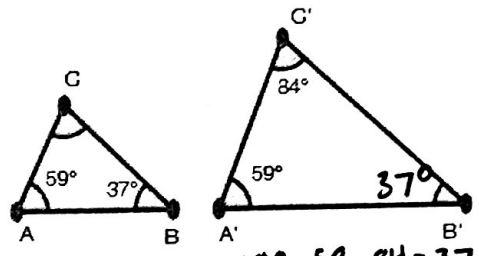
10.4 Proving Triangle Similarity

If two shapes are **similar**, then this means that all angles are congruent and all side lengths are proportional (fractions equal each other).

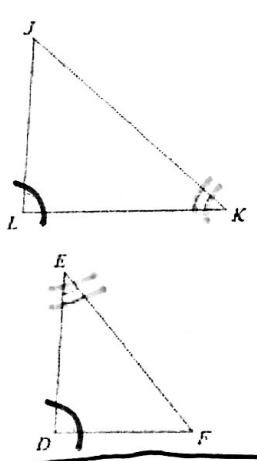
If we want to know if two triangles are similar, then we will be looking to show these two things. Luckily, we don't have to show that every single angle is congruent and that every single side is proportional to show that two shapes are similar. If we can show some of the sides are proportional and some of the angles are congruent, then we can infer that the rest of the sides and angles would follow suit.

There are three different ways that we can show similarity:

Angle-Angle Similarity Theorem	I should use it when...	
If two pairs of angles are congruent, the last pair is also congruent and the triangles are similar.	• two pairs of angles are given • one pair of angles & vertical angles • parallel lines	 180−59−84=37

1) State if the triangles are similar or not. Then complete the similarity statement.

a.

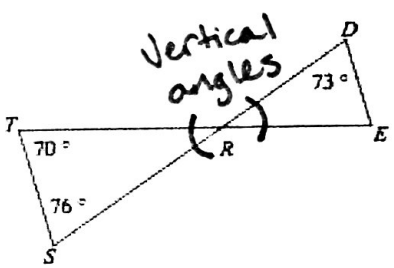


$\triangle LKJ \sim \triangle DEF$*

Similar by AA

* Must have Δ in similarity statement

b.

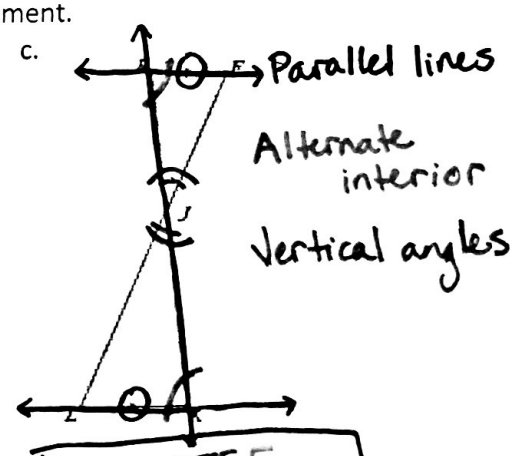


$\triangle RST \not\sim$ _____

Not similar

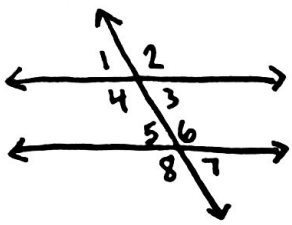
(Don't need to finish similarity statement)

c.



$\triangle JKL \sim \triangle JEF$

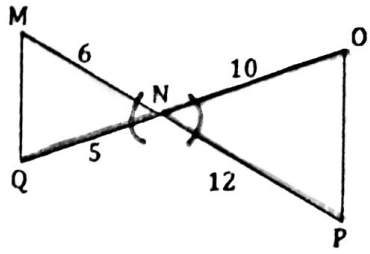
Similar by AA



Congruent relationships

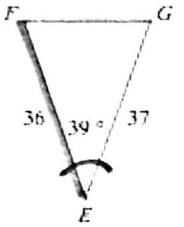
Alternate interior (4≅6, 3≅5)

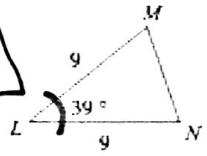
Corresponding (1≅5, 2≅6, 3≅7, 4≅8)

Side-Angle-Side Similarity Theorem	I should use it when...	
If two pairs of sides are proportional and the angle between them is congruent, the triangles are similar.	• two sides & a vertical angle • two sides, triangle in a triangle	

2) State if the triangles are similar or not. Then complete the similarity statement.

a.

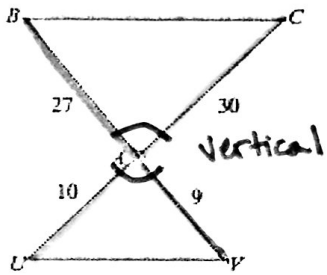




Not similar

$\triangle EFG \sim$ _____

b.



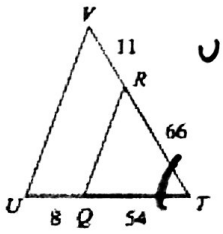
Vertical

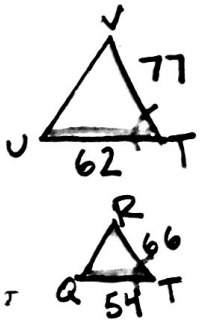
$\triangle ABC \sim \triangle AVU$

Similar by SAS

$\frac{27}{9} = \frac{30}{10}$ $3 = 3$ ✓

c.



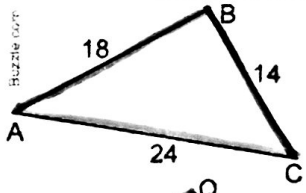
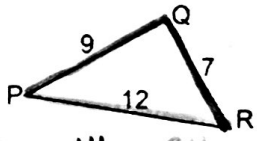


$\triangle TUV \sim$ _____

Not similar

$\frac{77}{66} = \frac{62}{54}$

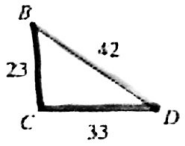
$1.17 \neq 1.15$

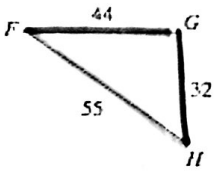
Side-Side-Side Similarity Theorem	I should use it when...	
If all sides are proportional, the triangles are similar.	• all three sides are labeled in both triangles * Biggest with biggest, smallest with smallest	 

$\frac{18}{9} = \frac{14}{7} = \frac{24}{12}$ $2 = 2 = 2$ ✓

3) State if the triangles are similar or not. Then complete the similarity statement.

a.





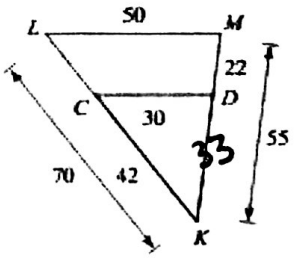
$\frac{42}{55} = \frac{23}{32} = \frac{33}{44}$

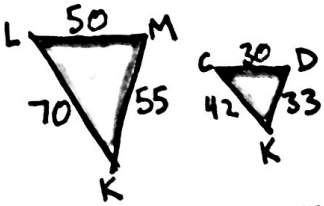
$0.76 \neq 0.72 \neq 0.75$

Not similar

$\triangle FGH \sim$ _____

b.





$55 - 22 = 33$

$\triangle KLM \sim \triangle KCD$

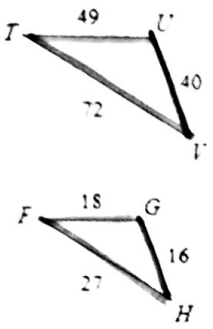
Similar by SSS

$\frac{50}{30} = \frac{55}{33} = \frac{70}{42}$

$1.67 = 1.67 = 1.67$ ✓

4) State if the triangles are similar or not. State how you know and complete the similarity statement.

a) SSS



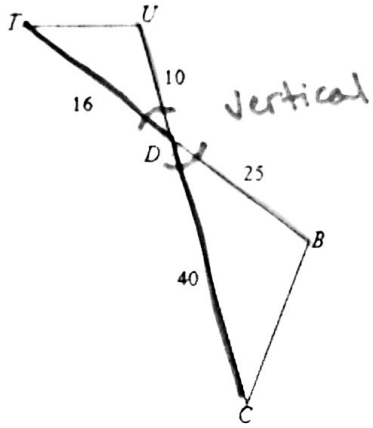
$\frac{49}{18} = \frac{72}{27} = \frac{40}{16}$

$2.72 \neq 2.67 \neq 2.5$

$\boxed{\text{Not similar}}$

$\triangle TUV \sim$ _____

b) SAS



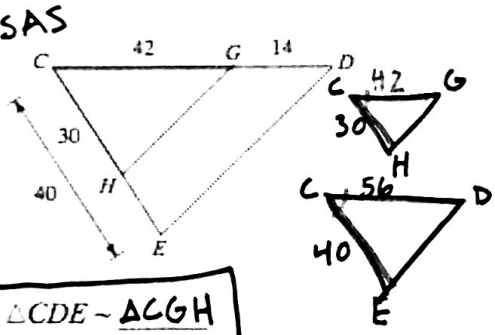
Vertical

$\frac{16}{40} = \frac{10}{25}$

$0.4 = 0.4$ ✓

$\triangle DCB \sim \underline{\triangle DTU}$
Similar by SAS

c) SAS

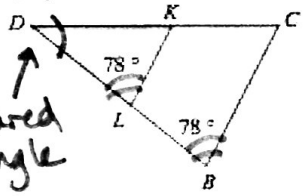


$\triangle CDE \sim \underline{\triangle CGH}$
Similar by SAS

$\frac{30}{40} = \frac{42}{56}$

$0.75 = 0.75$ ✓

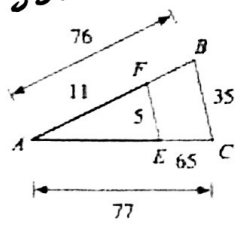
d) AA



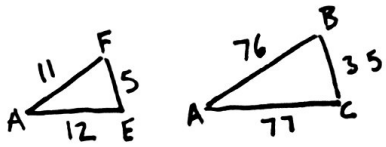
Shared angle

$\triangle DCB \sim \underline{\triangle DKL}$
Similar by AA

e) SSS



$\triangle ABC \sim$ _____



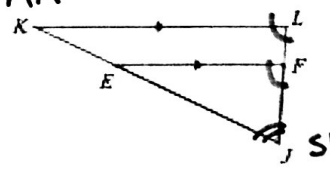
$77 - 65 = 12$

$\frac{11}{76} = \frac{5}{35} = \frac{12}{77}$

$0.14 = 0.14 \neq 0.16$

$\boxed{\text{Not similar}}$

f) AA



Corresponding angles

Shared angle

$\triangle JKL \sim \underline{\triangle JEF}$
Similar by AA