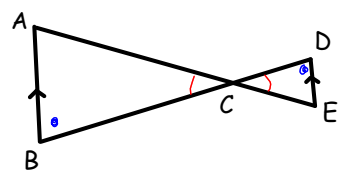
$$\begin{array}{l} \text{big } \triangle \rightarrow \frac{AB}{DE} = \frac{AC}{DF} \leftarrow \text{big } \triangle \\ \text{small } \triangle \rightarrow \end{array}$$

Two triangles are similar if:

- the corresponding angles are equal.
- the lengths of the corresponding sides are proportional.

Ex. 2 Determine if the following pairs of triangles are similar.

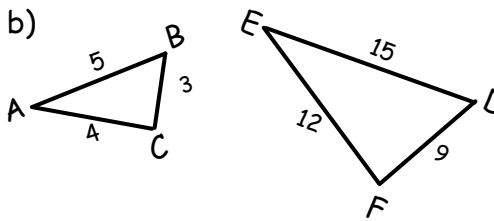
a)



$\angle B = \angle D$ (Z-pattern)
 $\angle BCA = \angle DCE$ (O.A.T.)
 "opposite angle theorem"

$\therefore \triangle ABC \sim \triangle EDC$

b)



Are sides proportional?

$$\frac{ED}{AB} = \frac{15}{5} = 3$$

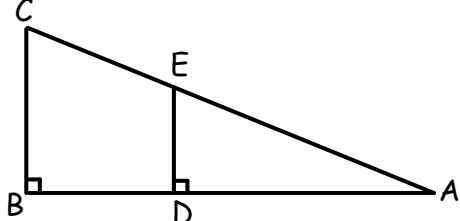
$$\frac{FD}{CB} = \frac{9}{3} = 3$$

$$\frac{EF}{AC} = \frac{12}{4} = 3$$

... All are the same proportion!

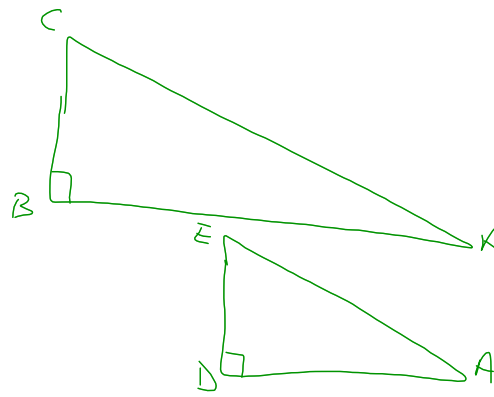
$\therefore \triangle ABC \sim \triangle EDF$

c)



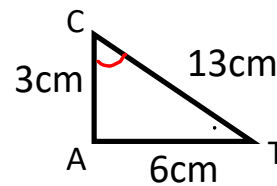
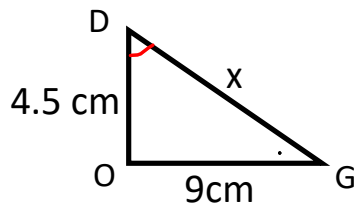
$\angle B = \angle D$
 $\angle A = \angle A$

$\therefore \triangle CBA \sim \triangle EDA$



Ex. 3 Prove that the following triangles are similar. Determine the unknowns.

a)



Prove

Angles?

Proportional sides?

Given $\angle G = \angle T$

$\angle D = \angle C$

$\therefore \triangle DOG \sim \triangle CAT$

SOLVE

$$\frac{DO}{CA} = \frac{DG}{CT}$$

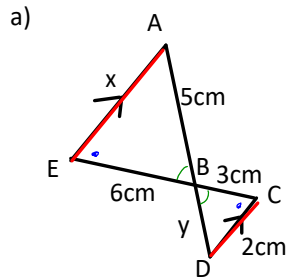
$$\frac{4.5}{3} = \frac{x}{13}$$

$$(13) \frac{4.5}{3} = x$$

$$x = 19.5$$

$$\therefore x = 19.5 \text{ cm}$$

Ex. 4 Prove that the following triangles are similar. Determine the unknowns.



Proof
 $\angle E = \angle C$ (Z-pattern)
 $\angle ABE = \angle DBC$ (O.A.T.)
 $\therefore \triangle ABE \sim \triangle DBC$

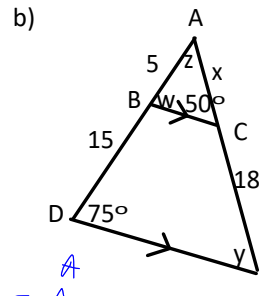
SOLVE

$$\frac{x}{2} = \frac{6}{3}$$

$$x = \frac{6}{3}(2)$$

$$= 4$$

$$\therefore x = 4 \text{ cm}$$



Proof
 $\angle D = \angle B$ (F-pattern)
 $\angle C = \angle E$ (")
 $\therefore \triangle ABC \sim \triangle ADE$

SOLVE

$$w = 75^\circ$$

$$y = 50^\circ$$

$$z = 180 - 75 - 50 = 55^\circ$$

$$\frac{DA}{BA} = \frac{AE}{AC}$$

$$\frac{20}{5} = \frac{x+18}{x}$$

$$(x) 20 = (x+18)(5)$$

$$20x = 5x + 90$$

$$15x = 90$$

$$x = 6$$

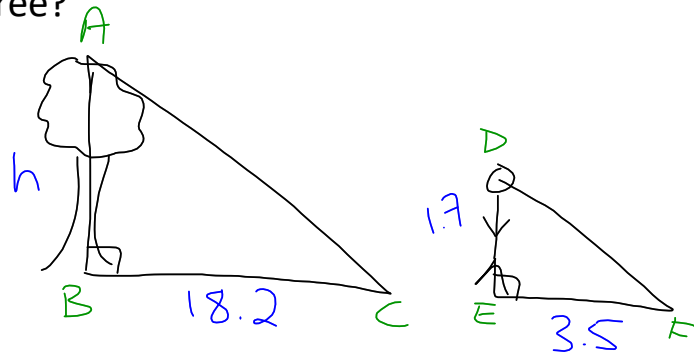
$$x = 6$$

$$y = 50^\circ$$

$$z = 55^\circ$$

$$w = 75^\circ$$

Ex. 5 On a sunny day, Tanner who is 1.7 m tall and standing by a tree, casts a shadow which is 3.5 m long. The nearby tree casts a shadow of 18.2 m long. How tall is the tree?



Prove

Similar because
Shadows
 $\therefore \triangle ABC \sim \triangle DEF$

SOLVE

$$\frac{h}{1.7} = \frac{18.2}{3.5}$$

$$h = \frac{18.2}{3.5} (1.7)$$

$$= 8.8$$

$\therefore$ The tree is 8.8 m tall.

Homework

Set 1: p. 348 #6e, 9, 11, 14

Set 2: p. 348 #6e, 9, 14, 23ab*, 24

