Name Key Period

**Secondary 2 Honors** **Triangle Similarity & Proportionality** **Notes 1.4**

**Warm-up:** What does the word "similar" mean? What does it mean for two or more shapes to be similar?

They are proportional.

**Vocabulary:**

1. **Similar Triangle**: Two triangles are similar if corresponding sides are proportional and corresponding angles are congruent.
2. **Dilation**: is a transformation that produces an image that is the same shape as the original figure but the image is a different size. The dilation uses a center and a scale factor to create a proportional figure that is congruent, an enlargement, or reduction. Angle measure is preserved under a dilation.

**There are 2 methods to prove triangle similarity.**

**Method 1: Proving Triangles are Similar Using Transformations.**

Show that the triangles are similar by completing the transformations that map ΔABC onto ΔXYZ. Note that: A (-8,-2), B (-6,-6), C (-3,-1), X (4,4), Y (8,12), and Z (14,2).

a) Reflect ΔABC over the x-axis.
The new coordinates are:

A' = (-8,2) B' = (-6,6) C' = (-3,1)

b) Translate this new triangle to the right 10 units. The new coordinates are: x→

A" = (2,2) B" = (4,6) C" = (7,1)

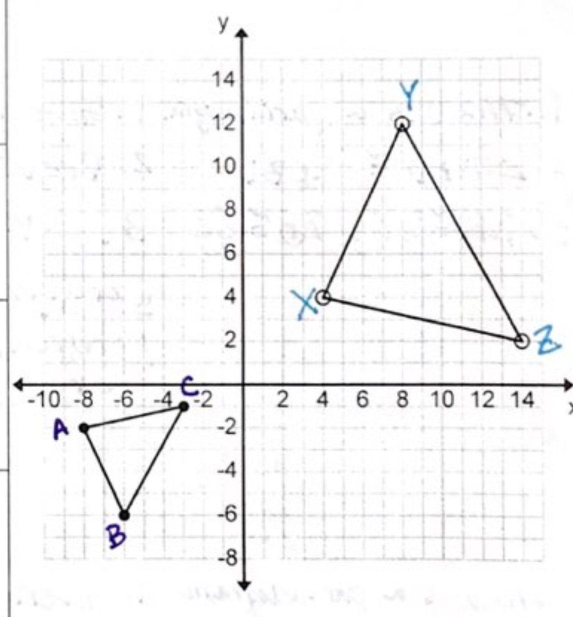
c) Dilate the newest figure you have drawn with a center at the origin and show that the points are collinear. Then find the scale factor:

Scale Factor: 2

d) Because these transformations map ΔABC onto ΔXYZ, I know that.....

ΔABC is similar to ΔXYZ

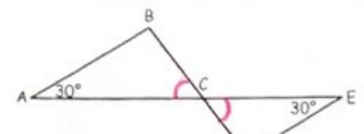
ΔABC ~ ΔXYZ




**Method 2: Proving Triangles are Similar Using Similarity Statements.**

1. **Angle-Angle Similarity (AA~):** If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.
2. **Side-Side-Side Triangle Similarity Statement (SSS~)**: If the measures of the corresponding sides of two triangles are proportional, then the triangles are similar.
3. **Side-Angle-Side Triangle Similarity Statement (SAS~)**: If the measures of two sides of a triangle are proportional to the measures of two corresponding sides of another triangle and the included angles are congruent, then the triangles are similar.

**Example 1**: Are the triangles similar? If so, write a *similarity* statement. (Δ____ ~Δ____ *by* ___)

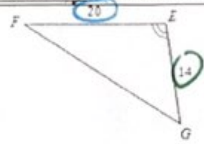


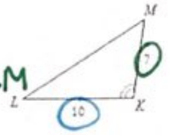

ΔABC~Δ EDC

by AA~

$\frac{20}{10} = \frac{14}{7}$

2 = 2



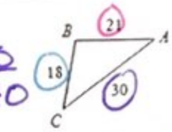



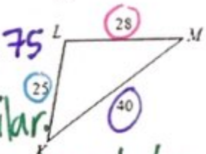

ΔFEG~ΔLKM

By SAS ~

$\frac{18}{25} = \frac{21}{28} = \frac{30}{40}$

.72 ≠ .75 = .75

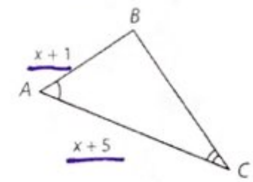


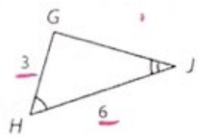




Not similar

All 3 sides need to be proportional.

**Example 2**: Identify the similar triangles. Solve for x and the measures of the indicated sides.




$\frac{x+1}{x+5} = \frac{3}{6}$

$6x+6 = 3x+15$
$-3x-6 \quad -3x \quad -6$

$\frac{3x}{3} = \frac{9}{3}$

$x = 3$

$\overline{AB} = 3+1 = 4$

$\overline{AC} = 3+5 = 8$

$\overline{AB} = 4$
$\overline{AC} = 8$

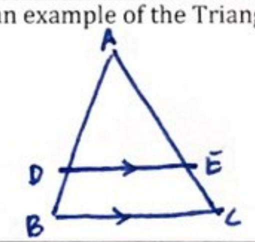
**Triangle Proportionality Theorem:**

**Triangle Proportionality Thm**:

**If a line parallel to one side of a triangle intersects the other two sides of the triangle, then the line divides these two sides proportionally.*

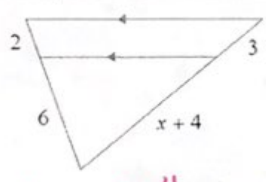
* It creates 2 similar triangles

Construct an example of the Triangle Proportionality Theorem:




$\frac{AD}{DB} = \frac{AE}{EC}$

**Example 3**: Use the Triangle Proportionality Theorem to find the value of the missing side(s)

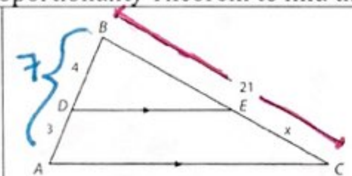



$\frac{6}{2} = \frac{x+4}{3}$

$18 = 2x+8$
$-8 \quad -8$

$\frac{10}{2} = \frac{2x}{2}$

$x = 5$

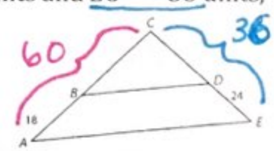



$\frac{7}{3} = \frac{21}{x}$

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

$x = 9$

If $AC = 60$ units and $EC = 36$ units, is $\overline{AE} \parallel \overline{BD}$?




$\frac{60}{18} = \frac{36}{24}$

$3.\overline{3} \neq 1.5$

NOT PARALLEL

**Example 4 - Application Problems**: How does triangle similarity help us?

1) A meter stick casts a shadow 0.65 meters long. At the same time, a tree casts a shadow 2.6 meters long. How tall is the tree?

The tree is 4m tall.

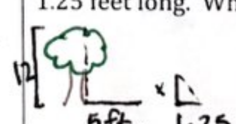
$\frac{1}{.65} = \frac{x}{2.6}$

$\frac{2.6}{.65} = \frac{.65x}{.65}$

$x = 4$


65cm = .65m

2) A 12-foot statue casts a shadow that is 5 feet long. At the same time a fence post casts a shadow that is 1.25 feet long. What is the height of the fence post?




$\frac{12}{5} = \frac{x}{1.25}$

$\frac{15}{5} = \frac{5x}{5}$

$x = 3$

the fence post is 3 ft tall.