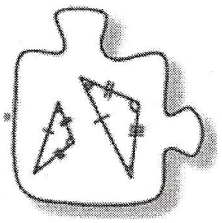
Name: Notes Period: Date:

3.2.3 How can I use equivalent ratios?

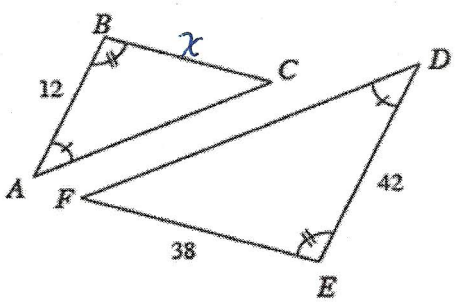


Triangle Similarity and Congruence

By examining and testing side ratios and angles, you are now able to determine whether two figures are similar. But how can you tell if two shapes are the same shape *and* the same size? In this lesson you will examine properties that guarantee that shapes are exact replicas of one another. Note that some figures in this lesson and throughout the course may not be drawn to scale. Always use the factual information stated about or marked on the figure(s) to make decisions.

3-71. Decide if each pair of triangles below is similar. Use a flowchart to organize your facts and conclusion for each pair of triangles.

a.



$\angle A \cong \angle D$ $\angle B \cong \angle E$

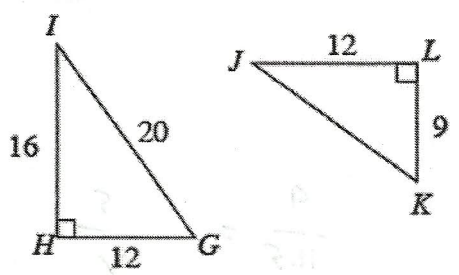
$\triangle ABC \sim \triangle DEF$ AA~

$\frac{42}{12} = \frac{38}{x}$

$\frac{42x}{42} = \frac{456}{42}$

$x = 10.86$

b.

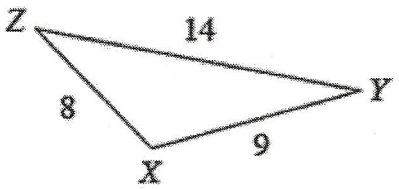


$\frac{12}{16} = \frac{3}{4}$ $\angle H \cong \angle L$ $\frac{9}{12} = \frac{3}{4}$

$\triangle HIG \sim \triangle LJK$

SAS~

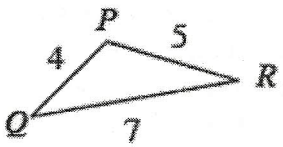
c.



$\frac{8}{4} = 2$

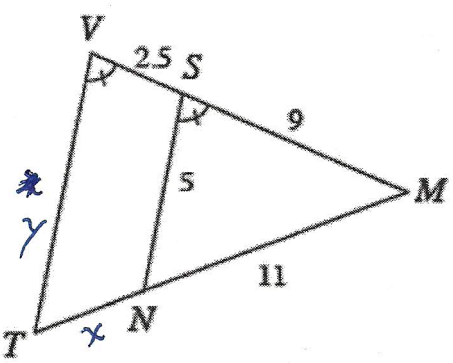
$\frac{14}{7} = 2$

Not enough information



$\frac{9}{5} = 1.8$

d.

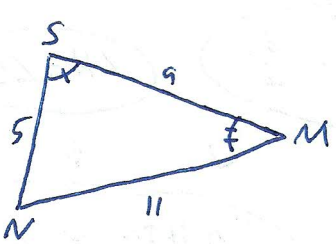


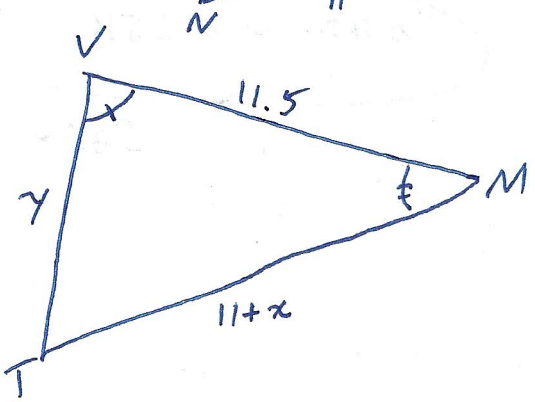
$\angle V \cong \angle S$ $\quad$ $\angle M \cong \angle M$

$\triangle VMT \sim \triangle SMN$

AA~

Redraw!





$\frac{9}{11.5} = \frac{5}{y}$ $\quad$ $\frac{9}{11.5} = \frac{11}{11+x}$

$9(11+x) = 126.5$

$\frac{9y}{9} = \frac{57.5}{9}$ $\quad$ $99+9x = 126.5$

$9x = 27.5$

$y = 6.39$ $\quad$ $x = 3.06$

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3-72. For the diagrams in problem 3-71, find the lengths of the sides listed below, if possible. If it is not possible, explain why not.

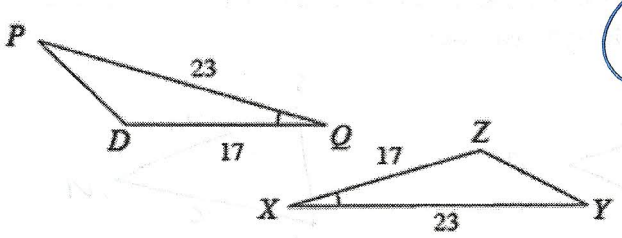
a. $\overline{BC}$ = 10.86

b. $\overline{AC}$ = Not possible b/c we don't know $\overline{FD}$

c. $\overline{VT}$ = 6.39

d. $\overline{TN}$ = 3.06

3-73. Kamraan offers you a challenge. Are the triangles below similar? How do you know? Examine the triangles at below. Use a flowchart to organize your explanation.



$\frac{23}{23} = 1$ $\angle Q \cong \angle X$ $\frac{17}{17} = 1$

$\triangle QDP \sim \triangle XZY$

SAS ~

a. Kamraan says, "*These triangles aren't just similar—they're congruent!*" Is Kamraan correct? What special value in your flowchart indicates that the triangles are congruent?

The ratio of the sides are 1

b. Write a conjecture (in "If..., then..." form) for your observation in part (b). Then prove that it is true by justifying the conclusion.

If similar triangles have a side ratio of 1, then the triangles are congruent.

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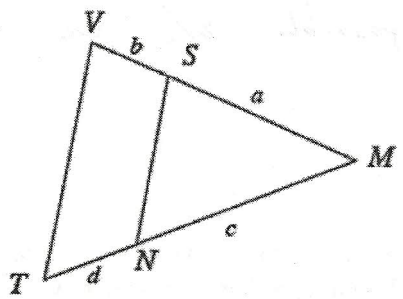
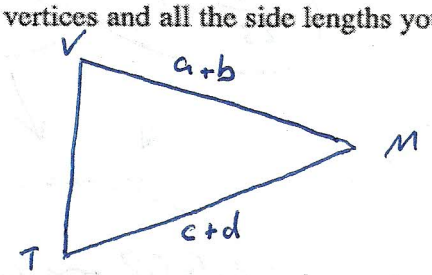
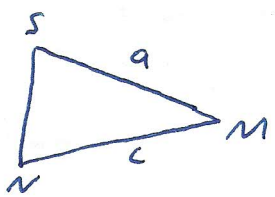
3-74. Kamraan has a new challenge. He drew triangle VTM below and $\overline{SN}$ which intersects the sides so that the subdivided lengths are proportional, that is, so that $\frac{b}{a}=\frac{d}{c}$. He asks, "*Is* $\overline{VT}$ *parallel to* $\overline{SN}$ *? How do you know?*" Think about this question as you answer the questions below.



a. Kamraan's figure looks like two triangles on top of each other. Separate the triangles, label the vertices and all the side lengths you can.





b. How can you prove that $\frac{a+b}{a}=\frac{c+d}{c}$? Talk about this with your team and be ready to share your reasoning with the class.

$\frac{a+b}{a}=\frac{c+d}{c}$

$a(c+d)=a(a+b)$

$ac+da=ca+cb$

$\frac{a+b}{a}=\frac{bd+c}{ac}$

$\frac{a}{a}+\frac{b}{a}=\frac{d}{c}+\frac{c}{c}$

$1+\frac{b}{a}=\frac{d}{c}+1$

$\frac{b}{a}=\frac{d}{c}$

c. Are the triangles similar? How do you know?

Yes, by SAS~

d. Address Kamraan's challenge: Prove that $\overline{VT}$ is parallel to $\overline{SN}$. Record your reasoning.