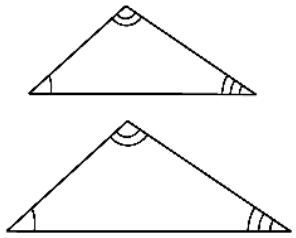
Notes: **SIMILAR TRIANGLES**

Content Objective: ***I will be able to use similarity theorems to determine if two triangles are similar.***

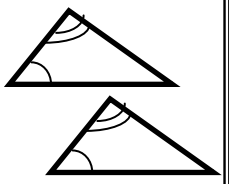
TERM	DESCRIPTION	EXAMPLE
SIMILAR POLYGONS	▪ Polygons with the same _____ but different _____. ▪ The corresponding angles are _____ and the corresponding sides are _____. ▪ The ratios of the corresponding sides are _____. ▪ The ratio of the corresponding sides is called the _____ _____.	

AA

Similarity

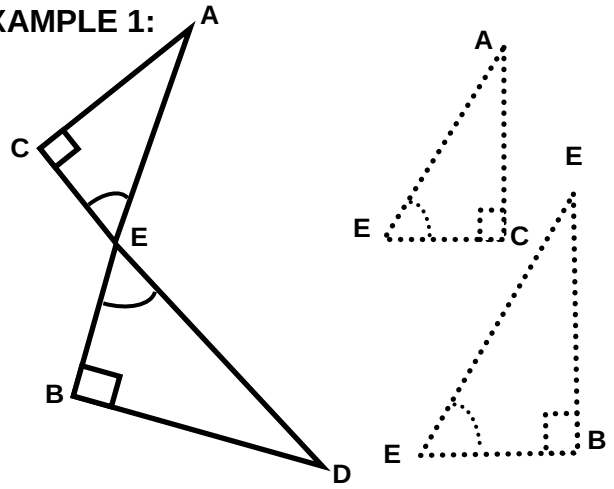
_____-_____ **Similarity**

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



Can these triangles be proven similar by AA? If so, write a similarity statement.

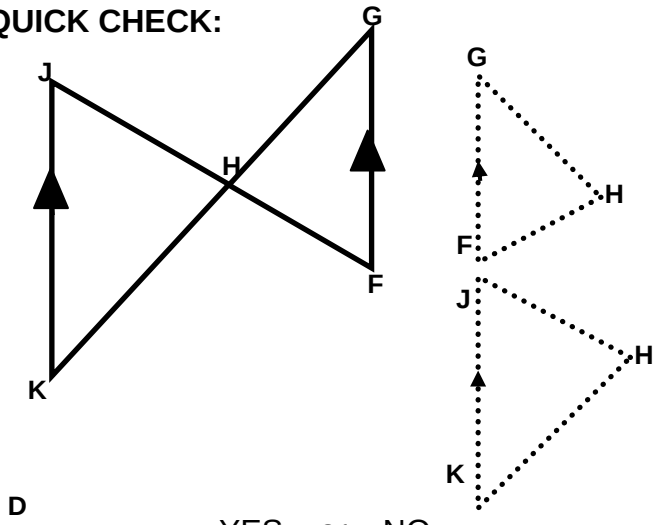
EXAMPLE 1:



YES or NO

Δ_____ ~ Δ_____

QUICK CHECK:



YES or NO

Δ_____ ~ Δ_____

Given $\overline{AB} \parallel \overline{CD}$, **AB** = 4, **AE** = 3x + 1, **CD** = 8, and **ED** = x + 12.

EXAMPLE 2:

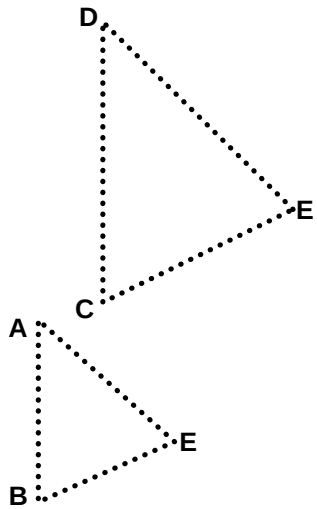
Find AE:

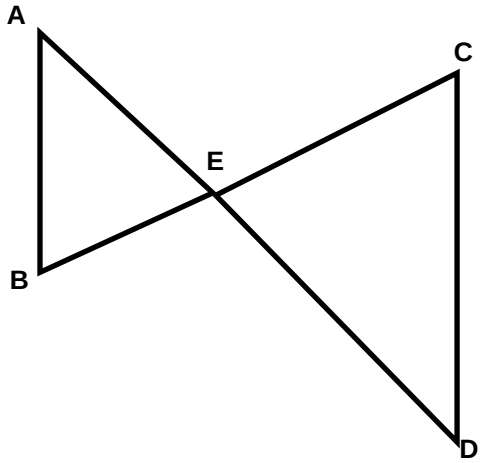
AE = _____

QUICK CHECK:

Find DE:

DE = _____



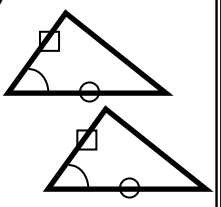


SAS

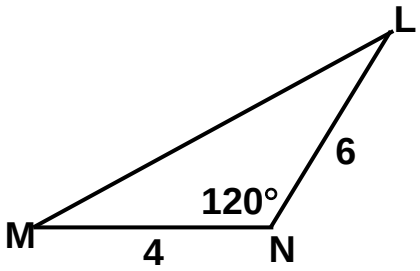
Similarity

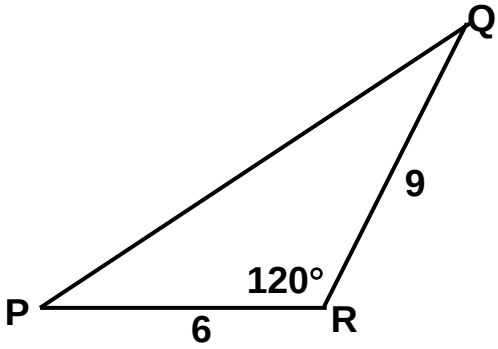
_____-_____ -_____ **Similarity**

In two triangles, if a pair of corresponding angles is _____ and the sides including the angle are _____, then the triangles are _____.



EXAMPLE 3: *Can these triangles be proven similar by SAS? If so, write a similarity statement.*





YES or NO

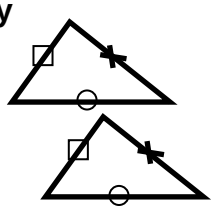
Δ_____ ~ Δ_____

SSS

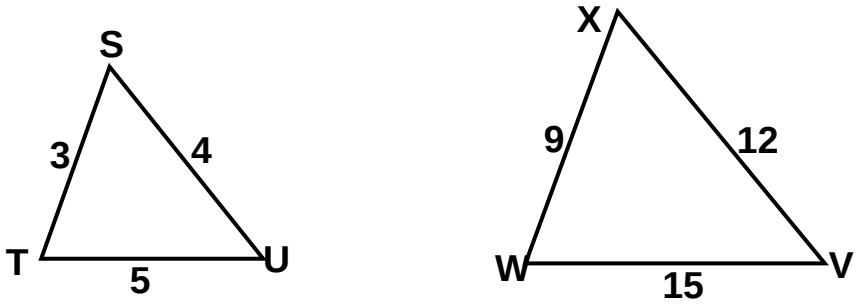
Similarity

_____-_____ -_____ **Similarity**

If all three pairs of corresponding sides of two triangles are _____, then the two triangles are _____.



EXAMPLE 4: *Are the triangles below similar by SSS? If so, write a similarity statement.*



YES or NO

Δ_____ ~ Δ_____

Determine if triangles with the given side lengths are similar. If the triangles are similar, what is the common ratio?

EXAMPLE 5:

The measures of the sides of ΔABC are 4, 5, and 7. The measures of ΔXYZ are 16, 20, and 28.

YES or NO

Δ_____ ~ Δ_____

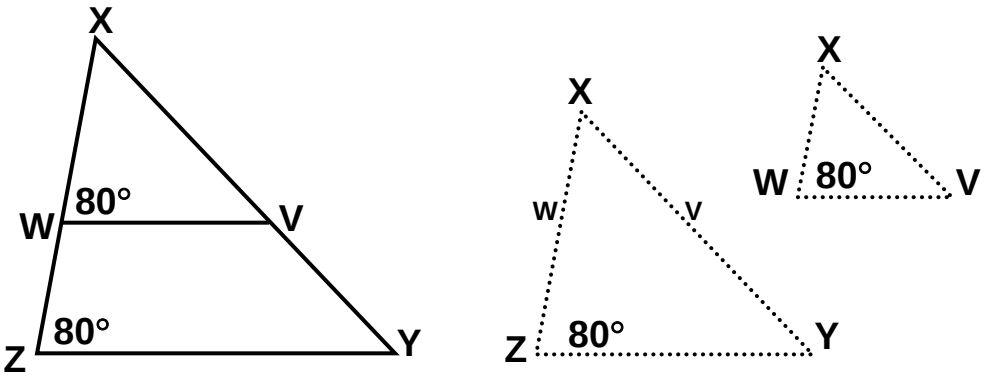
QUICK CHECK: ΔPQR has sides 3, 5, & 6. ΔSTU has sides 2.5, 2, and 3.

YES or NO

Δ_____ ~ Δ_____

EXAMPLE 6: Are the two triangles similar? If so, state how and write a similarity statement. *Solve for **x** and **y**.*

a.

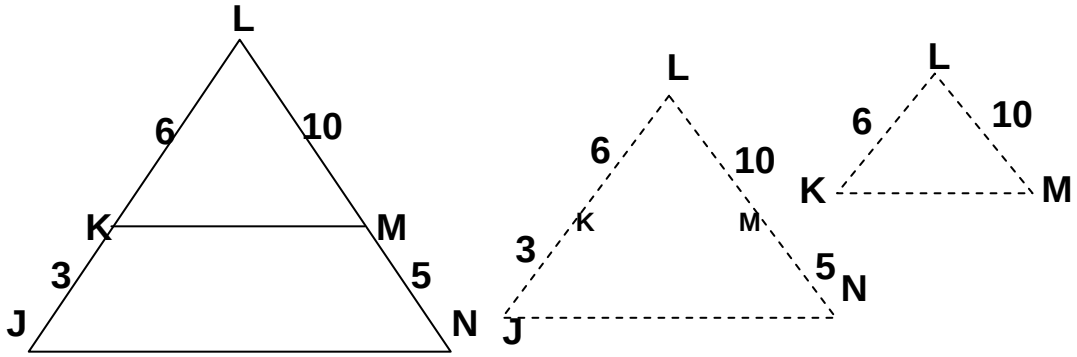


YES or NO

HOW? _____

∆_____ ~ ∆_____

b.

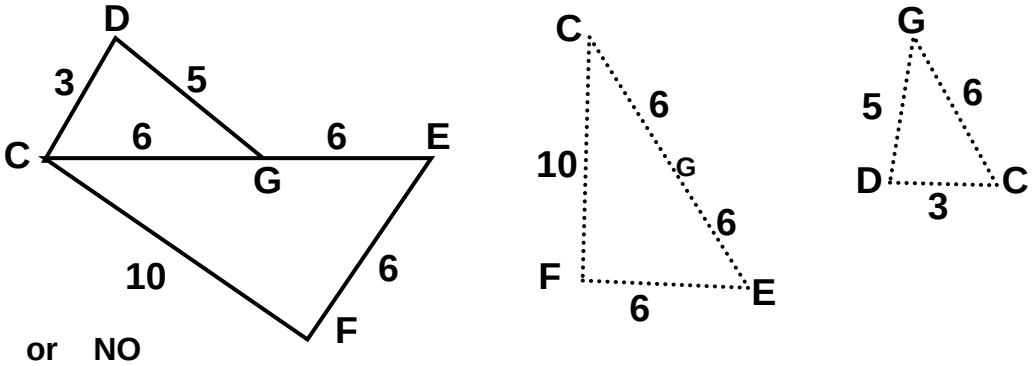


YES or NO

HOW? _____

∆_____ ~ ∆_____

c.

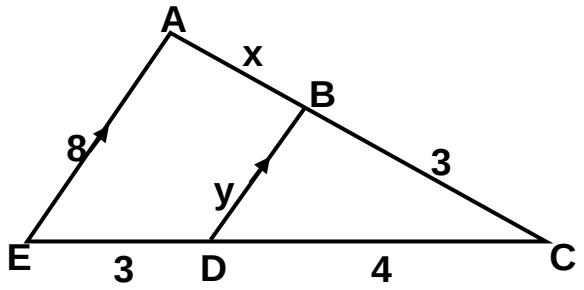


YES or NO

HOW? _____

∆_____ ~ ∆_____

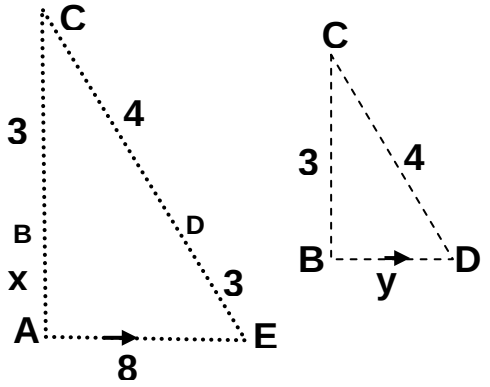
EXAMPLE 7:



x = _____

y = _____

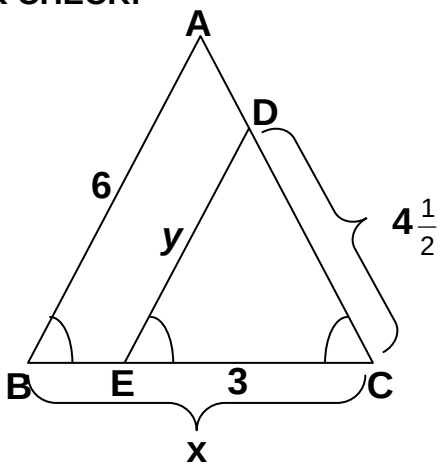
QUICK CHECK:



x = _____

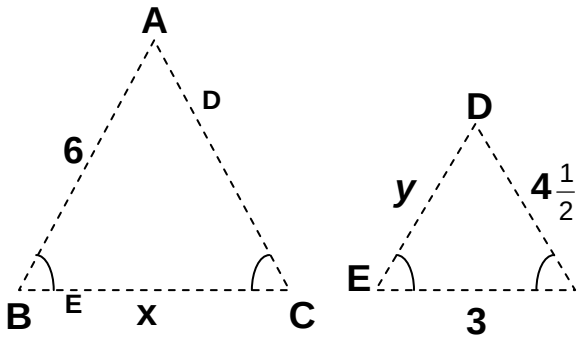
y = _____

QUICK CHECK:



x = _____

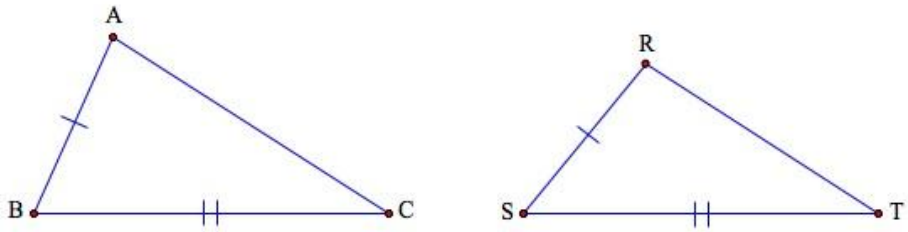
y = _____



x = _____

y = _____

SAS Inequality Theorem (The Hinge Theorem): If two sides of one triangle are congruent to two sides of another triangle, but the included angle of the first triangle larger than the included angle of the second triangle, then the third side of the first triangle is longer than the third side of the second triangle.



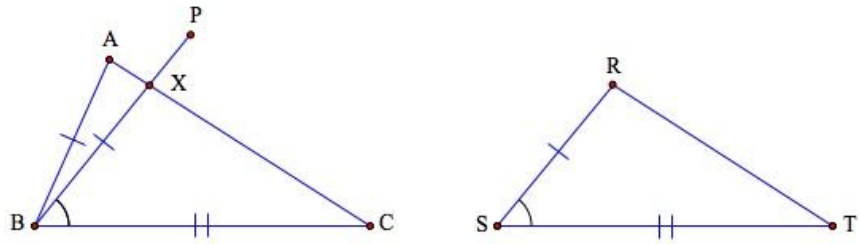
Proof.

Given: Δ ABC and Δ RST;
BA ≅ SR; m∠B > m∠S

Prove: AC > DF

Construct $\overline{BP}$ so that $m\angle PBC = m\angle RST$. On $\overline{BP}$, take point X so that $BX = SR$. Either X is on $\overline{AC}$ or X is not on $\overline{AC}$. In either case, we must have $\triangle XBC \cong \triangle RST$ by SAS postulate and $\overline{XC} \cong \overline{RT}$ by CPCTC.

Case 1: X is on $\overline{AC}$.

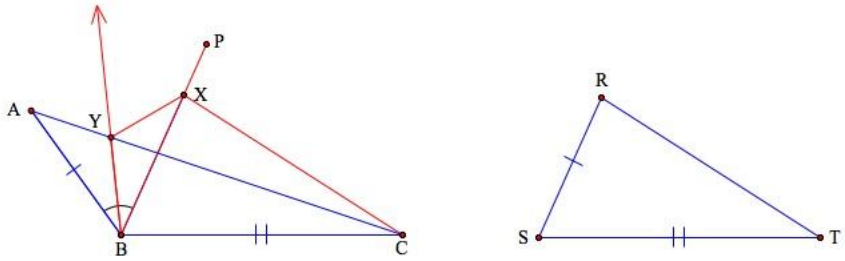


By the Segment Addition Postulate $AC = AX + XC$, so $AC > XC$. But from our congruence above we had $\overline{XC} \cong \overline{RT}$. By substitution we have $AC > RT$ and we have proven case 1.

Case 2: X is not on $\overline{AC}$.

Construct the bisector of $\angle ABX$ so that it intersects $\overline{AC}$ at point Y. Draw $\overline{XY}$ and $\overline{XC}$.

Recall that $AB = RS = BX$.



Note that $\triangle ABY \cong \triangle XBY$ by SAS postulate. Then $\overline{AY} \cong \overline{XY}$. So, $XY + YC > XC$ by the Triangle Inequality Theorem. Now $XY + YC = AC$ by the segment addition postulate, and $XC = RT$ by our original construction of $\overline{XC}$, so by substitution we have $AC = XY + YC > XC = RT$ or $AC > RT$ and we have proven case 2. ♦