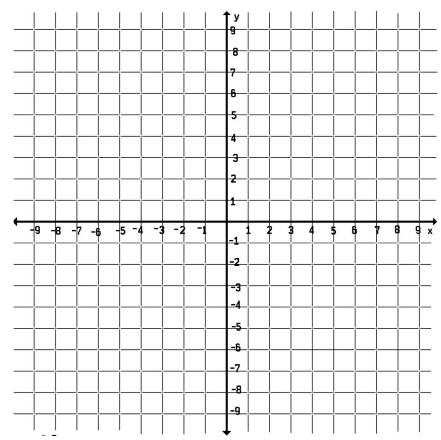
Name:______________________________ Date:_______________ Per:______ #_______

9.1.4 Can angles show similarity?

AA Triangle Similarity

In Chapter 6 you learned that you can create similar figures by using dilations. Today you will investigate what happens to the angles in a figure when you enlarge or reduce the figure to create a similar figure.

9-39. ANGLES IN SIMILAR FIGURES



a. Using a sheet of graph paper and a straightedge, graph the quadrilateral M(0, 3), N(4, 0), P(2, –2), Q(–2, 1).

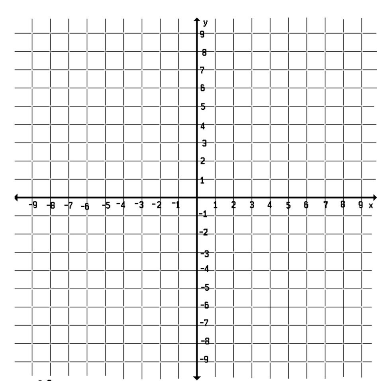
b. Enlarge the quadrilateral by a scale factor of 2.

c. What do you notice about side MN and side M′N′? Explain.

d. What can you say about ∠M and ∠M′? Explain your reasoning. Hint: Extend sides MN and QM.

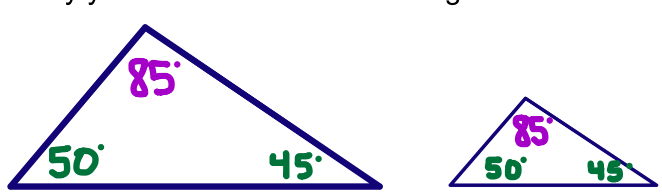
e. Remember that a conjecture is an inference or judgment based on incomplete evidence. Based on your work in this problem so far, make a conjecture about the angles in similar figures.

f. Test your conjecture in part (e) using a figure of your own design and a different scale factor. Each team member should create a different figure. Compare your work with your teammates' work. Does your conjecture seem to work always, sometimes, or never?



9-40. Imagine that two pairs of corresponding angles in two triangles are of equal measure. What could you then conclude about the third set of angles? Justify your answer and draw a diagram.

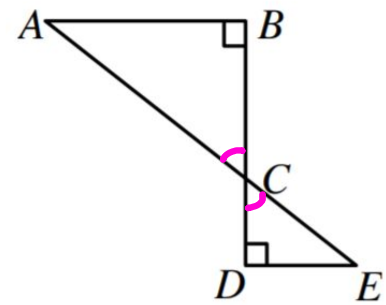
They're also the same.



9-41. Use your conjecture from part (e) of problem 9-39 along with your work from problem 9-40 to explain how you can use the angles in a pair of triangles to determine if they are similar. Be sure to include how many angles you need and what needs to be true about them.

9-42. The relationship in the previous problem is called **Angle Angle Similarity** and is written AA~. The symbol ~ means "similarity" or "is similar to." In the figure at right, is ΔABC ~ ΔEDC (that is, is ΔABC similar to ΔEDC)? Explain your reasoning.

Yes, AA~



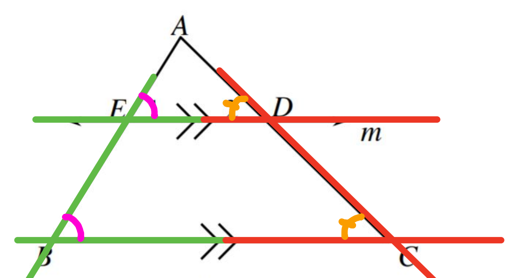
9-43. Eleanor and John were working on a geometry problem together.
They knew that in the figure below, line m is parallel to side BC. They wanted to find the side lengths of each triangle. First they decided that they needed to show that ΔAED ~ ΔABC.

Eleanor said, "This is easy. We have parallel lines, so the triangles are similar by AA~."

"Hold on a minute!" John replied, "Which angles are equal?"

a. Using the diagram at right, name the pairs of equal angles Eleanor sees. Why are they equal?

$\angle A = \angle A \quad \angle 1 = \angle B \quad \angle 2 = \angle C$

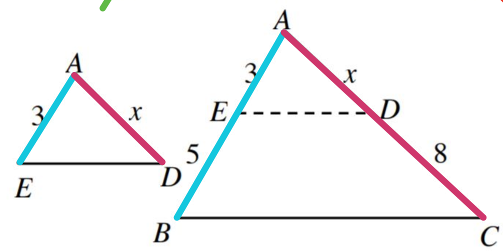


b. Are the triangles (ΔAED and ΔABC) similar? Explain.

Yes, AA~

c. Now that John sees how the triangles are similar, he suggests redrawing them separately as shown at right. "Look," he says, "Now we just write a proportion." He suggests the following equation:

$$\frac{3}{3+5} = \frac{x}{x+8}$$



Explain how John came up with this equation.

d. Solve the proportion equation in part (c) for x and check you answer.

$\frac{3}{8} = \frac{x}{x+8}$

$8x = 3(x+8)$

$8x = 3x + 24$

$-3x \quad -3x$

$5x = 24$

$\boxed{x = \frac{24}{5}}$

9-45. ΔABC is similar to ΔDEF .

a. Find the scale factor from ΔABC to ΔDEF .

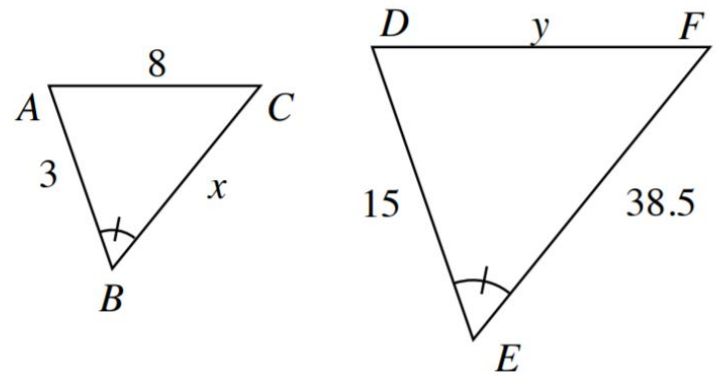
$\frac{\text{new}}{\text{original}} = \frac{15}{3} = \boxed{5}$

b. Find x.

$x = \frac{38.5}{5} = \boxed{7.7}$

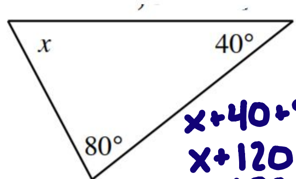
c. Find y.

$y = 8 \cdot 5 = \boxed{40}$



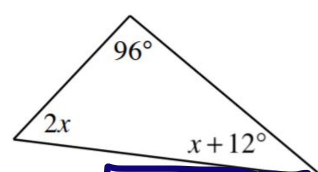
9-49. Use what you know about the angles in a triangle to find x in each diagram below. Show all work. Then classify each triangle as acute, right, or obtuse.

a.



$x + 40 + 80 = 180$
$x + 120 = 180$
$-120 \quad -120$
$\boxed{x = 60°}$

b.



$2x + x + 12 + 96 = 180$
$3x + 108 = 180$
$-108 \quad -108$
$3x = 72$
$\boxed{x = 24}$

angles:
96°
2(24) = 48°
24 + 12 = 36°

LESSON SUMMARY

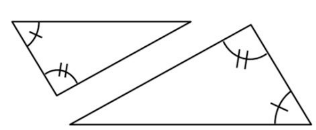
MATH NOTES

METHODS AND MEANINGS

AA Similarity for Triangles

For two triangles to be similar, corresponding angles must have equal measure.

However, it is sufficient to know that two pairs of corresponding angles have equal measures, because then the third pair of angles must have equal measure.



This is known as the **Angle-Angle Triangle Similarity Conjecture**, which can be abbreviated as "AA Similarity" or "AA ~."

AA ~ : If two pairs of corresponding angles have equal measure, then the triangles are similar.