Header: Your name

Mrs. Theo

3/8/22

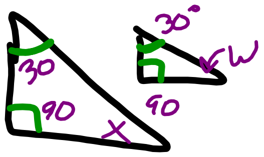
Notes

8.2-8.3

Similarity Theorems

3 Ways to Prove Triangle Similarity

AA ~ If 2 angles are congruent (then the third angle will be too, AAA) then the Triangles are Similar.



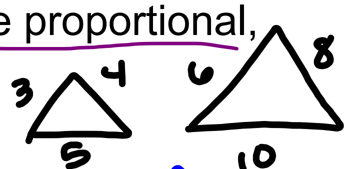
$30 + 90 + x = 180$

$x = 60$

$30 + 90 + w = 180$

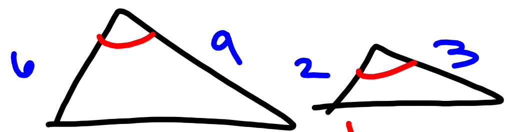
$w = 60$

SSS ~ If 3 sides of a triangle are proportional, then the triangles are Similar



scale factor = 2

SAS ~ If 2 sides are proportional, and the angle in between is congruent, then the triangles are Similar

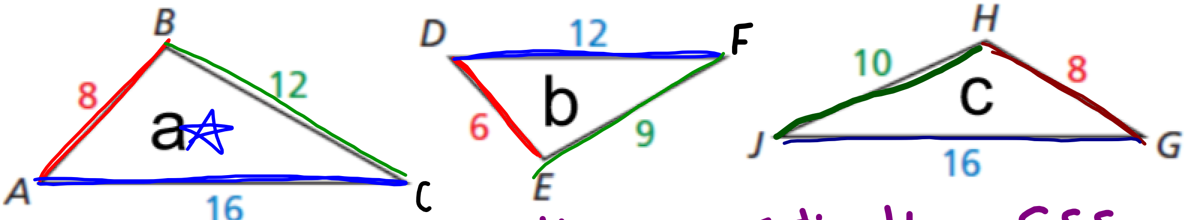


multiply $\frac{1}{3}$

Example #1

Prove Similiarity:

Is either $\triangle DEF$ or $\triangle GHJ$ similar to $\triangle ABC$?



if all 3 sides have the same ratio, then SSS~

$\frac{8 \div 2}{6 \div 2}$ $\frac{16 \div 4}{12 \div 4}$ $\frac{12 \div 3}{9 \div 3}$

$\frac{4}{3} \stackrel{\checkmark}{=} \frac{4}{3} \stackrel{\checkmark}{=} \frac{4}{3}$

By SSS~
$\triangle ABC \sim \triangle DEF$

$\frac{8}{8}$ $\frac{16}{16}$ $\frac{12 \div 2}{10 \div 2}$

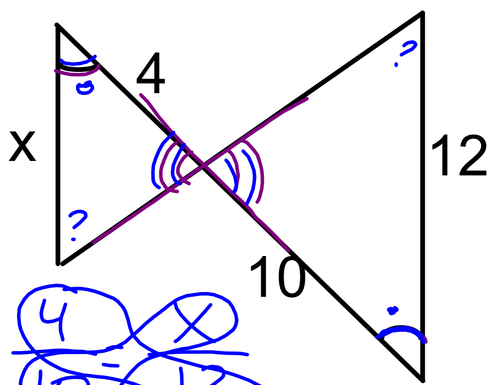
$1 = 1 \neq \frac{6}{5}$

Two sides proportional is not enough

Not similar

Example #2

Are these similar? Why? If so, Find the value of x.



can't use SSS~

Not SAS~ b/c one of the sides is a variable

Yes, AA~ b/c Vertical angles ≅

$\frac{4}{10} = \frac{x}{12}$

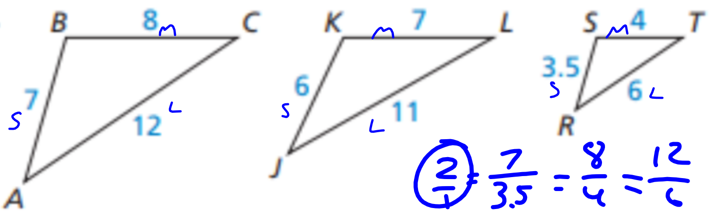
$10x = 48$

$\frac{10x}{10} = \frac{48}{10}$

$\boxed{x = 4.8}$

In Exercises 3 and 4, determine whether $\triangle JKL$ or $\triangle RST$ is similar to $\triangle ABC$. *(See Example 1.)*

3.



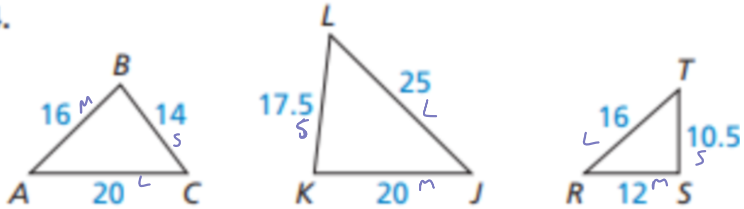
$\frac{8}{7}$ $\frac{7}{6}$ $\frac{12}{11}$

$1.143 \neq 1.1\overline{6} \neq 1.\overline{09}$

$\frac{7}{3.5} = \frac{8}{4} = \frac{12}{6}$ = 2

$\boxed{\triangle RST \sim \triangle ABC}$

4.



$\frac{16 \div 4}{20 \div 4}$ $\frac{14}{17.5}$ $\frac{20 \div 5}{25 \div 5}$

$\frac{4}{5} = 0.8 = \frac{4}{5}$ ✓

$\frac{10.5}{14}$ $\frac{12 \div 4}{16 \div 4}$ $\frac{16 \div 4}{20 \div 4}$

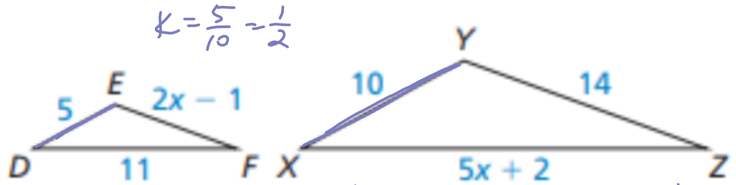
$0.75 = \frac{3}{4} \neq \frac{4}{5}$

$\boxed{\triangle ABC \sim \triangle JKL}$

In Exercises 5 and 6, find the value of x that makes $\triangle DEF \sim \triangle XYZ$. *(See Example 2.)*

5.

$k = \frac{5}{10} = \frac{1}{2}$



$\frac{1}{2} = \frac{2x-1}{14}$

$2(2x-1) = 1 \cdot 14$

$4x - 2 = 14$

$4x = 16$

$\boxed{x = 4}$

same

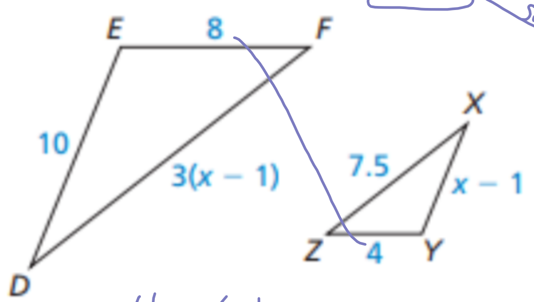
$\frac{1}{2} = \frac{11}{5x+2}$

$5x + 2 = 22$

$5x = 20$

$x = 4$ ✓

6.



$\frac{3(x-1)}{7.5} = \frac{8}{4}$

$3 \cdot 4(x-1) = 7.5 \cdot 8$

$12(x-1) = 60$

$12x - 12 = 60$

$12x = 72$

$\boxed{x = 6}$

$\frac{4}{8} = \frac{x-1}{10}$

$8(x-1) = 4 \cdot 10$

$8x - 8 = 40$

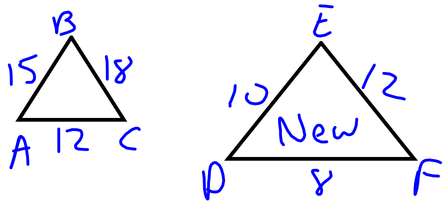
$8x = 48$

$x = 6$ ✓

same

In Exercises 7 and 8, verify that $\triangle ABC \sim \triangle DEF$. Find the scale factor of $\triangle ABC$ to $\triangle DEF$.

7. $\triangle ABC$: $BC = 18$, $AB = 15$, $AC = 12$
$\triangle DEF$: $EF = 12$, $DE = 10$, $DF = 8$

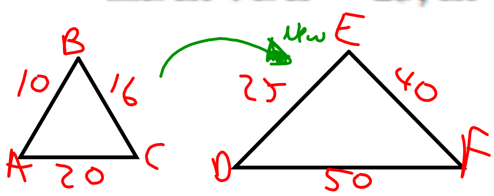


$K = \frac{12 \div 6}{18 \div 6} = \frac{10 \div 5}{15 \div 5} = \frac{8 \div 4}{12 \div 4}$

$\frac{2}{3} \checkmark \frac{2}{3} \checkmark \frac{2}{3}$

similar $K = \frac{2}{3}$

8. $\triangle ABC$: $AB = 10$, $BC = 16$, $CA = 20$
$\triangle DEF$: $DE = 25$, $EF = 40$, $FD = 50$



$\frac{10 \div 5}{25 \div 5}$ $\frac{16 \div 8}{40 \div 8}$ $\frac{20 \div 10}{50 \div 10}$

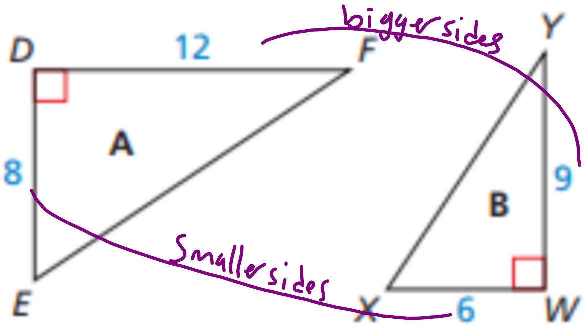
$\frac{2}{5} = \frac{2}{5} = \frac{2}{5}$

Yes similar by SSS~

$\triangle ABC \to \triangle DEF$ $K = \frac{25}{10} = \boxed{\frac{5}{2}}$

In Exercises 9 and 10, determine whether the two triangles are similar. If they are similar, write a similarity statement and find the scale factor of triangle B to triangle A. *(See Example 3.)*

9.



$\angle D \cong \angle W$

$\frac{9}{12} \stackrel{?}{=} \frac{6}{8}$

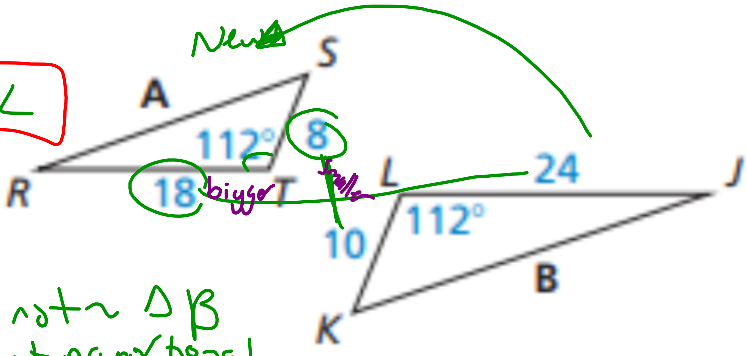
$\frac{3}{4} = \checkmark \frac{3}{4}$

Yes similar

$\triangle DFE \sim \triangle WYX$

10.

$\boxed{\angle T \cong \angle L}$



$\frac{18}{24} \stackrel{?}{=} \frac{8}{10}$

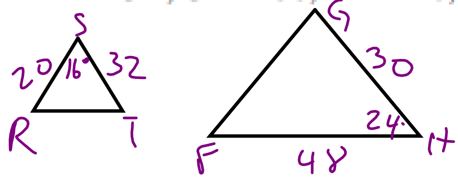
$\frac{3}{4} \neq \frac{4}{5}$

$\triangle A$ is not $\sim \triangle B$

Sides not proportional

In Exercises 11 and 12, sketch the triangles using the given description. Then determine whether the two triangles can be similar.

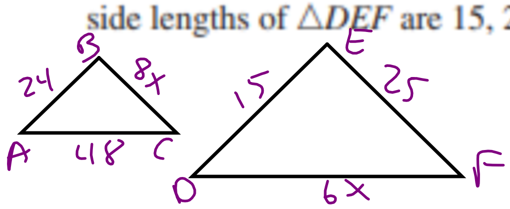
11. In $\triangle RST$, $RS = 20$, $ST = 32$, and $m\angle S = 16°$. In $\triangle FGH$, $GH = 30$, $HF = 48$, and $m\angle H = 24°$.



SAS?

The angle inbetween is not ≅ so $\boxed{\text{Not} \sim}$

12. The side lengths of $\triangle ABC$ are 24, $8x$, and 48, and the side lengths of $\triangle DEF$ are 15, 25, and $6x$.



SSS?

$\frac{24 \div 3}{15 \div 3}$ $\quad \frac{8x}{25}$ $\quad \frac{48 \div 6}{6x \div 6}$

$\frac{8}{5} = \frac{8x}{25}$ $\quad \frac{8}{5} = \frac{8}{x}$

$8x = 40$ $\quad x = 5$

if $x = 5$

then $\frac{8x}{25} = \frac{48}{6x} = \frac{24}{15}$

$\triangle ABC \sim \triangle DEF$

Wow! Cool!!