

Math 9

2.4 Similar Triangles

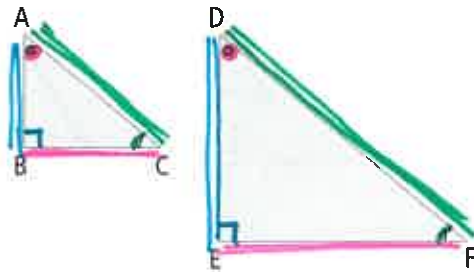
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Date: Mar. 4 / 5

Learning Goals: I will learn to

- analyze to determine whether two triangles are similar
- use similarity between triangles to solve problems

The two triangles below are similar. ← same shape, different size



$\Delta ABC \sim \Delta DEF$

~ means "is similar to"

When two triangles are similar:

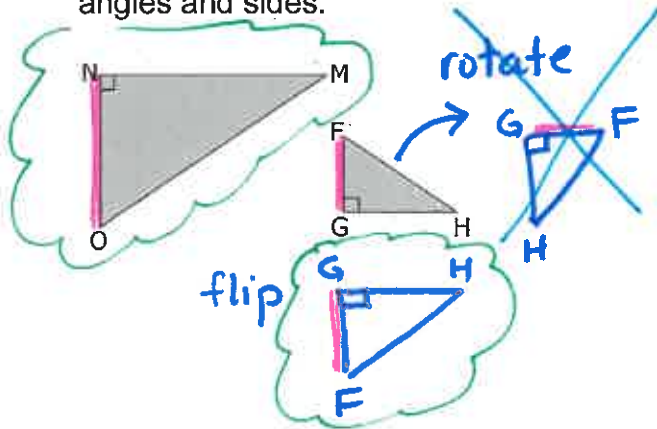
- corresponding angles have the same relative position and are equal

$$\begin{aligned} \angle A &= \angle D \\ \angle B &= \angle E \\ \angle C &= \angle F \end{aligned}$$

- corresponding sides have the same relative position and are proportional

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

Sometimes we need to rotate and/or flip the triangles to help us identify corresponding angles and sides.



Corresponding Angles

Corresponding Sides

- $\angle N$ and $\angle G$
- $\angle M$ and $\angle H$
- $\angle O$ and $\angle F$

- NO and GF
- NM and GH
- OM and FH

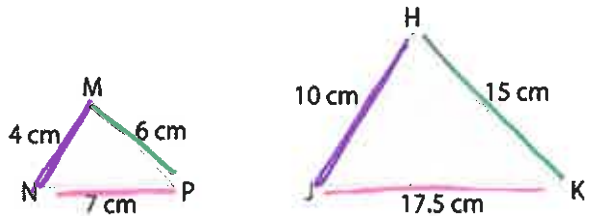
To **prove** that two triangles are similar, we need to show that:

- EITHER** 1. their corresponding angles are equal
OR 2. their corresponding sides are proportional

Example: Determine Whether Two Triangles Are Similar

Show that $\triangle MNP \sim \triangle HJK$.

- don't know any angles
- can show that corresponding sides are proportional



$$\frac{HJ}{MN} = \frac{JK}{NP} = \frac{HK}{MP}$$

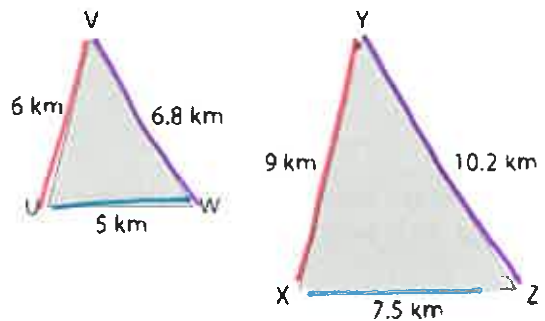
$$\frac{10\text{cm}}{4\text{cm}} = \frac{17.5\text{cm}}{7\text{cm}} = \frac{15\text{cm}}{6\text{cm}}$$

$$2.5 = 2.5 = 2.5$$

because corresponding sides are proportional, the triangles are similar
 $\triangle MNP \sim \triangle HJK$

Show You Know

Show that $\triangle UVW \sim \triangle XYZ$.



$$\frac{YZ}{VW} = \frac{XZ}{UV} = \frac{XY}{UW}$$

$$\frac{10.2\text{km}}{6.8\text{km}} = \frac{7.5\text{km}}{5\text{km}} = \frac{9\text{km}}{6\text{km}}$$

$$1.5 = 1.5 = 1.5$$

sides are proportional
 $\triangle UVW \sim \triangle XYZ$

OR

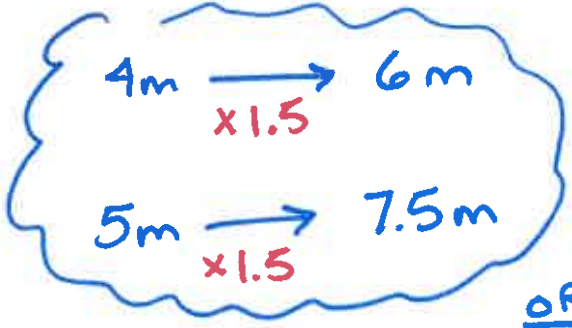
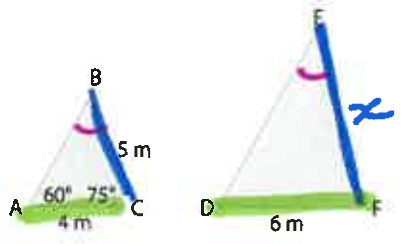
$$\frac{6.8}{10.2} = \frac{5}{7.5} = \frac{6}{9}$$

$$0.\overline{6} = 0.\overline{6} = 0.\overline{6}$$

If we **know** that two triangles are similar, we can use what we know about corresponding angles and sides to determine missing information.

Example: Determine the Unknown Angle and Side Measures

Given that $\triangle ABC \sim \triangle DEF$, determine the measure of $\angle E$ and the length of EF .



$\angle B = 180 - 60 - 75$
 $= 45^\circ$
 (angles in Δ add to 180°)
 $\angle B = \angle E$ (corresponding angles are equal)
 $\angle E = 45^\circ$

~~$\frac{6m}{4m} = \frac{x}{5m}$~~

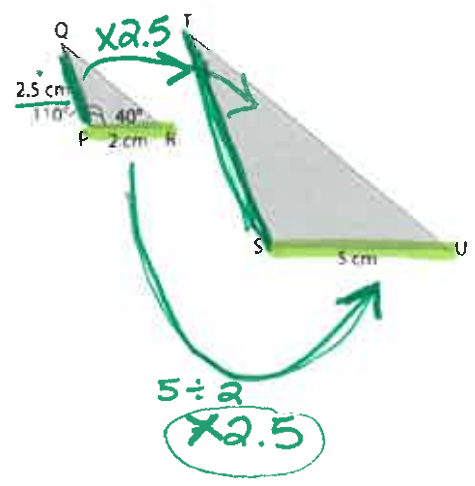
$x = \frac{6 \times 5}{4}$
 $= 7.5m \Rightarrow$

EF is 7.5m long

Show You Know

Given that $\triangle PQR \sim \triangle STU$, determine the measure of $\angle T$ and the length of ST .

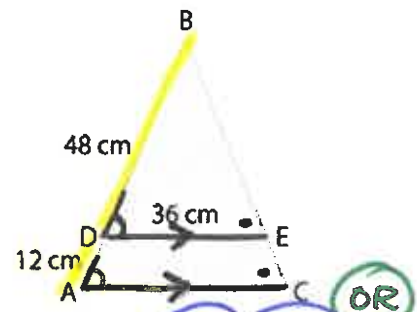
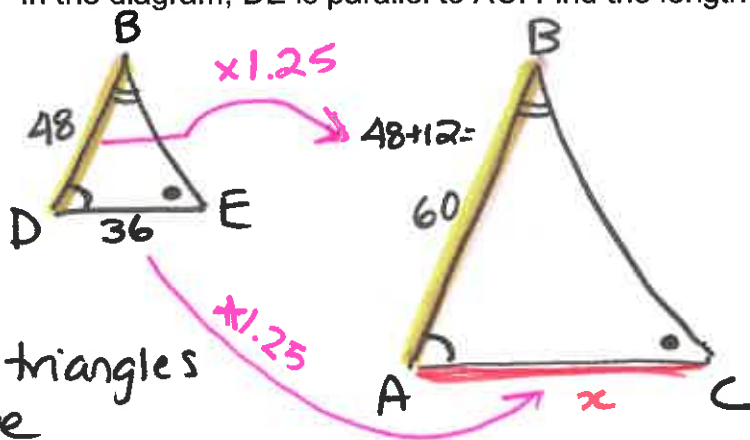
$\angle Q = 180 - 110 - 40$
 $= 30^\circ$ (angles in Δ add to 180°)
 $\angle T = \angle Q$ (corresponding angles are equal)
 $\angle T = 30^\circ$



$2.5 \times 2.5 = 6.25 \text{ cm}$

Example: Determine Unknown Measures in Nested Similar Triangles (p. 63)

In the diagram, DE is parallel to AC. Find the length of AC.



OR

$$\frac{60}{48} = \frac{x}{36}$$

$$x = \frac{60 \times 36}{48}$$

$$= 45$$

the triangles have equal corresponding angles

$$\angle A = \angle D$$

$$\angle B = \angle B$$

$$\angle C = \angle E$$

they are similar!

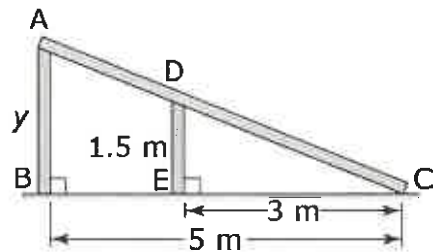
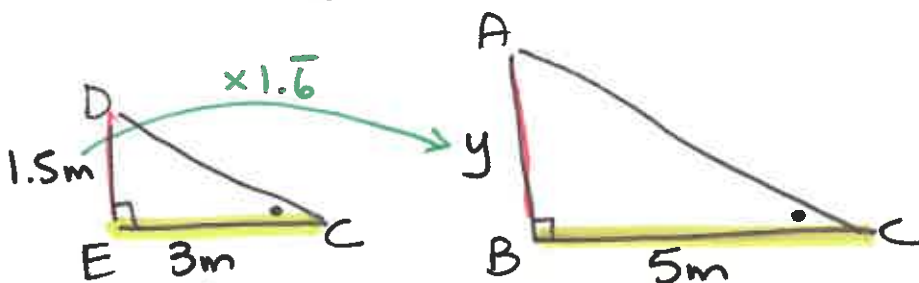
$$48 \xrightarrow{\times 1.25} 60$$

$$36 \xrightarrow{\times 1.25} 45$$

AC is 45cm long

Show You Know

Find the height of the ramp (y).



$$5 \div 3 = \times 1.6$$

$$1.5 \times 1.6 = 2.5$$

The ramp is 2.5m tall

OR

$$\frac{5}{3} = \frac{y}{1.5}$$

$$y = \frac{1.5 \times 5}{3}$$

$$= 2.5$$