

LESSON

5-5

Problem Solving**Similar Figures**

Write the correct answer.

1. Until 1929, United States currency measured 3.13 in. by 7.42 in. The current size is 2.61 in. by 6.14 in. Are the bills similar?

2. Owen has a 3 in. by 5 in. photograph. He wants to make it as large as he can to fit in a 10 in. by 12.5 in. ad. What scale factor will he use? What will be the new size?

3. A painting is 15 cm long and 8 cm wide. In a reproduction that is similar to the original painting, the length is 36 cm. How wide is the reproduction?

4. The two shortest sides of a right triangle are 10 in. and 24 in. long. What is the length of the shortest side of a similar right triangle whose two longest sides are 36 in. and 39 in.?

The scale on a map is 1 inch = 40 miles. Round to the nearest mile.

5. On the map, it is 5.75 inches from Orlando to Miami. How many miles is it from Orlando to Miami?
A 46 miles **C** 230 miles
B 175 miles **D** 340 miles
6. On the map it is $18\frac{1}{8}$ inches from Norfolk, VA, to Indianapolis, IN. How many miles is it from Norfolk to Indianapolis?
F 58 miles **H** 800 miles
G 725 miles **J** 1025 miles
7. It is 185 miles from Chicago to Indianapolis. On the map it is 2.5 inches from Indianapolis to Terra Haute, IN. How far is it from Chicago to Terra Haute going through Indianapolis?
A 100 miles **C** 430 miles
B 285 miles **D** 7500 miles
8. On the map, it is 7.5 inches from Chicago to Cincinnati. Traveling at 65 mi/h, how long will it take to drive from Chicago to Cincinnati? Round to the nearest tenth of an hour.
F 4.6 hours **H** 8.7 hours
G 5.2 hours **J** 12.0 hours

LESSON 5-5 Reteach

Similar Figures

Similar Polygons

same shape
corresponding angles are congruent
 $\angle A \cong \angle A'$, $\angle B \cong \angle B'$, $\angle C \cong \angle C'$

usually different size
corresponding sides are in proportion
 $\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{AC}{A'C'}$

Congruent Polygons

same shape
corresponding angles are congruent
 $\angle A \cong \angle A'$, $\angle B \cong \angle B'$, $\angle C \cong \angle C'$

same size
corresponding sides are congruent
 $AB \cong A'B'$, $BC \cong B'C'$, $AC \cong A'C'$

Complete to tell if the polygons are similar.

1. a. corresponding angles: $\angle A$ and $\angle E$, $\angle B$ and $\angle F$, $\angle C$ and $\angle G$, $\angle D$ and $\angle H$

b. all corresponding angles congruent? **yes**

c. corresponding sides: \overline{AB} and \overline{EF} , \overline{BC} and \overline{FG} , \overline{CD} and \overline{GH} , \overline{AD} and \overline{EH}

d. The ratio of each pair of corresponding sides is:
 $\frac{AB}{EF} = \frac{6}{7.5} = \frac{8}{10}$, $\frac{BC}{FG} = \frac{6}{8} = \frac{7.5}{10}$, $\frac{CD}{GH} = \frac{6}{7.5} = \frac{8}{10}$, $\frac{AD}{EH} = \frac{8}{10}$

e. Are the corresponding sides proportional? Explain.
yes; equal cross products $\frac{6}{7.5} \cdot \frac{8}{10} \rightarrow 60 = 60$

f. The **scale factor** is the simplest form of the ratio of the corresponding sides. What is the scale factor for these parallelograms? $\frac{4}{5}$

g. Are the parallelograms similar? Explain.
yes; corresponding \angle s congruent, corresponding sides proportional

LESSON 5-5 Reteach

Similar Figures (continued)

Use the scale factor to find a missing dimension.

scale factor = $\frac{6}{9}$ or $\frac{2}{3}$

Since EF corresponds to BC , multiply EF by the scale factor to find BC .
 $BC = \frac{2}{3}(15) = 10$ m

Complete to find each missing dimension.

2. scale factor $\frac{PQ}{JK} = \frac{4}{10}$ or $\frac{2}{5}$
 $RQ = \text{scale factor} \cdot (KL)$
 $RQ = \frac{2}{5} \times 12$ or **4.8** cm

3. scale factor = $\frac{MA}{RO} = \frac{14}{8}$ or $\frac{7}{4}$
 $MH = \text{scale factor} \cdot (RE)$
 $MH = \frac{7}{4} \times 6$ or **10.5** in.

Use a proportion to find a missing dimension.
Corresponding sides are in proportion.

$\frac{AB}{DE} = \frac{BC}{EF}$
 $\frac{6}{9} = \frac{BC}{15}$
 $9(BC) = 90$
 $BC = 10$ m

Complete to find the missing dimension.

4. $\frac{MH}{RE} = \frac{MA}{RO}$
 $\frac{MH}{6} = \frac{14}{8}$
 $8 \cdot (MH) = 84$
 $MH = \frac{84}{8}$ or **10.5** in.

LESSON 5-5 Challenge

In Like Manner

The ratio of a pair of corresponding sides of similar polygons is known as the **scale factor** and is also called the **ratio of similitude**.
The symbol \sim means *is similar to*.
In the diagram, $\triangle ABC \sim \triangle DEF$.

1. Find the ratio of similitude of $\triangle ABC$ to $\triangle DEF$. $\frac{AB}{DE} = \frac{4}{6}$ or $\frac{2}{3}$

2. a. Find the perimeter of $\triangle ABC$. **12** cm

b. Find the perimeter of $\triangle DEF$. **18** cm

c. Find the ratio $\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF}$ in simplest form. $\frac{2}{3}$

3. Make an observation from the result of Exercises 1 and 2.
The ratio of the perimeters of two similar triangles is the same as the ratio of similitude.

The sides of $\triangle JKL$ measure 5 in., 7 in., and 9 in.
The shortest side of a similar triangle, $\triangle J'K'L'$, measures 10 in.

4. Find the ratio of similitude of $\triangle JKL$ to $\triangle J'K'L'$. $\frac{5}{10}$ or $\frac{1}{2}$

5. Find the ratio $\frac{\text{perimeter of } \triangle JKL}{\text{perimeter of } \triangle J'K'L'}$. $\frac{1}{2}$

6. Find the perimeter of $\triangle J'K'L'$.
 $\frac{\text{perimeter } \triangle JKL}{\text{perimeter } \triangle J'K'L'} = \frac{1}{2} \rightarrow \frac{21}{\text{perimeter } \triangle J'K'L'} = \frac{1}{2}$
 $\frac{1}{2} \rightarrow \text{perimeter } \triangle J'K'L' = 42$ in.

LESSON 5-5 Problem Solving

Similar Figures

Write the correct answer.

1. Until 1929, United States currency measured 3.13 in. by 7.42 in. The current size is 2.61 in. by 6.14 in. Are the bills similar?
no

2. Owen has a 3 in. by 5 in. photograph. He wants to make it as large as he can to fit in a 10 in. by 12.5 in. ad. What scale factor will he use? What will be the new size?
 $\frac{1}{2.5}$; **7.5 in. by 12.5 in.**

3. A painting is 15 cm long and 8 cm wide. In a reproduction that is similar to the original painting, the length is 36 cm. How wide is the reproduction?
19.2 cm

4. The two shortest sides of a right triangle are 10 in. and 24 in. long. What is the length of the shortest side of a similar right triangle whose two longest sides are 36 in. and 39 in.?
15 in.

The scale on a map is 1 inch = 40 miles. Round to the nearest mile.

5. On the map, it is 5.75 inches from Orlando to Miami. How many miles is it from Orlando to Miami?
A 46 miles C 230 miles B 175 miles D 340 miles

6. On the map it is $18\frac{1}{8}$ inches from Norfolk, VA, to Indianapolis, IN. How many miles is it from Norfolk to Indianapolis?
F 58 miles H 800 miles G 725 miles J 1025 miles

7. It is 185 miles from Chicago to Indianapolis. On the map it is 2.5 inches from Indianapolis to Terra Haute, IN. How far is it from Chicago to Terra Haute going through Indianapolis?
A 100 miles C 430 miles B 285 miles D 7500 miles

8. On the map, it is 7.5 inches from Chicago to Cincinnati. Traveling at 65 mi/h, how long will it take to drive from Chicago to Cincinnati? Round to the nearest tenth of an hour.
F 4.6 hours H 8.7 hours G 5.2 hours J 12.0 hours