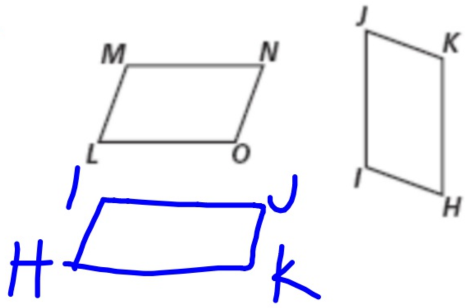
Complete the proportions and congruence statements.

1. $\angle M \cong$? $\angle I$ 2. $\angle K \cong$? $\angle O$ 3. $\angle N \cong$? $\angle J$

4. $\frac{MN}{IJ} = \frac{?}{JK}$ NO 5. $\frac{HK}{?} = \frac{HI}{LM}$ LO 6. $\frac{IJ}{MN} = \frac{HK}{?}$ LO



Postulate 7-1 **Angle-Angle Similarity (AA ~) Postulate**

If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.

$\triangle TRS \sim \triangle PLM$

Theorem 7-1 **Side-Angle-Side Similarity (SAS ~) Theorem**

If an angle of one triangle is congruent to an angle of a second triangle, and the sides including the two angles are proportional, then the triangles are similar.

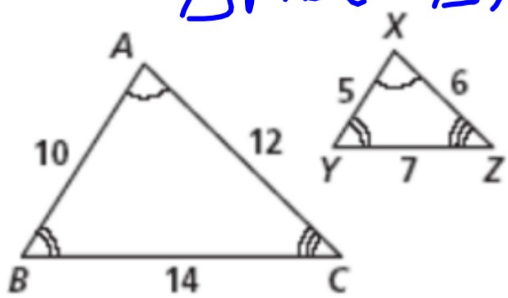
Theorem 7-2 **Side-Side-Side Similarity (SSS ~) Theorem**

If the corresponding sides of two triangles are proportional, then the triangles are similar.

Are the polygons similar? If they are, write a similarity statement, and give the similarity ratio. If they are not, explain.

$\triangle ABC \sim \triangle XYZ$ (1) corresp $\angle$s are $\cong$.

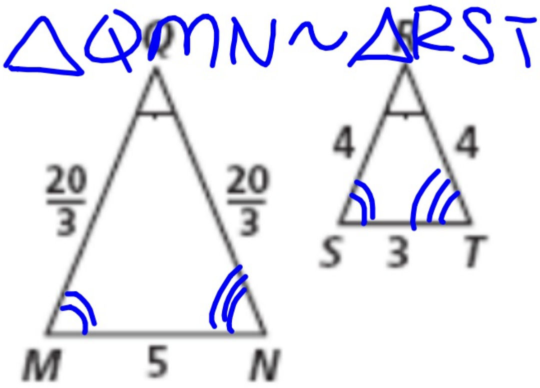
7.



$$(2)\ \frac{10}{5} = \frac{14}{7} = \frac{12}{6}$$

2:1

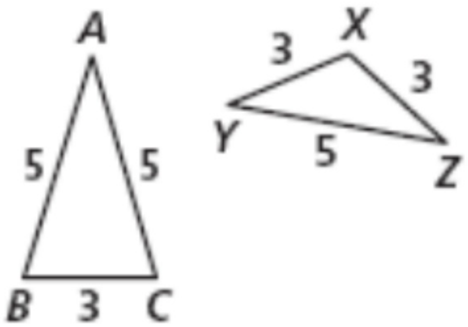
8. $\triangle QMN \sim \triangle RST$ (1) angles are $\cong$



(2) $\dfrac{\frac{20}{3}}{4} = \dfrac{\frac{20}{3}}{4} = \dfrac{5}{3}$

$\dfrac{5}{3}$

9.



$\dfrac{5}{3} \neq \dfrac{3}{5}$

Not similar

7.3 Proving Triangles Similar

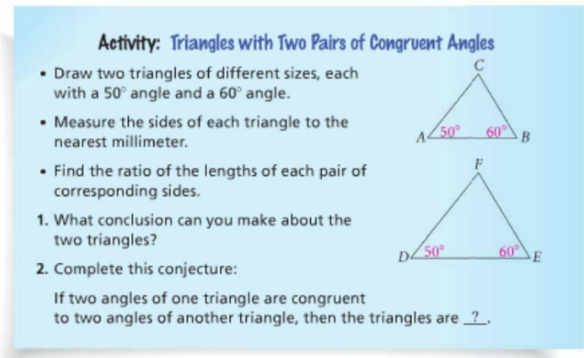
G-SRT.A.2, G-SRT.A.3

Content Objective: Students will apply AA, SAS, and SSS similarity statements to solve triangles.

Language Objective: Students will compare and contrast AA, SAS, and SSS by using a map to describe when each is used with similar triangles.

Geometry 7-3: Proving Similar Triangles

Objective 1: I can use AA, SAS, and SSS to prove triangles similar


Activity: Triangles with Two Pairs of Congruent Angles

- Draw two triangles of different sizes, each with a 50° angle and a 60° angle.
- Measure the sides of each triangle to the nearest millimeter.
- Find the ratio of the lengths of each pair of corresponding sides.

1. What conclusion can you make about the two triangles?
2. Complete this conjecture:

If two angles of one triangle are congruent to two angles of another triangle, then the triangles are _?_.

List the side lengths of the triangles below.

AB = ______ AC = ______ BC = ______

DE = ______ DF = ______ EF = ______

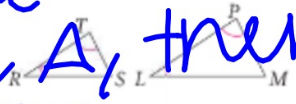
1) Conclusion about the triangles:

2) If two angles of one triangle are congruent to two angles of another triangle, then the triangles are _________________.

The above activity suggests the following postulate:

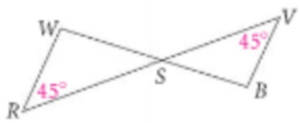
Postulate 7-1: Angle-Angle Similarity (AA~) Postulate

If two angles of one $\triangle$ are $\cong$ to two $\angle$'s in another $\triangle$, then the $\triangle$s are similar



$\triangle TRS \sim \triangle PLM$

Example 1: Explain why the triangles are similar. Write a similarity statement.



$\angle R \cong \angle V$ Given

$\angle WSR \cong \angle VSB$

$\triangle RSW \sim \triangle VSB$ by AA~

QC 1: In example 1, you have enough information to write a similarity statement. Do you have enough information to find the similarity ratio? Explain.

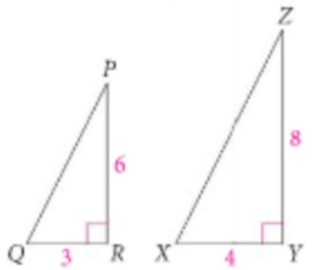
No, side lengths given

The next two theorems follow from the AA~ postulate.

Theorem 7-1: Side-Angle-Side Similarity Theorem (SAS~)

If an angle of one △ is ≅ to an ∠ of second △, and sides including the two ∠s are prop'l then the △s are similar

Example2A: Explain why the triangles below are similar.



angles are both 90

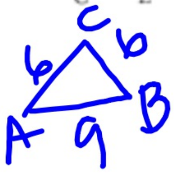
$$\frac{QR}{XY} = \frac{3}{4} = \frac{PR}{ZY} = \frac{6}{8} \checkmark$$

SAS~ $\triangle PQR \sim \triangle ZXY$

Theorem 7-2: Side-Side-Side Similarity Theorem(SSS~)

If corresp sides of two $\triangle$s are proportional. then the $\triangle$s are $\sim$.

Example 2B: Explain why the triangles are similar. Write a similarity statement.



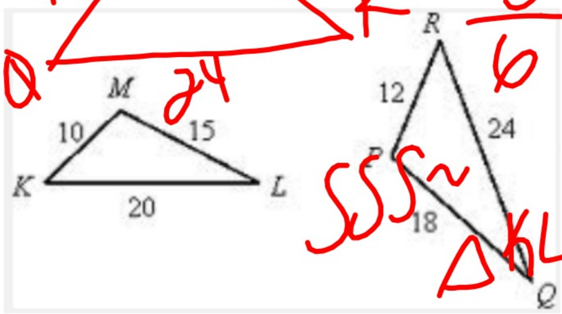
$$\frac{AC}{EG} = \frac{CB}{GF} = \frac{AB}{EF}$$

$$\frac{6}{8} = \frac{6}{8} = \frac{9}{12} \quad \frac{3}{4}$$

SSS~ $\triangle ABC \sim \triangle EFG$

QC 2: Explain why the triangles below are similar. Which Theorem did you use?

A)

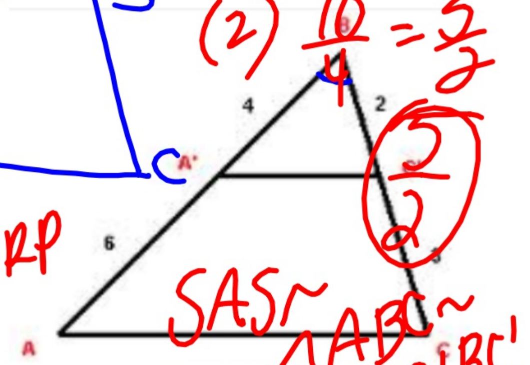


$\frac{10}{12}=\frac{15}{18}=\frac{20}{24}$ $\frac{5}{6}$

SSS~

$\triangle KLM \sim \triangle QRP$

B)



(1) angles are ≅

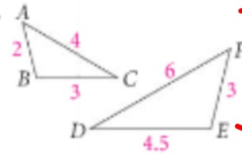
(2) $\frac{10}{4}=\frac{5}{2}$ $\frac{5}{2}$

SAS~ $\triangle ABC \sim \triangle A'BC'$

Practice Problems

Can you conclude the triangles are similar? If so, write a similarity statement and name the postulate or theorem that you used. If not, explain why.

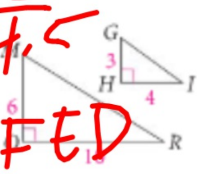
1.



$\frac{2}{3}=\frac{4}{6}=\frac{3}{4.5}$

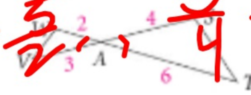
Similar $\triangle ABC \sim \triangle FED$

2.



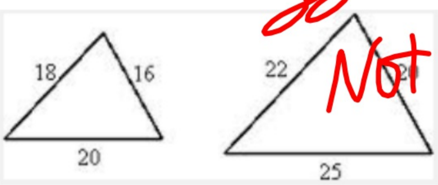
not similar $\frac{6}{3}=\frac{10}{4}$ $\frac{2}{1}=\frac{5}{2}$

3.



$\frac{3}{4}=\frac{2}{6}$ $\frac{3}{4}\neq\frac{1}{3}$

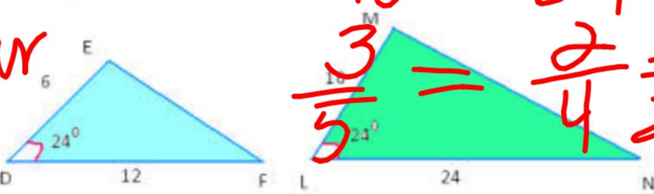
4.



$\frac{18}{22}\neq\frac{16}{20}=\frac{20}{25}$

Not similar

5.



$\frac{6}{10}=\frac{12}{24}$

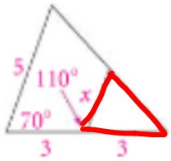
$\frac{3}{5}=\frac{2}{4}=\frac{1}{2}$

SAS~

Not similar

Explain why the triangles are similar. Then find the value of x.

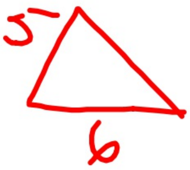
6.



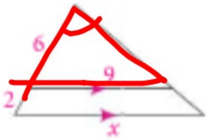
$\frac{5}{x} = \frac{6}{3}$

$6x = 15$

$x = 2.5$



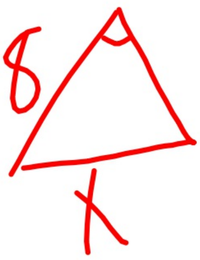
7.



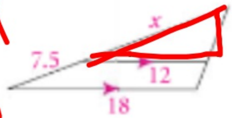
$\frac{6}{8} = \frac{9}{x}$

$6x = 72$

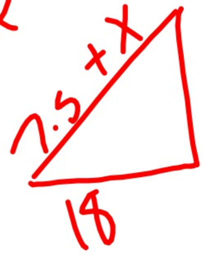
$x = 12$



8.



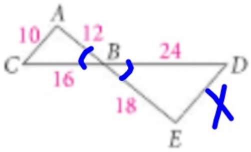
$\frac{7.5+x}{x} = \frac{18}{12}$



Objective 2: I can use AA, SAS, and SSS similarity in real-world applications

We can apply the AA~ postulate, SAS~ and SSS~ theorems to find missing sides in similar triangles.

Example 3: Assume the triangles are similar. Find DE.



SAS~

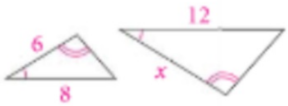
$\frac{AC}{DE} = \frac{CB}{BD}$

$\frac{10}{x} = \frac{16}{24}$

$16x = 240$

$x = 15$

QC 3: Assume the triangles below are similar. Find the value of x.



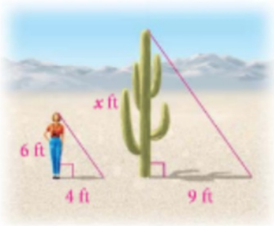
SAS ~

$$\frac{6}{x} = \frac{8}{12}$$

$$x = 9$$

We can use similar triangles to find distances that are difficult to measure directly. This is called ___Indirect measurement___. There are many methods of indirect measurement; the most common method using similar triangles formed by objects and their shadows. Another common method of indirect measurement, used in science, is using a light that reflects off of a mirror. The angle the light hits the mirror is the same angle it reflects back, forming vertical angles. (These are called ________________________________.)

Example 4: In sunlight, a cactus casts a 9-ft shadow. At the same time, a person 6 ft tall casts a 4-ft shadow. Use similar triangles to find the height of the cactus.



SAS ~

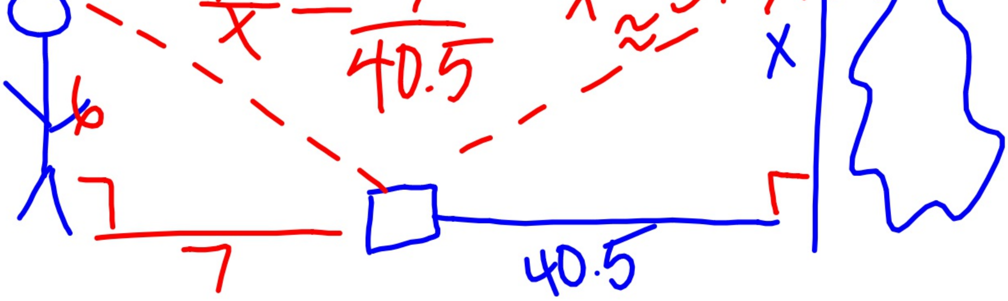
$$\frac{6}{x} = \frac{4}{9}$$

$x = 13.5$ ft

QC 4: Ramon places a mirror on the ground 40.5 ft from the base of a geyser. He walks backwards until he can see the top of the geyser in the middle of the mirror. At that point, Ramon's eyes are 6 ft from the ground and he is 7 ft from the image in the mirror. Use similar triangles to find the height of the geyser. (Hint: Draw a picture using 2 similar triangles.)

$$\frac{6}{x} = \frac{7}{40.5}$$

$x \approx 34.7$ ft



IXL #2 - due Friday, March 1st
P.1 Similarity Ratios
P.2 Similarity Statements

Hwk #10: Sec 7-3
pages 385-386
problems 1, 4, 5, 8, 9, 10, 12, 18, 19