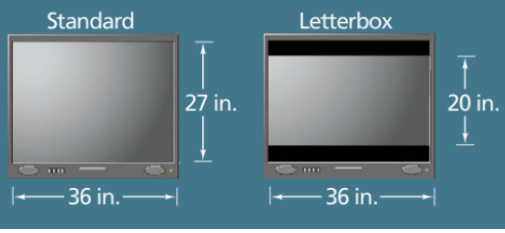
Similar Polygons

Warm-up:

A movie theater screen is in the shape of a rectangle 45 ft wide by 25 ft high. Which of the TV screen formats shown do you think would show the most complete scene from a movie shown on the theater screen? Explain.



$\frac{25}{45} = \frac{5}{9}$ $\frac{27}{36} = \frac{3}{4}$ $\frac{20}{36} = \frac{5}{9}$

Homework Check

Similar Polygons

Reteaching

Ratios and Proportions

Exercises

Use a proportion to solve each problem.

1. About 45 of every 300 apples picked at the Newbury Apple Orchard are rotten. If 3560 apples were picked one week, about how many apples were rotten? 534
2. A grocer orders 800 gal of milk each week. He throws out about 64 gal of spoiled milk each week. Of the 9600 gal of milk he ordered over three months, about how many gallons of spoiled milk were thrown out? 768
3. Seven of every 20 employees at V & B Bank Company are between the ages of 20 and 30. If there are 13,220 employees at V & B Bank Company, how many are between the ages of 20 and 30? 4627
4. About 56 of every 700 picture frames put together on an assembly line have broken pieces of glass. If 60,000 picture frames are assembled each month, about how many will have broken pieces of glass? 4800

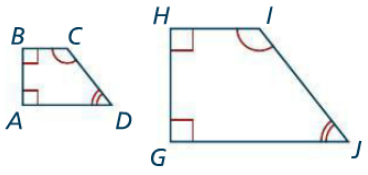
Algebra Solve each proportion.

5. $\frac{300}{1600} = \frac{x}{4800}$ 900
6. $\frac{40}{140} = \frac{700}{x}$ 2450
7. $\frac{x}{2000} = \frac{17}{400}$ 85
8. $\frac{35}{x} = \frac{150}{2400}$ 560
9. $\frac{x}{1040} = \frac{290}{5200}$ 58
10. $\frac{x}{42{,}000} = \frac{87}{500}$ 7308
11. $\frac{x}{380} = \frac{180}{5700}$ 12
12. $\frac{1200}{90{,}000} = \frac{270}{x}$ 20,250
13. $\frac{325}{x} = \frac{7306}{56{,}200}$ 2500

Similar Polygons

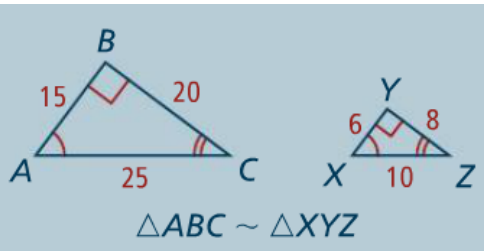
take note

Key Concept Similar Polygons

Define	Diagram	Symbols
Two polygons are **similar polygons** if corresponding angles are congruent and if the lengths of corresponding sides are proportional.	$ABCD \sim GHIJ$ 	$\angle A \cong \angle G$ $\angle B \cong \angle H$ $\angle C \cong \angle I$ $\angle D \cong \angle J$ $\frac{AB}{GH} = \frac{BC}{HI} = \frac{CD}{IJ} = \frac{AD}{GJ}$

Similar Polygons

A **scale factor** is the ratio of corresponding linear measurements of two similar figures. The ratio of the lengths of corresponding sides $\overline{BC}$ and $\overline{YZ}$, or more simply stated, the ratio of corresponding sides, is $\frac{BC}{YZ} = \frac{20}{8} = \frac{5}{2}$. So the scale factor of $\triangle ABC$ to $\triangle XYZ$ is $\frac{5}{2}$, or 5 : 2.



$\triangle ABC \sim \triangle XYZ$

Problem 1 Understanding Similarity

$DEFG \sim HJKL$

a. What are the pairs of congruent angles?

$\angle D \cong \angle H$
$\angle E \cong \angle J$
$\angle F \cong \angle K$
$\angle G \cong \angle L$

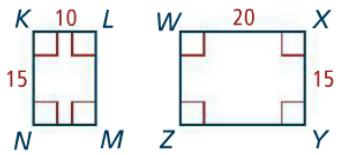
b. What is the extended proportion for the ratios of the lengths of corresponding sides?

$\frac{\overline{DE}}{\overline{HJ}} = \frac{\overline{EF}}{\overline{JK}} = \frac{\overline{FG}}{\overline{KL}} = \frac{\overline{GD}}{\overline{LH}}$

Similar Polygons

Problem 2 Determining Similarity

Are the polygons similar? If they are, write a similarity statement and give the scale factor.

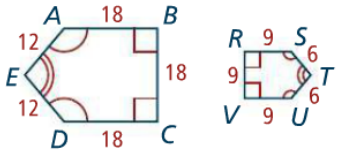
a. 

$\frac{10}{20}$ $\frac{15}{15}$

$\frac{10}{15}$ $\frac{15}{20}$

$\frac{2}{3}$ $\frac{3}{4}$

NO

b. 

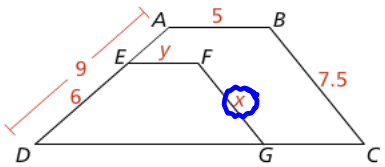
$\frac{18}{9} = \frac{12}{6} = 2$ ← scale factor

Yes. ABCDE ~ SRVUT

Problem 3 Using Similar Polygons

Algebra $ABCD \sim EFGD$. What is the value of x?

(A) 4.5 (B) 5 (C) 7.2 (D) 11.25



$\frac{6}{9} = \frac{x}{7.5}$

$9x = 45$

$x = 5$

Similar Polygons

Practice - Reteaching worksheet

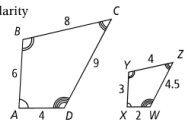
Reteaching

Similar Polygons

Similar polygons have corresponding angles that are congruent and corresponding sides that are proportional. An **extended proportion** can be written for the ratios of corresponding sides of similar polygons.

Problem

Are the quadrilaterals at the right similar? If so, write a similarity statement and an extended proportion.



Compare angles: $\angle A \cong \angle X, \angle B \cong \angle Y.$
$\angle C \cong \angle Z, \angle D \cong \angle W$

Compare ratios of sides: $\frac{AB}{XY} = \frac{6}{3} = 2$ $\frac{CD}{ZW} = \frac{9}{4.5} = 2$
$\frac{BC}{YZ} = \frac{8}{4} = 2$ $\frac{DA}{WX} = \frac{4}{2} = 2$

Because corresponding sides are proportional and corresponding angles are congruent, $ABCD \sim XYZW$.

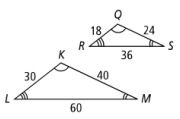
The extended proportion for the ratios of corresponding sides is:

$$\frac{AB}{XY} = \frac{BC}{YZ} = \frac{CD}{ZW} = \frac{DA}{WX}$$

Exercises

If the polygons are similar, write a similarity statement and the extended proportion for the ratios of corresponding sides. If the polygons are not similar, write *not similar.*

1.



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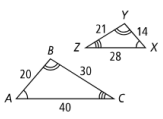

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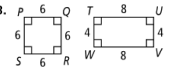

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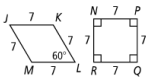


Similar Polygons

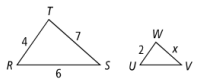
Reteaching (continued)

Similar Polygons

Problem

$\triangle RST \sim \triangle UVW$. What is the scale factor?

What is the value of x?



Identify corresponding sides: $\overline{RT}$ corresponds to $\overline{UW}$, $\overline{TS}$ corresponds to $\overline{WV}$, and $\overline{SR}$ corresponds to $\overline{VU}$.

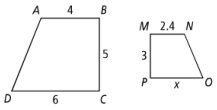
$\frac{RT}{UW} = \frac{TS}{WV}$	Compare corresponding sides.
$\frac{4}{2} = \frac{7}{x}$	Substitute.
$4x = 14$	Cross Products Property
$x = 3.5$	Divide each side by 4.

The scale factor is $\frac{4}{2} = \frac{7}{3.5} = 2$. The value of x is 3.5.

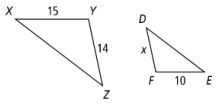
Exercises

Give the scale factor of the polygons. Find the value of x. Round answers to the nearest tenth when necessary.

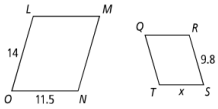
5. $ABCD \sim NMPO$



6. $\triangle XYZ \sim \triangle EFD$



7. $LMNO \sim RQTS$



8. $OPQRST \sim GHIJKL$