# Curriculum Outcomes:

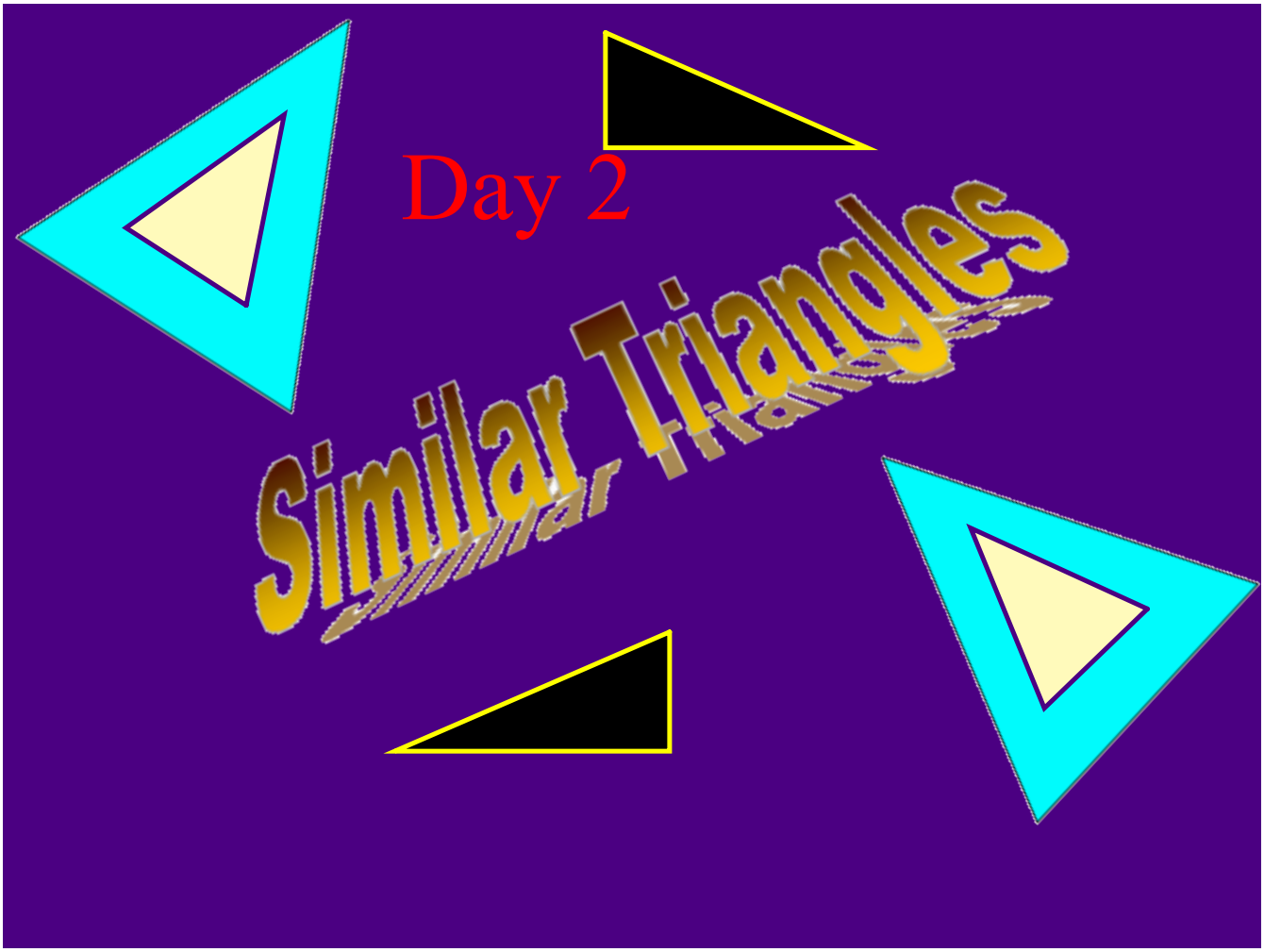
**(SS3) Demonstrate an understanding of similarity of polygons.**

**(SS4) Draw and interpret scale diagrams of 2-D shapes.**

**(SS5) Demonstrate an understanding of line and rotation symmetry.**

Student Friendly:

How are diagrams related in size? To increase a length by a certain number be it a fraction or a whole number.


Day 2
Similar Triangles

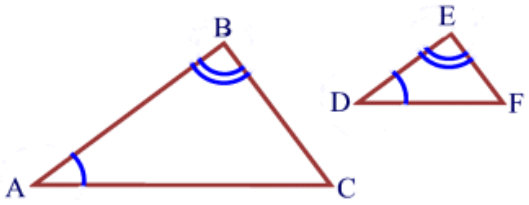
**Definition:** Two triangles are **similar** if and only if the corresponding sides are in proportion and the corresponding angles are congruent.

## There are three accepted methods of proving triangles similar:

### AA

To show two triangles are similar, it is sufficient to show that two angles of one triangle are congruent (equal) to two angles of the other triangle.

**Theorem:** If two angles of one triangle are congruent to two angles of another triangle, the triangles are similar.




If: $\measuredangle A \cong \measuredangle D$

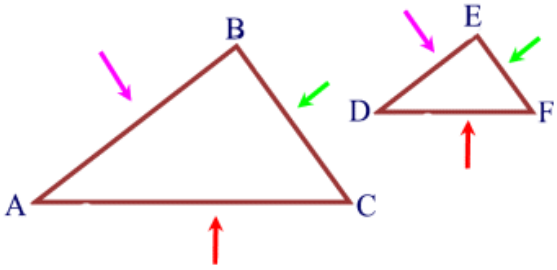
$\measuredangle B \cong \measuredangle E$

Then: $\Delta ABC \sim \Delta DEF$

### SSS for similarity

*BE CAREFUL!!* SSS for similar triangles is NOT the same theorem as we used for congruent triangles. To show triangles are similar, it is sufficient to show that the three sets of corresponding sides are in proportion.

**Theorem:** If the three sets of corresponding sides of two triangles are in proportion, the triangles are similar.



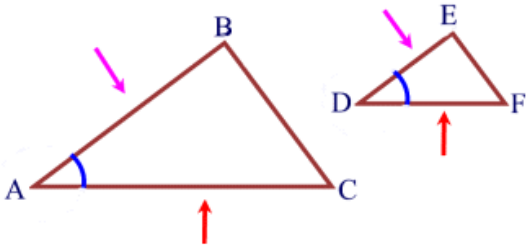

If: $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$

Then: $\Delta ABC \sim \Delta DEF$

### SAS for similarity

*BE CAREFUL!!* SAS for similar triangles is NOT the same theorem as we used for congruent triangles. To show triangles are similar, it is sufficient to show that two sets of corresponding sides are in proportion and the angles they include are congruent.

**Theorem:** If an angle of one triangle is congruent to the corresponding angle of another triangle and the lengths of the sides including these angles are in proportion, the triangles are similar.



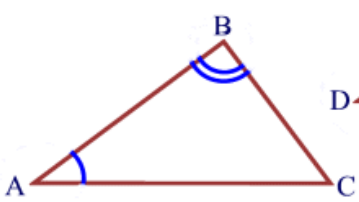

If: $\measuredangle A \cong \measuredangle D$

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

Then: $\Delta ABC \sim \Delta DEF$

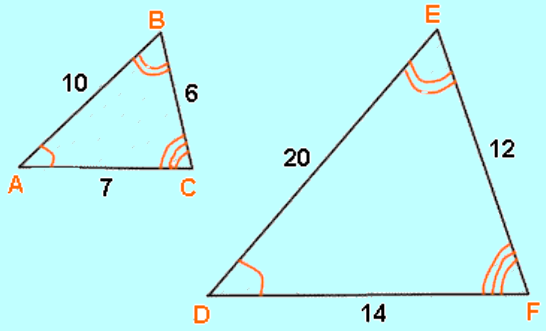
## Once the triangles are similar:

**Theorem:** The corresponding sides of similar triangles are in proportion.




$If: \Delta ABC \sim \Delta DEF$

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

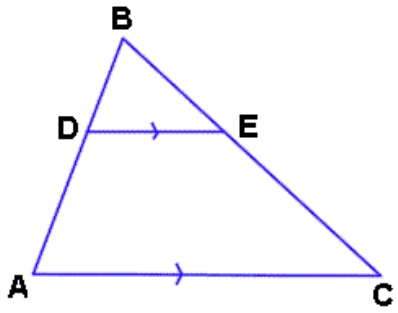



$\Delta ABC \sim \Delta DEF$

| Facts about similar triangles: | |
|---|---|
| $\measuredangle A = \measuredangle D$<br>$\measuredangle B = \measuredangle E$<br>$\measuredangle C = \measuredangle F$ | $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ |

Angles equal and sides are proportionate

# Dealing with overlapping triangles:




Many problems involving similar triangles have one triangle ON TOP OF (overlapping) another triangle. Since $\overline{DE}$ is marked to be parallel to $\overline{AC}$, we know that we have $\angle BDE$ congruent to $\angle DAC$ (by corresponding angles). $\angle B$ is shared by both triangles, so the two triangles are similar by AA.

There is an additional theorem that can be used when working with overlapping triangles:

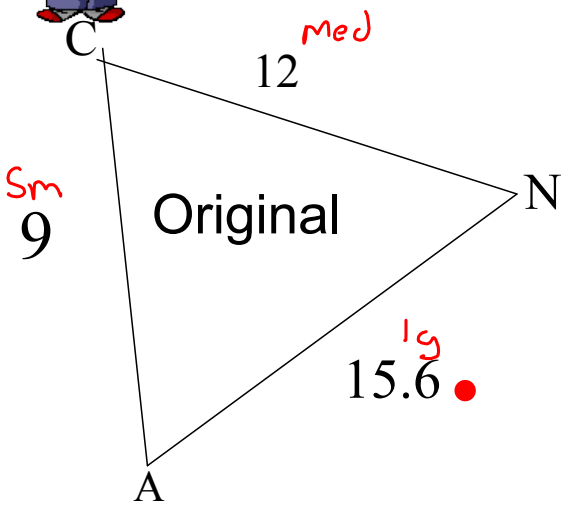
**Additional Theorem:** If a line is parallel to one side of a triangle and intersects the other two sides of the triangle, the line divides these two sides proportionally.

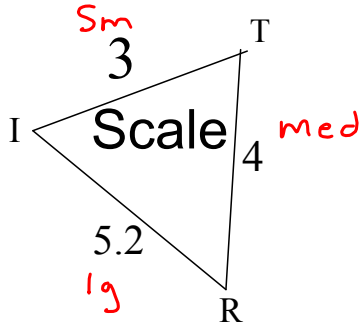
$$If: \overline{DE} \parallel \overline{AC}$$

$$Then: \frac{BD}{BA} = \frac{BE}{BC}$$

# Are these triangles similar?

Triangles are just polygons




Let's Compare sides $SF = \frac{S}{O}$

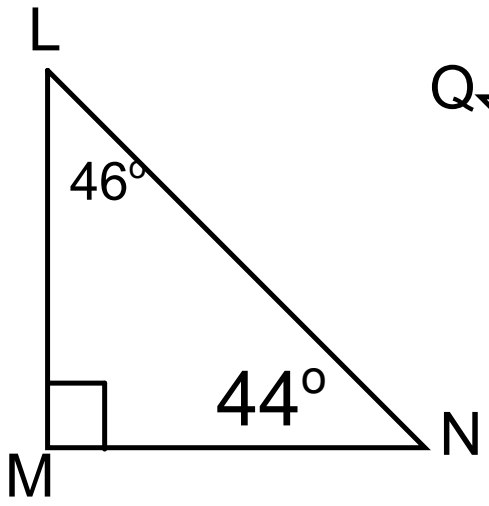
## Set up ratios of sides

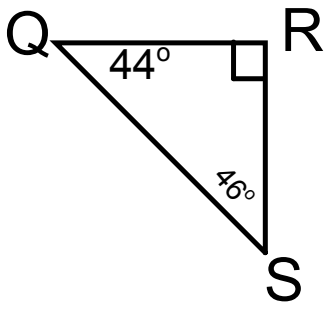
- →

| Sm | Med | lg |
|---|---|---|
| $\frac{TI}{CA}$ | $\frac{TR}{CN}$ | $\frac{IR}{AN}$ |
| $= \frac{3}{9}$ | $\frac{4}{12}$ | $\frac{5.2}{15.6}$ |
| $= \frac{1}{3}$ | $\frac{1}{3}$ | $\frac{1}{3}$ |

$\triangle TIR \sim \triangle CAN$ (SSS)

# Prove Similarity



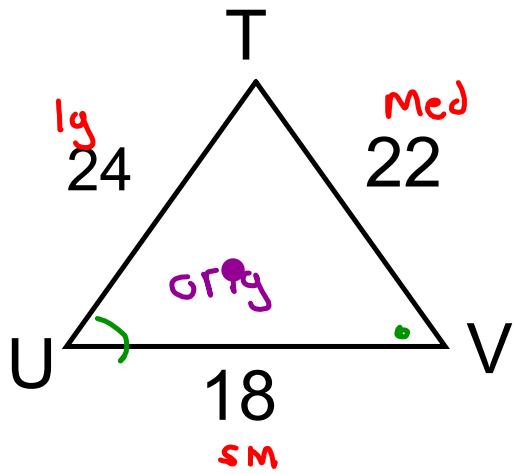

$\angle L = \angle S$

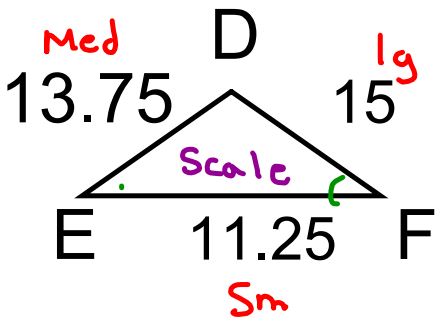
$\angle M = \angle R$

$\angle N = \angle Q$

$\triangle LMN \sim \triangle SRQ$ (AA)

# Prove Similarity



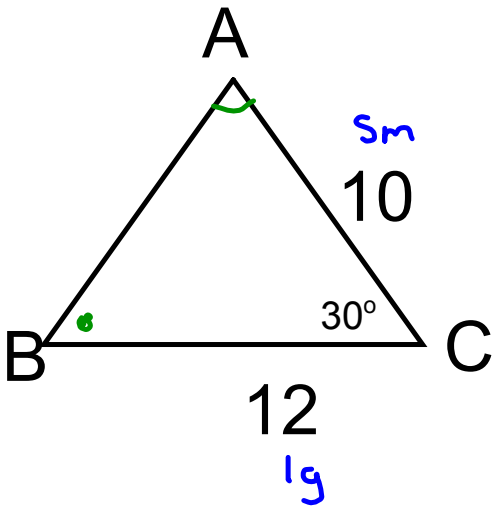



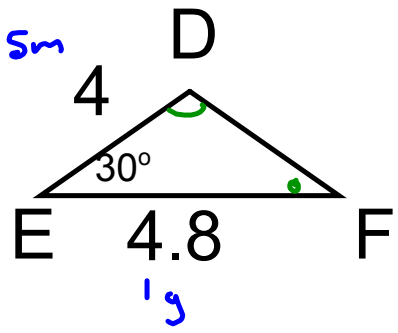

→ $\frac{\text{Sm}\ EF}{VU}$ $\frac{\text{Med}\ DE}{TV}$ $\frac{\text{lg}\ DF}{TU}$

SF $= \frac{S}{O}$ $\frac{11.25}{18}$ $\frac{13.75}{22}$ $\frac{15}{24}$

$= 0.625$ $0.625$ $0.625$

$\triangle EFD \sim \triangle VUT$ (SSS)




Prove Similarity

Sm $\frac{DE}{AC}$ $\angle$ $\angle E = \angle C$ lg $\frac{EF}{CB}$

$\frac{4}{10}$ $\frac{4.8}{12}$

$= 0.4$ $= 0.4$

$\triangle ACB \sim \triangle DEF$ (SAS)

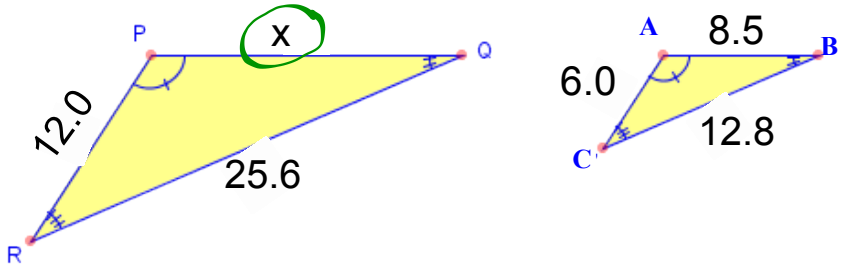
# Try This !!

**Solve for x .**

## 2 ratios needed

You only need a full ratio and a ratio with the missing side

**a)**




If $\triangle RPQ \sim \triangle CAB$, determine the value of X

$$\frac{PQ}{AB} = \frac{RQ}{CB} = \frac{PR}{AC}$$

$$\frac{x}{8.5} = \frac{25.6}{12.8}$$

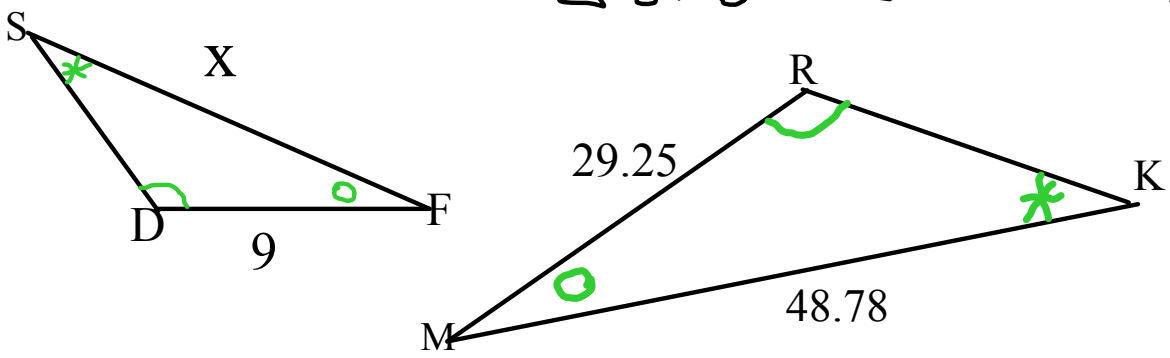
$$x = \frac{25.6\,(8.5)}{12.8}$$

$$x = 17$$

# IF IT DOES NOT STATE SIMILARITY

~~i)Determine if the triangles are similar~~
~~i~~ii) Write the Ratios
iii) Fill in ratios
iv) solve for "x"

$\angle S = \angle K$
$\angle F = \angle M$
$\angle D = \angle R$
$\triangle SFD \sim \triangle KMR$ (AAA)



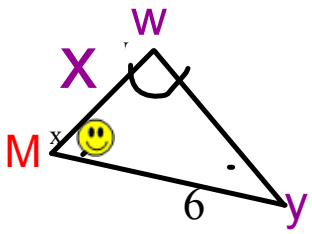

$\frac{SF}{KM} = \frac{DF}{RM}$

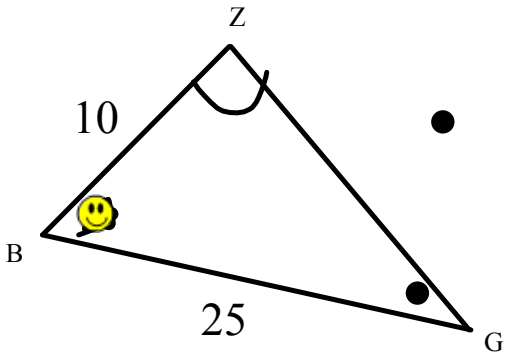
$\frac{X}{48.78} = \frac{9}{29.25}$

$X = \frac{9(48.78)}{29.25}$

$X = 15$

If $\triangle MWY \sim \triangle BZG$, determine the value of X




$$\frac{WM}{ZB} = \frac{MY}{BG}$$

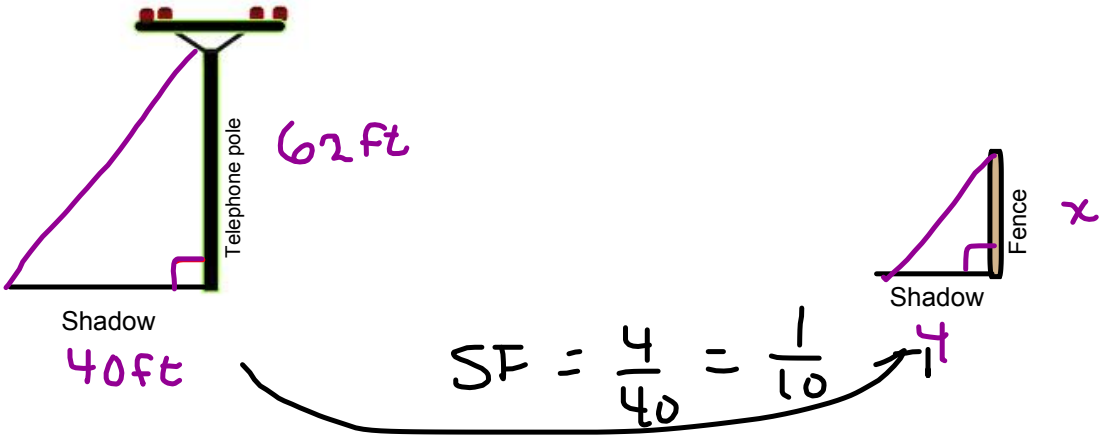
$$\frac{x}{10} = \frac{6}{25}$$

$$x = \frac{6(10)}{25}$$

$$x = 2.4$$

A telephone pole that is 62 ft tall cast a shadow that is 40 ft long. Find the height of a fence pole that cast a 4 ft shadow.

always say similar

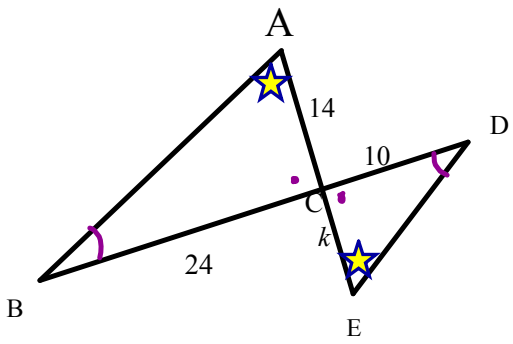



$$\frac{x}{62} = \frac{4}{40}$$

$$x = \frac{4(62)}{40}$$

$$x = 6.2$$

Solve for "k"




Hint:

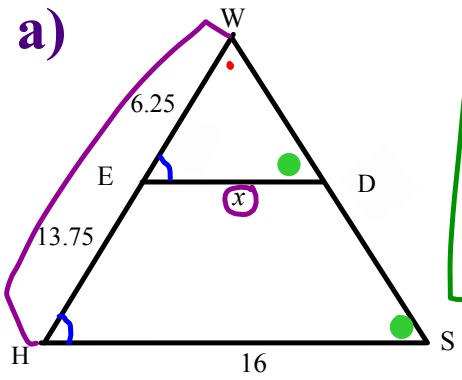
Start by proving triangles are similar first

# Try This !!

**Solve for x .**

Remember to include a similarity statement

**a)**




$\angle W = \angle W$

$\angle E = \angle H$

$\angle D = \angle S$

$\triangle WED \sim \triangle WHS$ (AA)

$$\frac{ED}{HS} = \frac{WE}{WH}$$

$$\frac{x}{16} = \frac{6.25}{20}$$

$$x = \frac{16(6.25)}{20}$$

$$x = 5$$