Warm-Up: Find the image given the pre-image and scale factor for the following figures.

1) A(3, 1), B(-2, -4), C(0, 5) with a scale factor of 3 A'(9, 3) B'(-6, -12) C'(0, 15)

2) D(9, -6), E(-3, 12), F(15, -9), G(0, 0) with a scale factor of 2/3

D'(6, -4) E'(-2, 8) F'(10, -6) G'(0, 0)


# Similar Polygons

## Objectives

- Develop an intuitive concept of similarity
- Define similar polygons
- Use the definition of similar polygons to solve problems

LESSON 7.1

# Similar Polygons

## Vocabulary

similar

proportion






LESSON 7.1

Similar Polygons

You know that figures that have the same shape and size are congruent figures. Figures that have the same shape but not necessarily the same size are **similar** figures. To say that two figures have the same shape but not necessarily the same size is not, however, a precise definition of similarity.

Is your reflection in a fun-house mirror similar to a regular photograph of you? The images have a lot of features in common, but they are not mathematically similar. In mathematics, you can think of similar shapes as dilations (enlargements or reductions) of each other with no irregular distortions.

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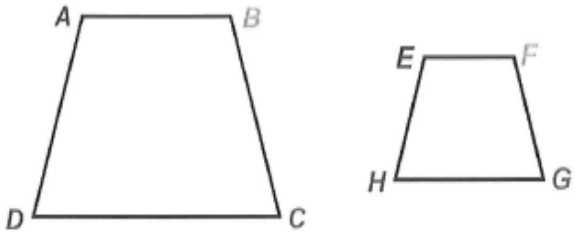
Lesson 7.1: Similar Polygons

Two figures are *SIMILAR* if they have the same shape. Two polygons are *SIMILAR POLYGONS* if corresponding angles are congruent and corresponding side lengths are proportional. – equal ratios

Similarity statement

1. *ABCD ~ EFGH.* Write the corresponding angles and the ratios of corresponding sides.




Corresponding Angles

$\angle A \cong \angle E$ $\angle C \cong \angle G$

$\angle B \cong \angle F$ $\angle D \cong \angle H$

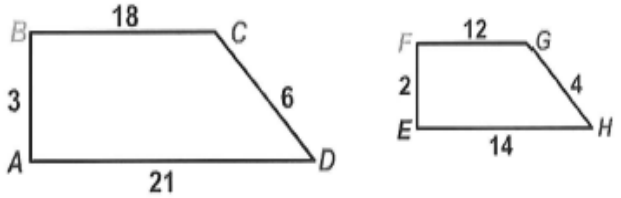
Ratios of Corresponding Sides

$$\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$$

2. *ABCD ~ EFGH.* Write the corresponding angles and the ratios of corresponding sides. Then check that the ratios of the corresponding sides are equal.

~ - similar

Big/small or small/Big




Corresponding Angles

$\angle A \cong \angle E$

$\angle B \cong \angle F$

$\angle C \cong \angle G$

$\angle D \cong \angle H$

Ratios of Corresponding Sides

$\frac{AB}{EF}$ $\frac{BC}{FG}$

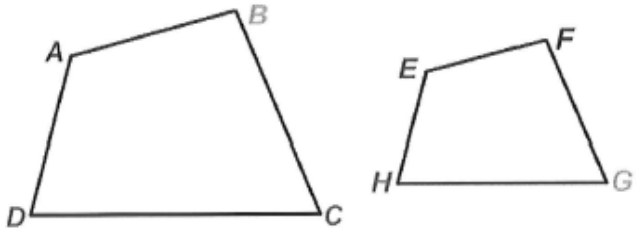
$\frac{CD}{GH}$ $\frac{DA}{HE}$

Checking Ratios of Corresponding Sides are Equal

$\frac{3}{2}$ $\frac{18}{12} = \frac{3}{2}$

$\frac{6}{4} = \frac{3}{2}$ $\frac{21}{14} = \frac{3}{2}$

**SCALE FACTOR**: the ratio of the lengths of two corresponding sides of two similar polygons.




Scale Factor of *EFGH* to *ABCD* = $\frac{EF}{AB} = \frac{FG}{BC} = \frac{GH}{CD} = \frac{HE}{DA}$

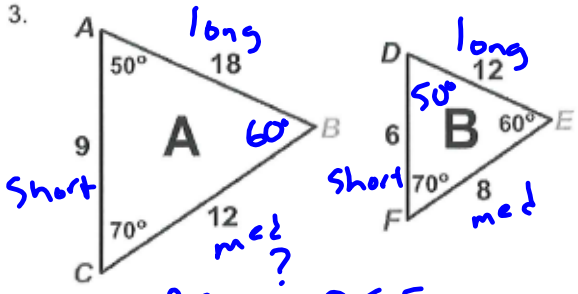
$\frac{EFGH}{ABCD}$

Determine whether the polygons are similar. If they are similar, write a similarity statement and find the scale factor of figure *A* to figure *B*.

figure A / figure B

corr. ∠s ≅ ✓

3.




$\frac{18}{12} = \frac{3}{2}$

$\frac{12}{8} = \frac{3}{2}$

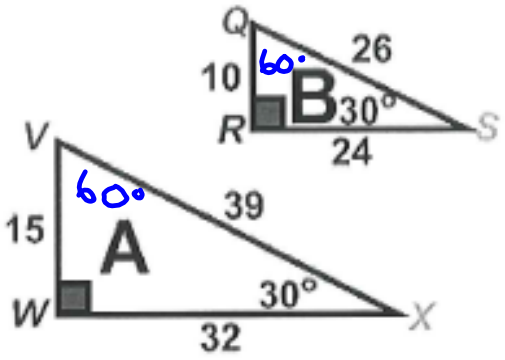
$\frac{9}{6} = \frac{3}{2}$

$\triangle ABC \sim \triangle DEF$

$\triangle ABC \sim \triangle DEF$

Scale factor: $\frac{3}{2}$

4.



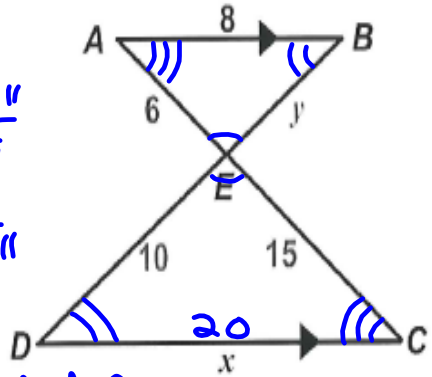

NOT similar.
Corr. sides are not proportional.

$\frac{15}{10} = \frac{3}{2}$ $\frac{39}{26} = \frac{3}{2}$

$\frac{32}{24} = \frac{4}{3}$ ≠

In the diagrams, the two polygons are similar. Write a similarity statement and find the value of $x$ and $y$.

5.




small / big

big / small

$\triangle ABE \sim \triangle CDE$

$\frac{8}{x} = \frac{6}{15}$

$6x = 120$

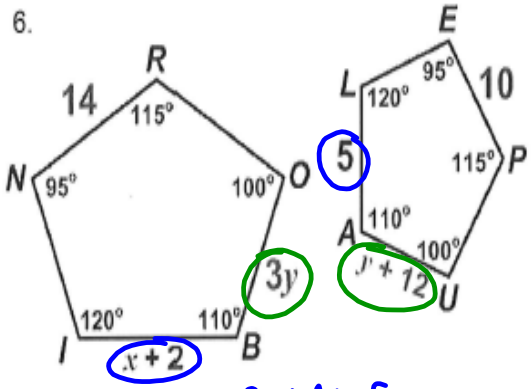
$x = 20$

$\frac{y}{10} = \frac{6}{15}$

$15y = 60$

$y = 4$

6.




ROBIN ~ PUALE

$\frac{x+2}{5} = \frac{14}{10}$

$10x + 20 = 70$

$10x = 50$

$x = 5$

$\frac{3y}{y+12} = \frac{14}{10}$

$30y = 14y + 168$

$16y = 168$

$y = 10.5$

LESSON 7.1

# Similar Polygons

## Summarize

- What does similarity have to do with dilations?
- Can two figures be similar but not be only a dilation of the other? Explain.
- If two polygons are congruent, must they be similar? Explain.





LESSON 7.1

Similar Polygons

## Summarize

- What does similarity have to do with dilations?
  Similar figures are dilations of each other or of isometric images of each other.
- Can two figures be similar but not be only a dilation of the other? Explain.
  Yes, it could be a reflection, rotation, or translation followed by a dilation of the other figure.
- If two polygons are congruent, must they be similar? Explain.
  Yes; each can be obtained from the other through dilation by a scale factor of 1 and a rigid transformation.

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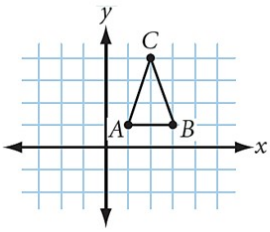
Lesson 7.1: Similar Polygons

LESSON 7.1

# Similar Polygons

## Extra Example




Copy $\Delta ABC$. Draw its dilation by a scale factor of 2.

What is the center of the dilation?

What is the ratio of the sides of the triangle and its image?

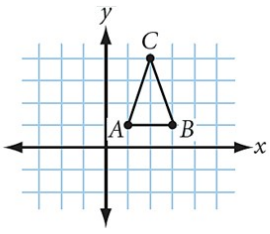


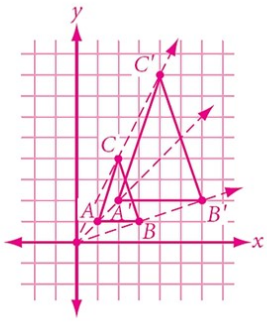
LESSON 7.1

# Similar Polygons

## Extra Example

ANSWER




Copy $\Delta ABC$. Draw its dilation by a scale factor of 2.

What is the center of the dilation? (0, 0)

What is the ratio of the sides of the triangle and its image? 1:2

LESSON 7.1

# Similar Polygons

## Closing Question

What ordered pair rule will transform circle B with center at (6, 3) and radius 3 onto circle $B'$ with center at (0,0) and radius 1. Explain how you know.





LESSON 7.1

Similar Polygons

## Closing Question

ANSWER

What ordered pair rule will transform circle B with center at (6, 3) and radius 3 onto circle $B'$ with center at (0,0) and radius 1. Explain how you know.

$(x, y) \rightarrow (\frac{1}{3}x - 6, \frac{1}{3}y - 3)$;

To move the center from (6, 3) to (0,0), translate 6 units left and 3 units down.

To change the radius from 3 to 1, use the scale factor $\frac{1}{3}$.

Homework: Workbook Pg. 52