

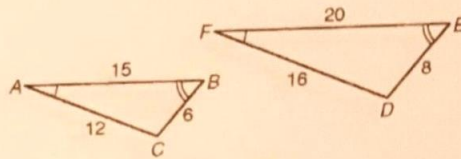
## Scale Factor & Similarity

- Figures that are similar have the same shape but not necessarily the same size.
- Two polygons are similar if and only if their corresponding angles are congruent and their corresponding sides are proportional.
- A similarity ratio (scale factor) is the ratio of the lengths of the corresponding sides of two similar polygons.
- Scale factor:  $k = \frac{\text{scale factor new}}{\text{old}}$
- We denote similarity with the symbol:  $\sim$ .

Use the figure at the right. The triangles are similar.

Name the pairs of congruent angles.

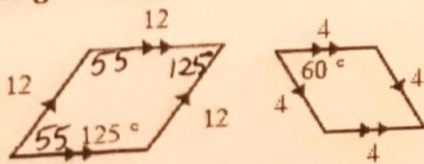
$$\begin{aligned} \angle A &\cong \angle F \\ \angle B &\cong \angle E \\ \angle C &\cong \angle D \end{aligned}$$



Write the corresponding side lengths in the proportion.  $\frac{AB}{FE} = \frac{CB}{DE} = \frac{AC}{FD}$

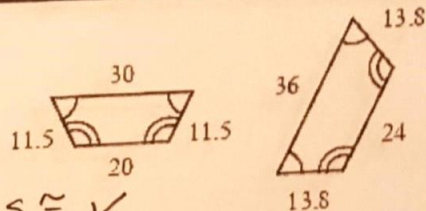
Are these figures similar?

1.



$$125 \neq 120^\circ \text{ not } \cong \text{ NO!}$$

2.

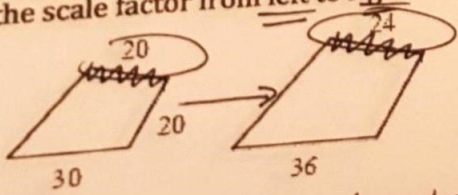


$$\angle S \cong \checkmark$$

$$\frac{11.5}{13.8} = \frac{11.5}{13.8} = \frac{30}{36} = \frac{20}{24} \text{ Yes!}$$

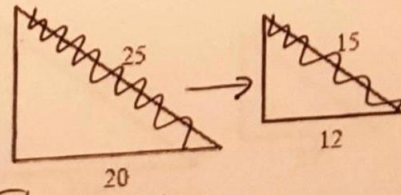
What is the scale factor from left to right?

3.



$$\frac{24}{20} = \frac{6}{5} \quad k > 1 \text{ (gets bigger)}$$

4.



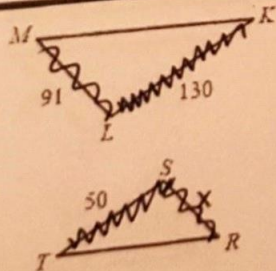
$$15/25 = 3/5$$

$k < 1$   
(gets small)

Solve for x.

5.  $\triangle KLM \sim \triangle TSR$

$$\frac{91}{130} = \frac{x}{50}$$

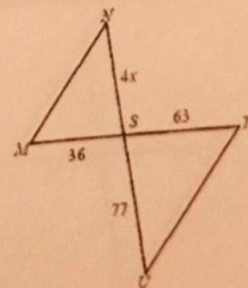


6.  $\triangle STU \sim \triangle SMN$

$$\frac{36}{4x} = \frac{63}{77}$$

$$252x = 2772$$

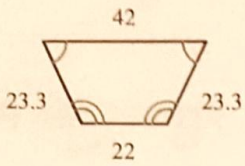
$$x = 11$$



3.1 PRACTICE - Scale Factor & Similarity

State if the polygons are similar.

1)



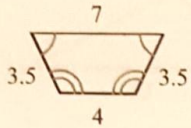
L's are  $\cong$

$$\frac{42}{7} =$$

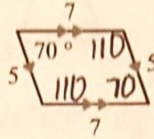
$$\frac{23.3}{3.5} =$$

$$3.5$$

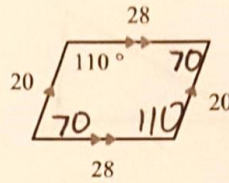
$$\frac{23.3}{23.3}$$



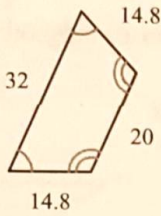
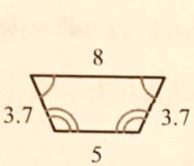
2)



Similar

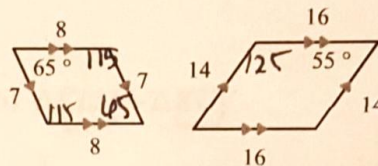


3)



L's  $\cong$

4)

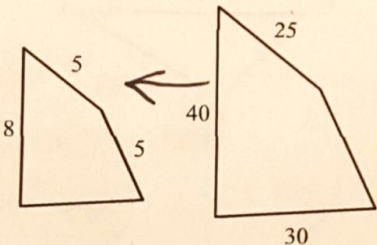


L's are not  $\cong$

The polygons in each pair are similar. Find the scale factor of the larger to the smaller figure.

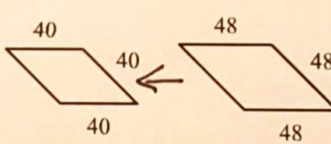
$$K = \frac{\text{old}}{\text{new}}$$

5)



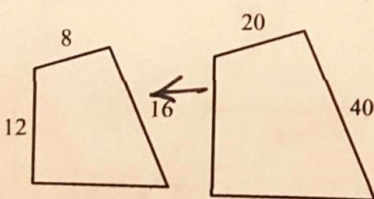
$$\frac{5}{40} = \frac{1}{8}$$

6)



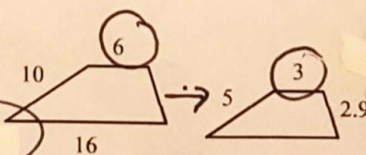
$$\frac{40}{48} = \frac{5}{6}$$

7)



$$\frac{8}{20} = \frac{2}{5}$$

8)



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

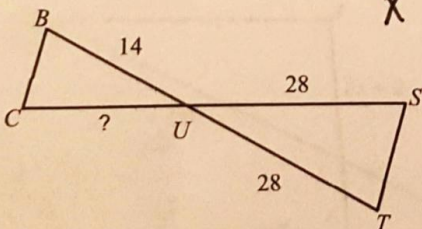
Find the missing length. The triangles in each pair are similar.

9)  $\triangle UTS \sim \triangle UCB$

$$\frac{14}{x} = \frac{28}{28}$$

$$28x = 392$$

$$x = 14$$

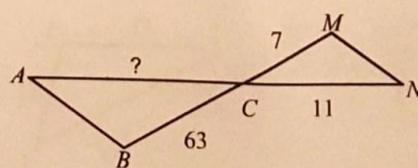


10)  $\triangle CBA \sim \triangle CMN$

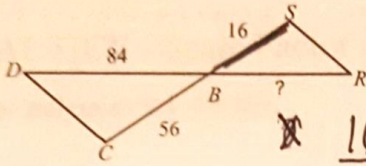
$$\frac{63}{x} = \frac{7}{11}$$

$$7x = 693$$

$$x = 99$$



11)  $\triangle BCD \sim \triangle BSR$

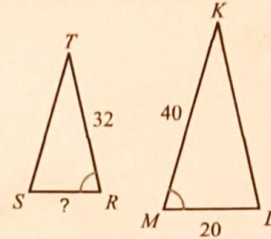


$$\frac{16}{x} = \frac{56}{84}$$

$$5.6x = 1344$$

$$x = 24$$

12)  $\triangle MLK \sim \triangle RST$

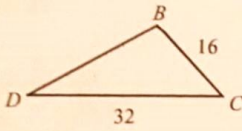


$$\frac{20}{40} = \frac{x}{32}$$

$$40x = 640$$

$$x = 16$$

13)  $\triangle DCB \sim \triangle TSR$

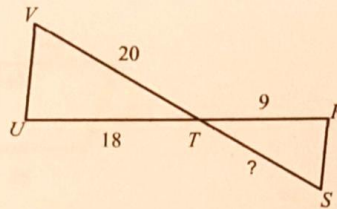


$$\frac{32}{16} = \frac{24}{x}$$

$$32x = 384$$

$$x = 12$$

14)  $\triangle TUV \sim \triangle TRS$



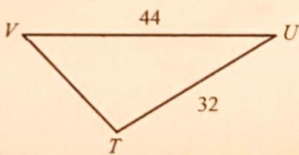
$$\frac{9}{x} = \frac{18}{20}$$

$$18x = 180$$

$$x = 10$$

Solve for x. The triangles in each pair are similar.

15)  $\triangle TUV \sim \triangle KLM$



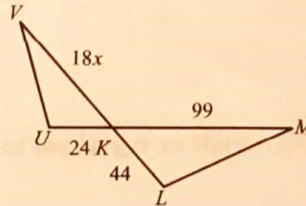
$$\frac{44}{32} = \frac{33}{2x+8}$$

$$1056 = 88x + 352$$

$$704 = 88x$$

$$x = 8$$

16)  $\triangle KLM \sim \triangle KUV$

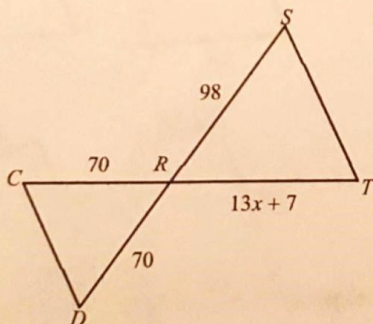


$$\frac{18x}{24} = \frac{99}{44}$$

$$792x = 2376$$

$$x = 3$$

17)  $\triangle RST \sim \triangle RDC$



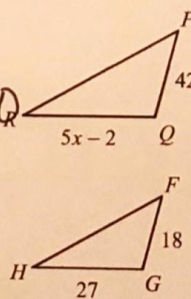
$$\frac{70}{70} = \frac{13x+7}{98}$$

$$6860 = 910x + 490$$

$$6370 = 910x$$

$$x = 7$$

18)  $\triangle PQR \sim \triangle FGH$



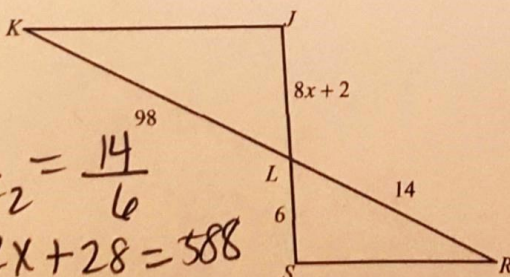
$$\frac{42}{5x-2} = \frac{18}{27}$$

$$90x - 36 = 1134$$

$$90x = 1170$$

$$x = 13$$

19)  $\triangle LKJ \sim \triangle LRS$



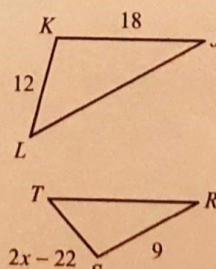
$$\frac{98}{8x+2} = \frac{14}{6}$$

$$112x + 28 = 588$$

$$112x = 560$$

$$x = 5$$

20)  $\triangle JKL \sim \triangle RST$



$$\frac{18}{12} = \frac{9}{2x-22}$$

$$108 = 36x - 396$$

$$504 = 36x$$

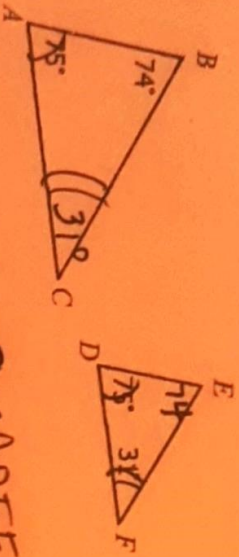
$$x = 14$$

# AA~

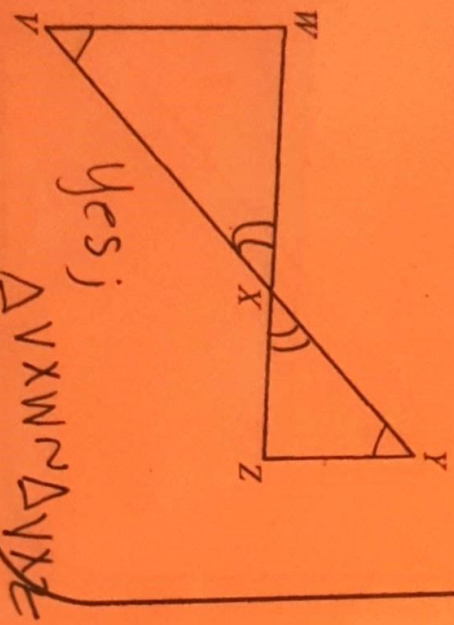
## Angle-Angle Similarity

If two corresponding angles are congruent, then the triangles are similar.

Determine if the examples below are similar by AA~. If yes, write a similarity statement.



Yes;  $\triangle ABC \sim \triangle DEF$



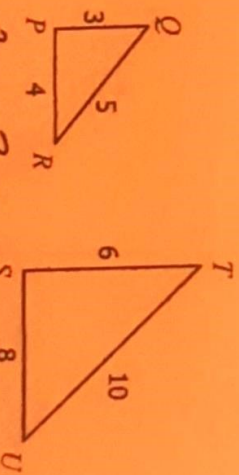
Yes;  
 $\triangle VWX \sim \triangle YXZ$

# SSS~

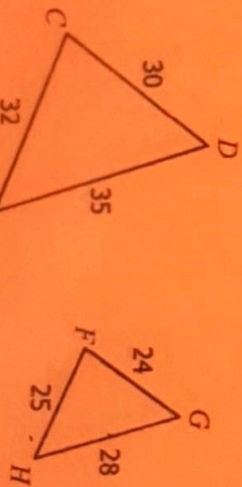
## Side-Side-Side Similarity

If all corresponding sides are proportional, then the triangles are similar.

Determine if the examples below are similar by SSS~. If yes, write a similarity statement.



$\frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{1}{2}$   
Yes;  $\triangle PQR \sim \triangle STU$



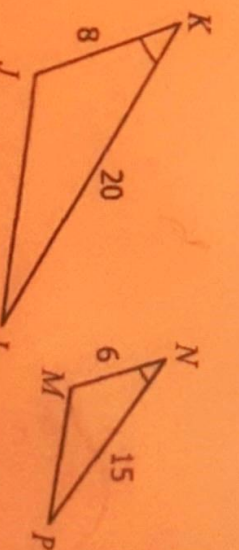
$\frac{30}{24} = \frac{32}{25} = \frac{35}{28}$   
 $1.25 \neq 1.28 \neq 1.28$   
NO!

# SAS~

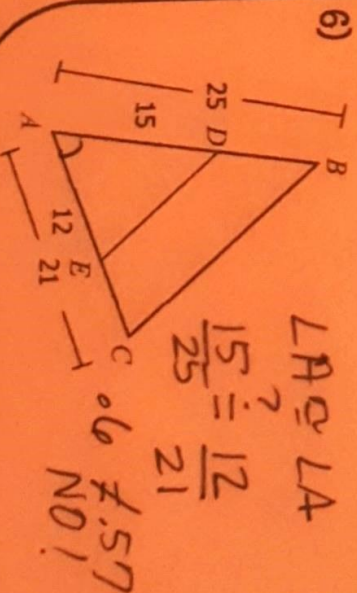
## Side-Angle-Side Similarity

If two corresponding sides are proportional and the included angles are congruent, then the triangles are similar.

Determine if the examples below are similar by SAS~. If yes, write a similarity statement.



$\frac{8}{6} = \frac{20}{15} = 1.\bar{3}$   
Yes!

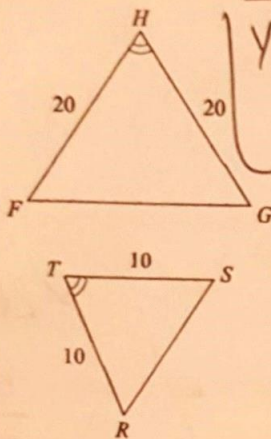


$\frac{15}{12} = \frac{25}{21} \neq 1.57$   
NO!

Triangle Similarity

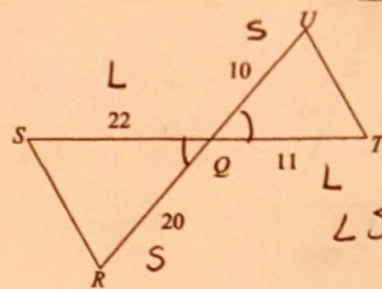
State if the triangles in each pair are similar. If so, state how you know they are similar (AA, SAS, or SSS).

1)  $\triangle HGF \sim \triangle TSR$



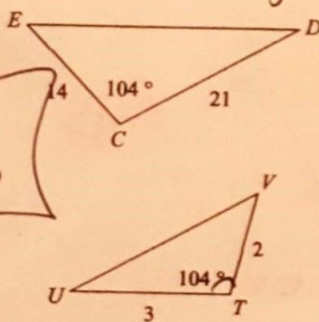
Yes  
SAS ~  
 $\frac{20}{10} = \frac{20}{10} \checkmark$   
 $\angle H \cong \angle T \checkmark$

2)  $\triangle QRS \sim \triangle QUT$



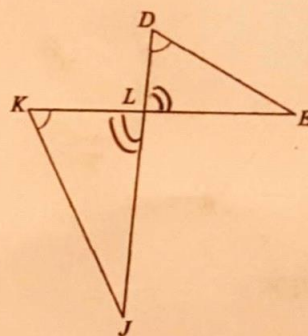
Yes SAS ~  
 $\frac{22}{20} = \frac{11}{10} \checkmark$   
 $\angle SQR \cong \angle UQT \checkmark$

3)  $\triangle CDE \sim \triangle TUV$



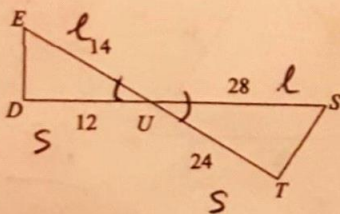
Yes  
SAS ~  
Yes  
 $\angle C \cong \angle T$   
 $\frac{14}{21} = \frac{2}{3} \checkmark$

4)  $\triangle LKJ \sim \triangle LDE$



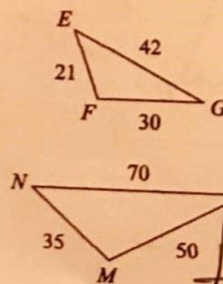
Yes, AA ~  
 $\angle D \cong \angle K$   
 $\angle K L J \cong \angle D L E$

5)  $\triangle UTS \sim \triangle UDE$



$\angle EUD \cong \angle SUT \checkmark$   
 $\frac{14}{12} = \frac{28}{24} \checkmark$   
Yes  
SAS ~

6)  $\triangle LMN \sim \triangle GFE$

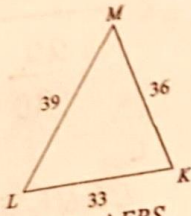
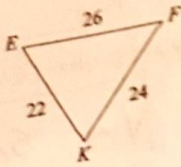


NO  
 $\frac{50}{30} = \frac{70}{42} = \frac{35}{21}$   
NO!  
1.6

G  
o  
l  
S  
S  
1

7)  $\triangle KLM \sim \triangle KEF$

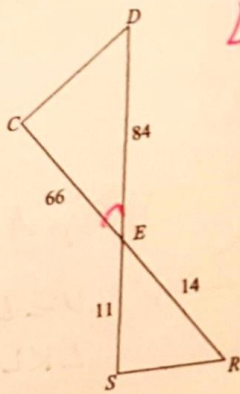
NO



$$\frac{33}{22} = \frac{36}{24} = \frac{39}{22}$$

$$1.5 \quad 1.5 = 1.77$$

9)  $\triangle EDC \sim \triangle ERS$



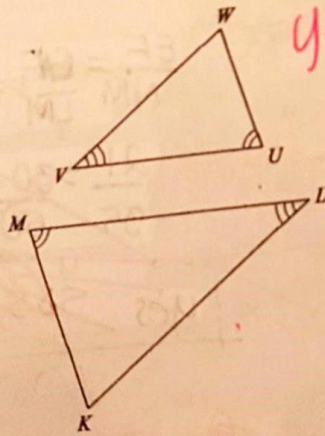
Yes  
 $\angle DEC = \angle RES$

$$\frac{84}{14} = \frac{66}{11}$$

$$6 = 6$$

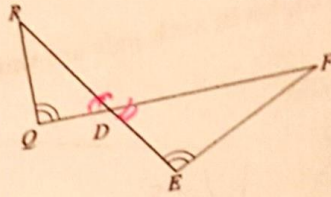
SAS ~

11)  $\triangle MLK \sim \triangle UVW$



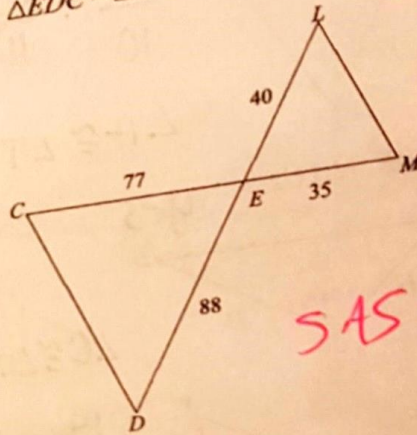
Yes  
AA ~

8)  $\triangle DEF \sim \triangle DQR$



AA ~

10)  $\triangle EDC \sim \triangle ELM$



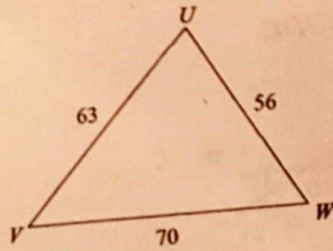
$\angle CED = \angle MEL$

$$\frac{88}{40} = \frac{77}{35}$$

$$2.2 = 2.2$$

SAS ~

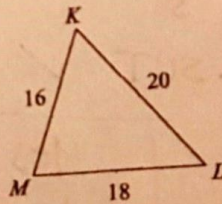
12)  $\triangle WVU \sim \triangle KLM$



$$\frac{70}{20} = \frac{63}{16} = \frac{56}{16}$$

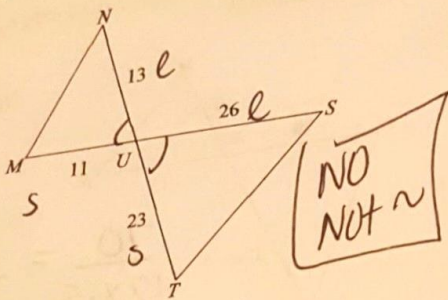
$$\frac{20}{70} = \frac{18}{63} = \frac{16}{56}$$

Yes.  
SSS ~



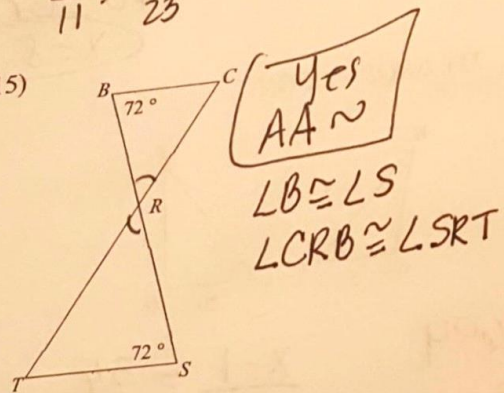
# Triangle Similarity

13)  $\triangle UTS \sim \triangle UMN$



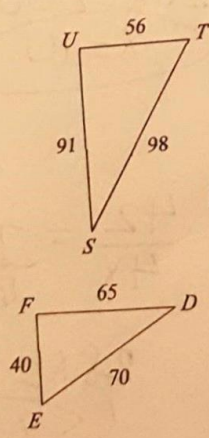
$\angle NUM \cong \angle SUT$   
 $\frac{13}{11} \neq \frac{26}{5} = \frac{23}{23}$  NO!

15)



Yes AA ~  
 $\angle B \cong \angle S$   
 $\angle C R B \cong \angle S R T$

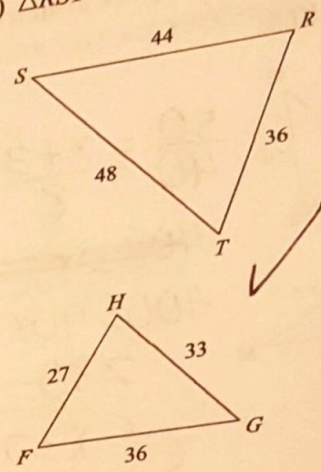
17)  $\triangle STU \sim \triangle DEF$



$\frac{ST}{DE} = \frac{TU}{EF} = \frac{SU}{DF}$   
 $\frac{56}{65} = \frac{91}{40} = \frac{98}{70}$

Yes SSS ~

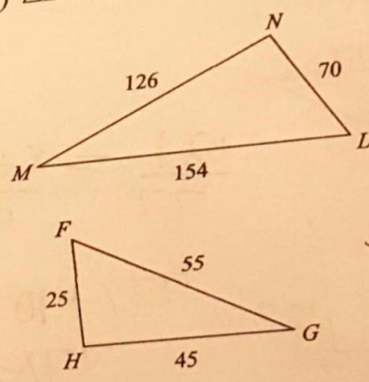
14)  $\triangle RST \sim \triangle HGF$



$\frac{RS}{HG} = \frac{ST}{GF} = \frac{RT}{FH}$   
 $\frac{44}{27} = \frac{48}{33} = \frac{36}{36}$

Yes, SSS ~

16)  $\triangle LMN \sim \triangle FGH$



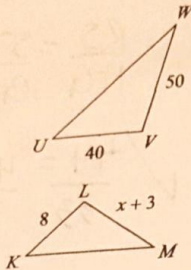
$\frac{LM}{FG} = \frac{LN}{GH} = \frac{LN}{FH}$   
 $\frac{154}{25} = \frac{126}{55} = \frac{70}{45}$

Yes, SSS ~

# Triangle Similarity

Solve for  $x$ . Be sure to set up the proportion. The triangles in each pair are similar.

18)  $\triangle UVW \sim \triangle KLM$



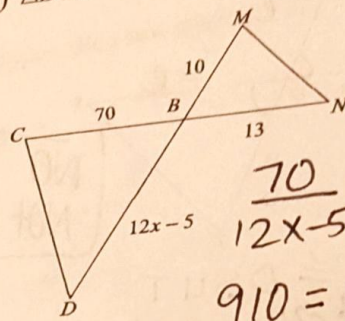
$$\frac{50}{40} = \frac{x+3}{8}$$
~~$$400 = x + 3$$~~

$$400 = 40x + 120$$

$$280 = 40x$$

$$x = 7$$

19)  $\triangle BCD \sim \triangle BMN$

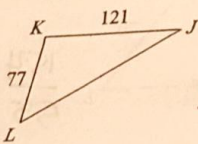


$$\frac{70}{12x-5} = \frac{10}{13}$$

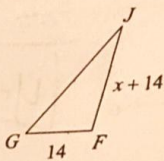
$$910 = 120x - 50$$
~~$$960 = 120x$$~~

$$x = 8$$

20)  $\triangle JKL \sim \triangle JFG$



$$\frac{121}{77} = \frac{x+14}{14}$$

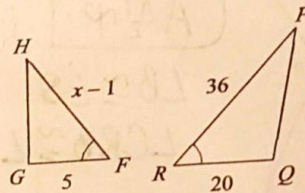


$$77x + 1078 = 1694$$

$$77x = 616$$

$$x = 8$$

21)  $\triangle RQP \sim \triangle FGH$



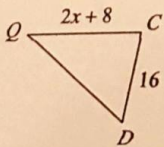
$$\frac{x-1}{5} = \frac{36}{20}$$

$$20x - 20 = 180$$

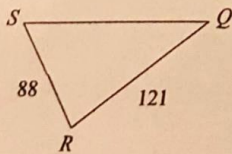
$$20x = 200$$

$$x = 10$$

22)  $\triangle QRS \sim \triangle QCD$



$$\frac{2x+8}{16} = \frac{121}{88}$$

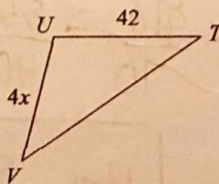


$$176x + 704 = 1936$$

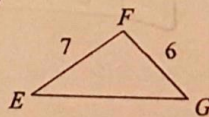
$$176x = 1232$$

$$x = 7$$

23)  $\triangle TUV \sim \triangle EFG$



$$\frac{42}{4x} = \frac{7}{6}$$



$$28x = 252$$

$$x = 9$$