4-5 Similar Figures

You will need your notebooks and a clicker.

CONTENT STANDARDS
7.RP.1, 7.RP.2, 7.G.1

What You'll Learn

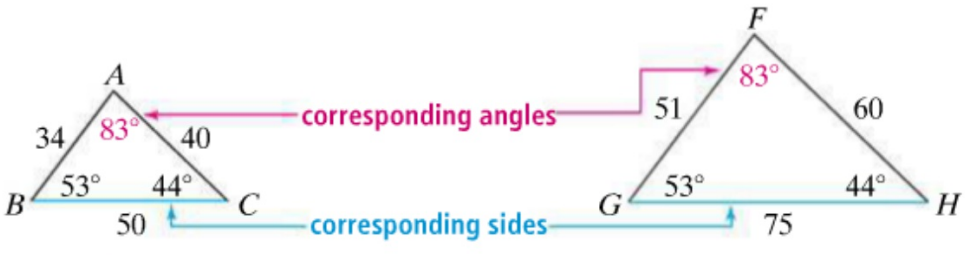
To use proportions to find missing lengths in similar figures

New Vocabulary polygon, similar polygons, indirect measurement

Why Learn This?

The heights of objects such as totem poles may be difficult to measure directly. You can measure indirectly by using figures that have the same shape. When two figures have the same shape, but not necessarily the same size, they are similar.

In the similar triangles below, corresponding angles have the same measure. Since $\frac{40}{60} = \frac{50}{75} = \frac{34}{51}$, the corresponding sides are proportional. You write $\triangle ABC \sim \triangle FGH$. The symbol $\sim$ means "is similar to."



A **polygon** is a closed plane figure formed by three or more line segments that do not cross.

KEY CONCEPTS Similar Polygons

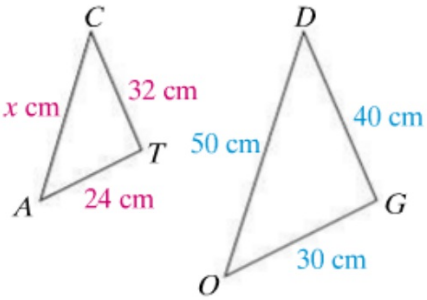
Two polygons are **similar polygons** if

- corresponding angles have the same measure, and
- the lengths of the corresponding sides form equivalent ratios.

You can use proportions to find missing side lengths in similar polygons.

EXAMPLE Finding a Missing Measure

1 **Algebra** $\triangle ACT$ and $\triangle ODG$ are similar. Find the value of x.



$$\frac{AC}{OD} = \frac{AT}{OG}$$ ← Write a proportion.

$$\frac{x}{50} = \frac{24}{30}$$ ← Substitute.

$$\frac{x}{50} = \frac{4}{5}$$ ← Write $\frac{24}{30}$ in simplest form.

$\frac{x}{50} = \frac{4}{5}$ (×10 on both sides) ← Find the common multiplier.

$$x = 40$$ ← Use mental math.

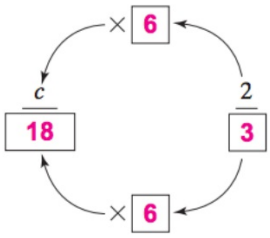
Example

1 Finding a Missing Measure $\triangle ABC$ and $\triangle DEF$ are similar. Find the value of c.

$\frac{AB}{DE} = \frac{AC}{DF}$ ← Write a proportion.

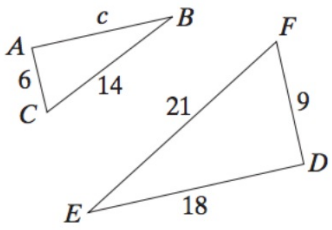
$\frac{c}{18} = \frac{6}{9}$ ← Substitute.

$\frac{c}{18} = \frac{2}{3}$ ← Write $\frac{6}{9}$ in simplest form.



← Find the common multiplier.

$c = 12$ ← Use mental math.



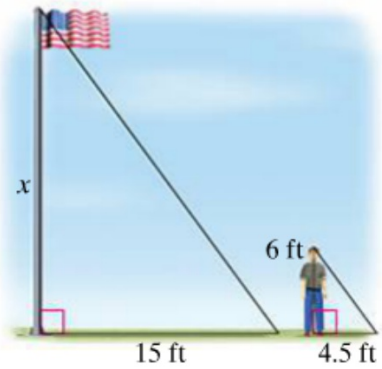
You can use **indirect measurement** to measure distances that are difficult to measure directly. You do this by using proportions and similar figures.

EXAMPLE Application: Indirect Measurement

2 Multiple Choice A 6-ft-tall person standing near a flagpole casts a shadow 4.5 ft long. The flagpole casts a shadow 15 ft long. What is the height of the flagpole?

(A) 11.25 ft (B) 18 ft (C) 20 ft (D) 360 ft

Draw a picture and let x represent the height of the flagpole.



$\frac{x}{6} = \frac{15}{4.5}$ ← Write a proportion.

$4.5x = 6 \cdot 15$ ← Write the cross products.

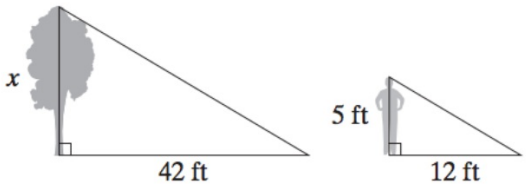
$\frac{4.5x}{4.5} = \frac{6 \cdot 15}{4.5}$ ← Divide each side by 4.5.

$x = 20$ ← Simplify.

The height of the flagpole is 20 ft. The answer is C.

2 Multiple Choice A 5-ft person standing near a tree has a shadow 12 ft long. At the same time, the tree has a shadow 42 ft long. What is the height of the tree?

A. 17.5 ft **B.** 35 ft **C.** 49 ft **D.** 100.8 ft



Draw a picture and let x represent the height of the tree.

$\frac{x}{\boxed{5}} = \frac{42}{\boxed{12}}$ ← Write a proportion.

$\boxed{12}x = \boxed{5} \cdot 42$ ← Write the cross products.

$\frac{12x}{12} = \frac{5 \cdot 42}{12}$ ← Divide each side by 12.

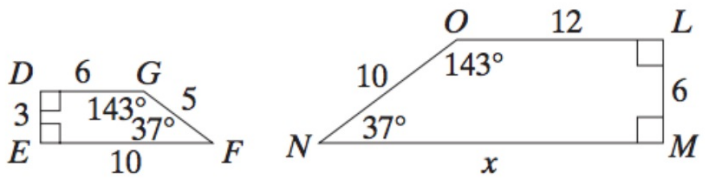
$x = \boxed{17.5}$ ← Simplify.

The height of the tree is $\boxed{17.5}$ ft. The correct answer is choice $\boxed{A}$.

Quick Check

Table talk about these two problems.

1. The trapezoids below are similar. Find x.



2. A 6-ft person has a shadow 5 ft long. A nearby tree has a shadow 30 ft long. What is the height of the tree?

Look at the picture below. Which angle besides angle K has a measure of 29 degrees?

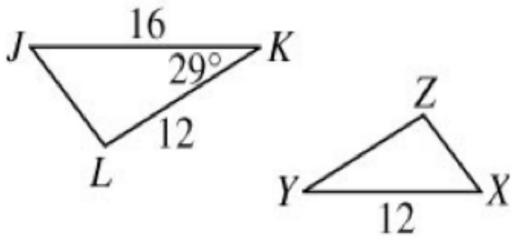
(A) Angle X

(B) Angle Y

(C) Angle Z

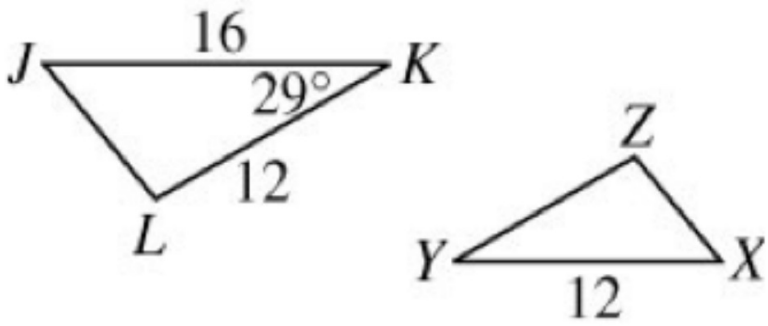
(D) Not enough information

In the figure below, $\triangle JKL \sim \triangle XYZ$.



Look at the picture. Find YZ.
Text in your answer.

In the figure below, $\triangle JKL \sim \triangle XYZ$.



A 4-ft-tall person standing near a telephone pole has a shadow 3 ft long. At the same time, the telephone pole has a shadow 18 ft long.

What is the height of the telephone pole? _____ feet

Text in your number answer only.

Today's big ideas summarized:

Similar Polygons

Two polygons are similar if

- corresponding angles **have the same measure.**
- the lengths of corresponding sides **form equivalent ratios.**

A polygon is **a closed plane figure formed by three or more line segments that do not cross.**

Indirect measurement is **measuring distances by using proportions and similar figures.**

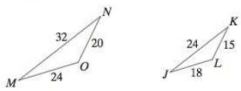
You can put your clickers away. There is a practice worksheet for your assignment.

Name _____ Class _____ Date _____

Practice 4-5

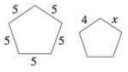
Similar Figures

$\triangle MNO \sim \triangle JKL$. Complete each statement.



1. $\angle M$ corresponds to _____.
2. $\angle L$ corresponds to _____.
3. $\overline{JL}$ corresponds to _____.
4. $\overline{MN}$ corresponds to _____.
5. What is the ratio of the lengths of the corresponding sides? _____

The pairs of figures below are similar. Find the value of each variable.

6. 

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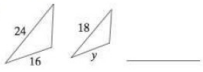
7. 

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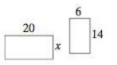
8. 

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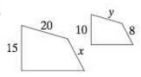
9. 

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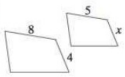
10. 

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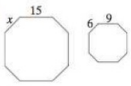
11. 

_____

12. On a sunny day, if a 36-inch yardstick casts a 21-inch shadow, how tall is a building whose shadow is 168 ft?

_____

13. Oregon is about 400 miles from west to east, and 300 miles from north to south. If a map of Oregon is 15 inches tall (from north to south), about how wide is the map?

_____