

Ratios, Proportions, and Similar Figures

What is the ratio of boys to girls in this class?

What is the ratio of girls to students in this class?

To solve a proportion, cross multiply

Example 1: Solve $\frac{4x-5}{3} = \frac{26}{6}$

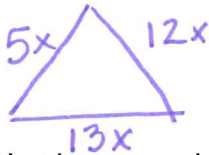
$$6(4x-5) = 3 \cdot 26$$

$$24x - 30 = 78$$

$$24x = 108$$

$$\boxed{x = 4.5}$$

Example 2: In a triangle, the ratio of measures of 3 sides is 5:12:13 and the perimeter is 90 inches. Find the measure of the *shortest* side.



$$5x + 12x + 13x = \del{180} 90 \text{ in}$$

$$30x = 90$$

$$\boxed{x = 3}$$

Shortest:

$$5(3) = \boxed{15 \text{ in}}$$

Two polygons that have exactly the same shape but not necessarily the same size are similar.

Two polygons are congruent if that have exactly the same shape & size.

Similar figures must have:

1. congruent corresponding angles AND
2. sides that are proportional (same side length ratio or SLR)

Congruent figures must have:

1. all congruent sides
2. all congruent angles

The ratio of the sides is called the scale factor.

Are congruent figures also similar? Why or why not?

\cong figures are similar because corr. \angle s are \cong and SLR = 1:1

Are similar figures congruent? Why or why not?

No (Not always) They do not need to be the same ~~shape~~ size but must be some shape.

Determine whether each statement is sometimes, always, or never true.

- a. Two equilateral triangles are congruent. Sometimes
- b. An equilateral triangle is similar to a scalene triangle. never
- c. Two rectangles are similar. Sometimes
- d. Two isosceles right triangles are congruent. Sometimes
- e. Two isosceles right triangles are similar. always
- f. Two rectangles in which the length is twice the width are similar. always

Example 3: Determine if the triangles are similar.

Are corresponding angles equal? Yes!

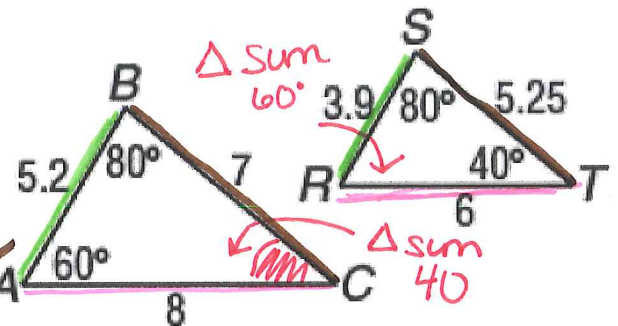
$$\angle A \cong \angle R \quad \angle B \cong \angle S$$

$$\angle C \cong \angle C$$

Are corresponding sides proportional?

$$\frac{AB}{RS} = \frac{5.2}{3.9} = 1.\bar{3} = \frac{4}{3} \checkmark$$

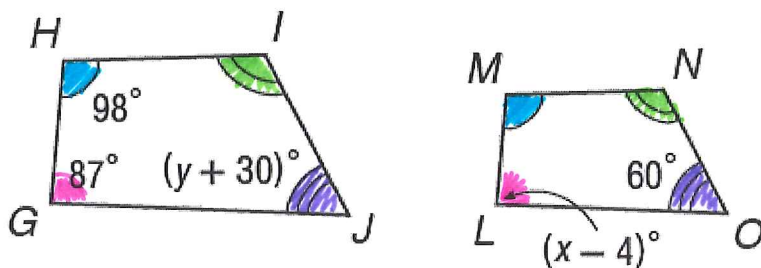
$$\frac{AC}{RT} = \frac{8}{6} = \frac{4}{3} \checkmark \quad \frac{BC}{ST} = \frac{7}{5.25} = 1.\bar{3} = \frac{4}{3} \checkmark$$



Similarity Statement:

$\triangle ABC \sim \triangle RST$ because ^① corr. \angle s are \cong and ^② SLR's are equal (sides are proportional)

Example 4: Given the two polygons are similar, find x and y.



$\text{Quad } HIGJ \sim \text{Quad } MNOL$

Similar polygons have \cong corresponding angles!

Find x

$$\angle L \cong \angle G$$

$$x - 4 = 87$$

$$\boxed{x = 91^\circ}$$

Find y

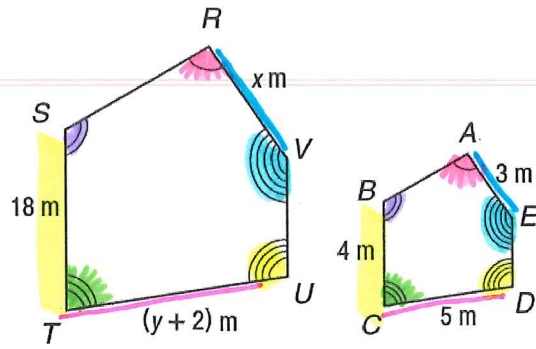
$$\angle J \cong \angle O$$

$$y + 30 = 60$$

$$\boxed{y = 30}$$

Example 5: The two polygons are similar.

- A. Write the similarity statement.
- B. Find the scale factor.
- C. Find x and y.
- D. Find the measure of the indicated side.



B.) Scale factor: $\frac{18}{4} = \frac{9}{2}$ OR $\frac{2}{9}$

C.) $\frac{TS}{CB} = \frac{VR}{EA}$ $\frac{18}{4} = \frac{x}{3}$
 $54 = 4x$
 $13.5 = x$

$\frac{TS}{CB} = \frac{TU}{CD}$ $\frac{18}{4} = \frac{y+2}{5}$

$90 = 4(y+2)$
 $90 = 4y + 8$
 $82 = 4y$

$y = 20.5$

A. Poly DEABC ~ Poly UVRST B. $\frac{9}{2}$

C. $x = 13.5$ $y = 20.5$ D. TU = 22.5 \leftarrow D. TU = $20.5 + 2$
 $TU = 22.5$

Example 5: The two quadrilaterals are similar.

- A. Write the similarity statement. ✓
- B. Find the scale factor.
- C. Find x.
- D. Find the measure of the indicated side.

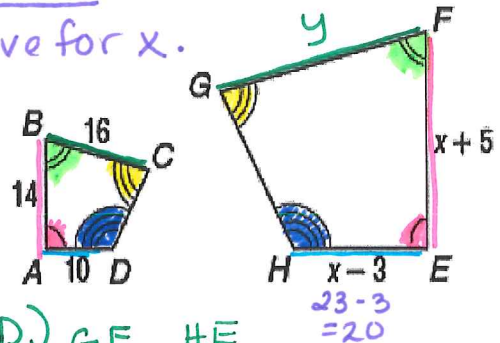
B.) Scale Factor

wait to solve for x.

$\frac{HE}{DA} = \frac{20}{10} = 2$

C.) $\frac{HE}{DA} = \frac{EF}{AB}$
 $\frac{x-3}{10} = \frac{x+5}{14}$

$14(x-3) = 10(x+5)$
 $14x - 42 = 10x + 50$
 $4x - 42 = 50$
 $4x = 92$
 $x = 23$



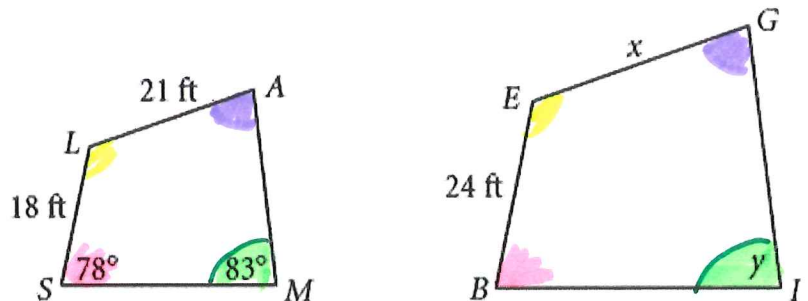
D.) $\frac{GF}{CB} = \frac{HE}{DA}$
 $\frac{y}{16} = \frac{20}{10}$ $10y = 320$
 $y = 32$
 $GF = 32$

A. Quad ABCD ~ Quad EFGH B. SLR = 2

C. x = 23 D. GF = 32

Example 6. The two quadrilaterals are similar.

- A. Write the similarity statement.
- B. Find the scale factor.
- C. Find x. *only*
- D. Find the measure of the indicated side.



C.) Find x

$\frac{GE}{AL} = \frac{EB}{LS}$ $\frac{x}{21} = \frac{24}{18}$
 $18x = 504$
 $x = 28$

B.) Scale factor:
 $\frac{EB}{LS} = \frac{24 \div 6}{18 \div 6} = \frac{4}{3}$

A. Quad AMSL ~ Quad GIBE B. SLR = $\frac{4}{3}$ C. 28 ft D. EG = 28 ft ✓

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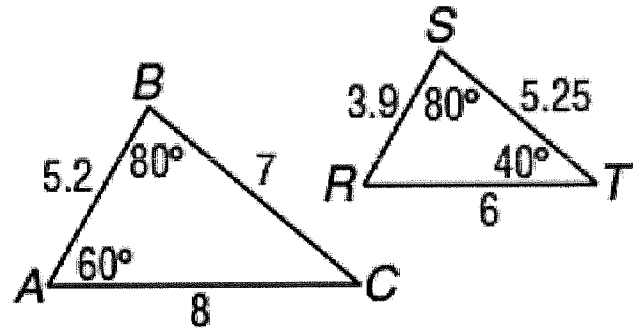
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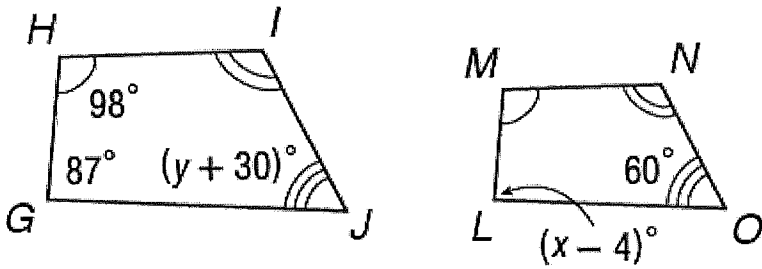
Are corresponding angles equal?



Are corresponding sides proportional?

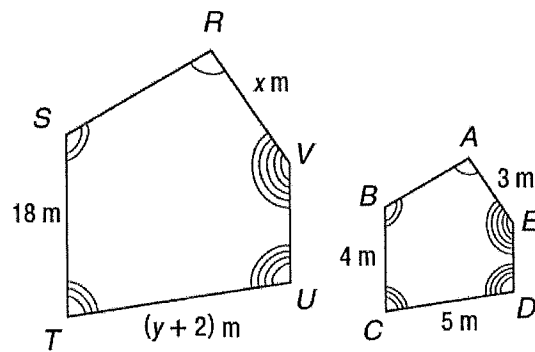
Similarity Statement:

Example 4: Given the two polygons are similar, find x and y .



Example 5: The two polygons are similar.

- A. Write the similarity statement.
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A. Poly DEABC ~ _____ B. _____ C. _____ D. TU = _____

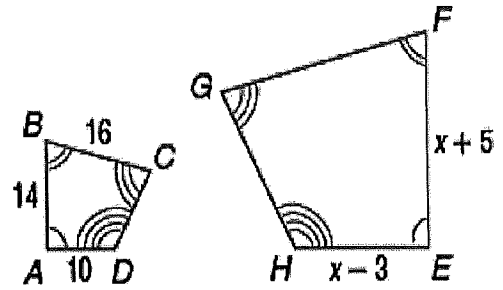
Example 5: The two quadrilaterals are similar.

A. Write the similarity statement.

B. Find the scale factor.

C. Find x .

D. Find the measure of the indicated side.



A. Quad ABCD ~ _____ B. _____ C. _____ D. GF = _____

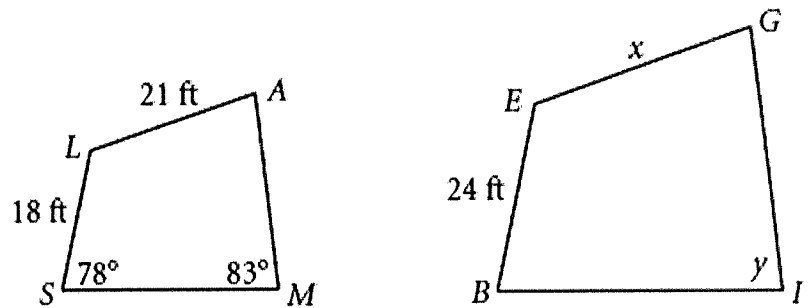
Example 6. The two quadrilaterals are similar.

A. Write the similarity statement.

B. Find the scale factor.

C. Find x and y .

D. Find the measure of the indicated side.



A. Quad AMSL ~ _____ B. _____ C. _____ D. EG = _____