MEA 2013-2014
Teacher: Claudia Valle
Start Date:

Course: Geometry B
Student: ________________
Completed Date:

Unit 1: Similarity

Objectives: Students will understand how to recognize similar polygons. Students will understand how to solve real-life problems using similar polygons and proportions.

Essential Questions: What is the relationship between the perimeters and areas of similar polygons? How can you decide if two triangles are similar?

TEKS Standards: GG.1.B, G.2.A, G.3.B, G.5.B, G.9.B, G.11.A, G.11.B, G.11.D

Geometry

(1) Geometric structure. The student understands the structure of, and relationships within, an axiomatic system. The student is expected to:

(B) recognize the historical development of geometric systems and know mathematics is developed for a variety of purposes; and

(2) Geometric structure. The student analyzes geometric relationships in order to make and verify conjectures. The student is expected to:

(A) use constructions to explore attributes of geometric figures and to make conjectures about geometric relationships; and

(3) Geometric structure. The student applies logical reasoning to justify and prove mathematical statements. The student is expected to:

(B) construct and justify statements about geometric figures and their properties;

(5) Geometric patterns. The student uses a variety of representations to describe geometric relationships and solve problems. The student is expected to:

(B) use numeric and geometric patterns to make generalizations about geometric properties, including properties of polygons, ratios in similar figures and solids, and angle relationships in polygons and circles;

(9) Congruence and the geometry of size. The student analyzes properties and describes relationships in geometric figures. The student is expected to:

(B) formulate and test conjectures about the properties and attributes of polygons and their component parts based on explorations and concrete models;

(11) Similarity and the geometry of shape. The student applies the concepts of similarity to justify properties of figures and solve problems. The student is expected to:

(A) use and extend similarity properties and transformations to explore and justify conjectures about geometric figures;

(B) use ratios to solve problems involving similar figures;

(D) describe the effect on perimeter, area, and volume when one or more dimensions of a figure are changed and apply this idea in solving problems.

Turn In:

Assignment #	Activity	TEKS
1	Ratio and Proportions	G.5.B, G.11.D
2	Ratios in Similar Polygons	G.5.B, G.11.A, G.11.B
3	Triangle Similarity: AA, SSS, and SAS	G.5.B, G.9.B, G.11.A, G.11.B, G.11.D
4	Applying Properties of Similar Triangles	G.2.A
5	Using Proportional Relationships	G.1.B, G.11.A, G.11.B, G.11.D
6	Dilations and Similarity in the Coordinate Plane	G.9.B, G.11.A
7	Unit 1 Test	G.1.B, G.2.A, G.3.B, G.5.B, G.9.B, G.11.A, G.11.B, G.11.D

Name ______________________ Date ______________ Class ______________

LESSON 7-1

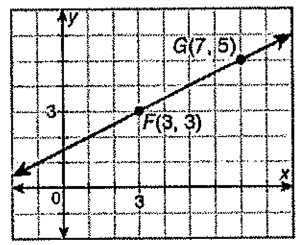
Reteach

Ratio and Proportion

A **ratio** is a comparison of two numbers by division. Ratios can be written in various forms.

Ratios comparing x and y	Ratios comparing 3 and 2
x to y $x : y$ $\frac{x}{y}$, where $y \neq 0$	3 to 2 3 : 2 $\frac{3}{2}$

Slope is a ratio that compares the rise, or change in y, to the run, or change in x.



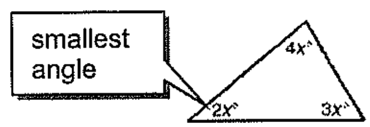
$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} \qquad \text{Definition of slope}$$

$$= \frac{5-3}{7-3} \qquad \text{Substitution}$$

$$= \frac{2}{4} \text{ or } \frac{1}{2} \qquad \text{Simplify.}$$

A ratio can involve more than two numbers.

The ratio of the angle measures in a triangle is 2 : 3 : 4. What is the measure of the smallest angle?



Let the angle measures be $2x°$, $3x°$, and $4x°$.

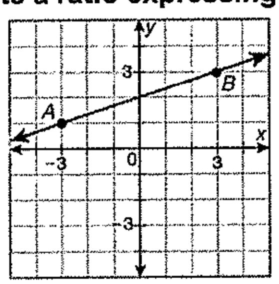
$2x + 3x + 4x = 180$ Triangle Sum Theorem

$9x = 180$ Simplify.

$x = 20$ Divide both sides by 9.

The smallest angle measures $2x°$. So $2x = 2(20) = 40°$.

Write a ratio expressing the slope of each line.

1. 

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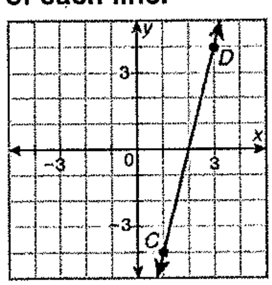
2. 

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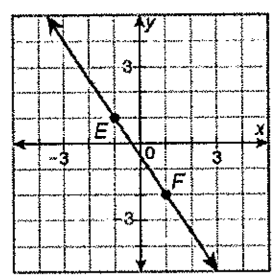
3. 

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4. The ratio of the side lengths of a triangle is 2 : 4 : 5, and the perimeter is 55 cm. What is the length of the shortest side?

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5. The ratio of the angle measures in a triangle is 7 : 13 : 16. What is the measure of the largest angle?

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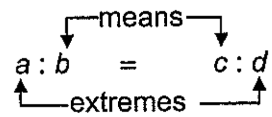
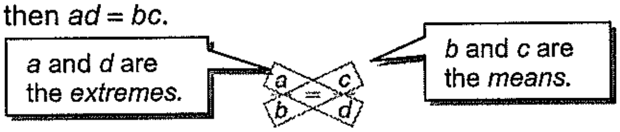
LESSON 7-1

Reteach

Ratio and Proportion continued

A proportion is an equation stating that two ratios are equal. In every proportion, the product of the extremes equals the product of the means.



Cross Products Property	In a proportion, if $\frac{a}{b}=\frac{c}{d}$ and b and $d \neq 0$, then $ad = bc$. 

You can solve a proportion like $\frac{x}{8}=\frac{35}{56}$ by finding the cross products.

$\frac{x}{8}=\frac{35}{56}$	
$x(56)=8(35)$	Cross Products Property
$56x=280$	Simplify.
$x=5$	Divide both sides by 56.

You can use properties of proportions to find ratios.

Given that $8a = 6b$, find the ratio of a to b in simplest form.

$8a=6b$	
$\frac{a}{b}=\frac{6}{8}$	Divide both sides by b.
$\frac{a}{b}=\frac{3}{4}$	Simplify $\frac{6}{8}$.

The ratio of a to b in simplest form is 3 to 4.

Solve each proportion.

6. $\frac{9}{t}=\frac{36}{28}$ ______________________

7. $\frac{x}{32}=\frac{15}{16}$ ______________________

8. $\frac{24}{42}=\frac{y}{7}$ ______________________

9. $\frac{2a}{3}=\frac{8}{3a}$ ______________________

10. Given that $5b = 20c$, find the ratio $\frac{b}{c}$ in simplest form. ______________________

11. Given that $24x = 9y$, find the ratio $x : y$ in simplest form. ______________________

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LESSON 7-1

Practice A

Ratio and Proportion

Fill in the blanks to complete each definition.

1. A ____________________ is an equation stating that two ratios are equal.

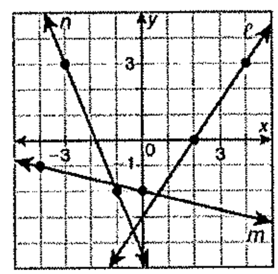
2. In a proportion, if $\frac{a}{b} = \frac{c}{d}$ and b and $d \neq 0$, then $ad = bc$. The products ad and bc are called the ____________________.

3. A ____________________ compares two numbers by division.

In Exercises 4–6, write two additional forms of each ratio.

4. $\frac{3}{5}$ ______________ 5. 4 to 3 ______________ 6. 2 : 7 ______________

The slope of a line is the ratio $\frac{\text{rise}}{\text{run}}$. Use the graph for Exercises 7–9. Write a ratio expressing the slope of each line.

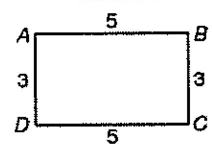


7. ℓ ______________

8. m ______________

9. n ______________

10. $ABCD$ is a rectangle with side lengths as shown in the figure. Write the ratio of the side lengths in the form $a : b : a : b$.



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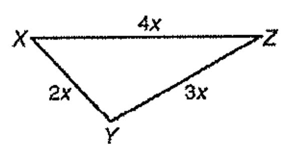
11. XYZ is a triangle with side lengths in the ratio 2 : 3 : 4. The perimeter of XYZ is 27 yards. Find the length of the shortest side.



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Use cross products to solve each proportion.

12. $\frac{a}{8} = \frac{10}{16}$ $a =$ ______________ 13. $\frac{9}{b} = \frac{3}{2}$ $b =$ ______________ 14. $\frac{1}{10} = \frac{c}{100}$ $c =$ ______________

Given that $\frac{a}{b} = \frac{c}{d}$ and none of the variables equals 0, fill in the blanks in Exercises 15–17 to make equivalent statements.

15. $ad =$ ______________ 16. $\frac{a}{c} =$ ______________ 17. $\frac{b}{a} =$ ______________

18. Given that $7x = 4y$, find the ratio $\frac{x}{y} : \frac{x}{y} =$ ______________

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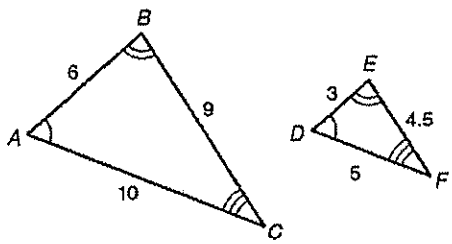
LESSON 7-2

Reteach

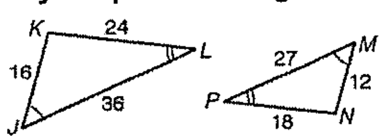
Ratios in Similar Polygons

Similar polygons are polygons that have the same shape but not necessarily the same size.

Similar Polygons	
 $\triangle ABC \sim \triangle DEF$	Corresponding angles are congruent. $\angle A \cong \angle D$ $\angle B \cong \angle E$ $\angle C \cong \angle F$ Corresponding sides are proportional. $\frac{AB}{DE} = \frac{6}{3} = 2$ $\frac{BC}{EF} = \frac{9}{4.5} = 2$ $\frac{CA}{FD} = \frac{10}{5} = 2$

A similarity ratio is the ratio of the lengths of the corresponding sides. So, for the similarity statement $\triangle ABC \sim \triangle DEF$, the similarity ratio is 2. For $\triangle DEF \sim \triangle ABC$, the similarity ratio is $\frac{1}{2}$.

Identify the pairs of congruent angles and corresponding sides.

1. 

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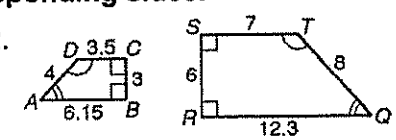
2. 

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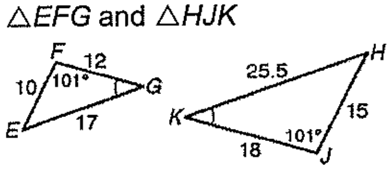
Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement.

3. $\triangle EFG$ and $\triangle HJK$



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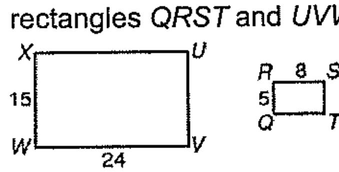
4. rectangles *QRST* and *UVWX*



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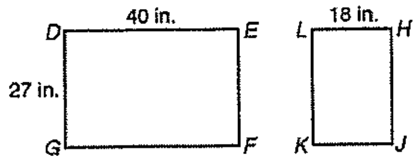
LESSON 7-2

Reteach

Ratios in Similar Polygons continued

You can use properties of similar polygons to solve problems.

Rectangle *DEFG* ~ rectangle *HJKL*. What is the length of *HJKL*?



$$\frac{\text{length of } DEFG}{\text{length of } HJKL} = \frac{\text{width of } DEFG}{\text{width of } HJKL}$$ Write a proportion.

$$\frac{40}{x} = \frac{27}{18}$$ Substitute the known values.

$40(18) = 27(x)$ Cross Products Property

$720 = 27x$ Simplify.

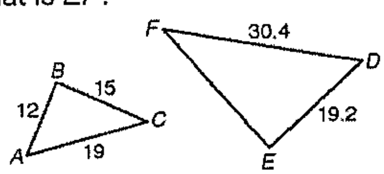
$26\frac{2}{3} = x$ Divide both sides by 27.

The length of *HJKL* is $26\frac{2}{3}$ in.

5. A rectangle is 3.2 centimeters wide and 8 centimeters long. A similar rectangle is 5 centimeters long. What is the width of the second rectangle?

6. Rectangle *CDEF* ~ rectangle *GHJK*, and the similarity ratio of *CDEF* to *GHJK* is $\frac{1}{16}$. If $DE = 20$, what is *HK*?

7. $\triangle ABC$ is similar to $\triangle DEF$. What is *EF*?



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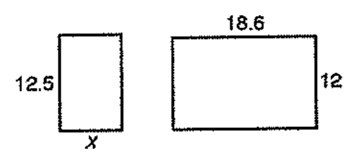
8. The two rectangles are similar. What is the value of *x* to the nearest tenth?



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9. $\triangle MNP \sim \triangle QRS$, and the ratio of $\triangle MNP$ to $\triangle QRS$ is 5 : 2. If $MN = 42$ meters, what is *QR*?

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10. Triangle *HJK* has side lengths 21, 17, and 25. The two shortest sides of triangle *WXY* have lengths 48.3 and 39.1. If $\triangle HJK \sim \triangle WXY$, what is the length of the third side of $\triangle WXY$?

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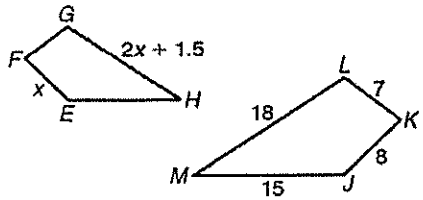
LESSON 7-2

Problem Solving

Ratios in Similar Polygons

1. *EFGH* ~ *JKLM*. What is the value of *x*?



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2. The ratio of a model scale die cast motorcycle is 1 : 18. The model is $5\frac{1}{4}$ inches long. What is the length of the actual motorcycle in feet and inches?

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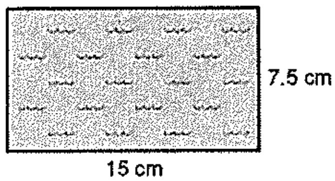
3. A diagram of a new competition swimming pool is shown. If the width of the pool is 25 meters, find the length of the actual pool.



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4. Rectangle A has side lengths 16.4 centimeters and 10.8 centimeters. Rectangle B has side lengths 10.25 centimeters and 6.75 centimeters. Determine whether the rectangles are similar. If so, write the similarity ratio.

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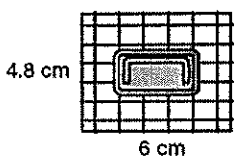
Choose the best answer.

5. A pet store has various sizes of guinea pig cages. A diagram of the top view of one of the cages is shown. What are possible dimensions of this cage?



A 28 in. by 24 in. C 30 in. by 24 in.

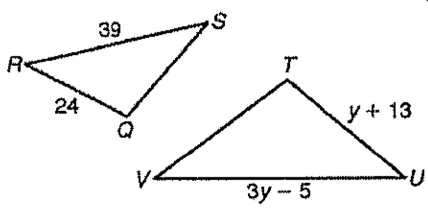
B 28 in. by 18 in. D 30 in. by 18 in.

6. A gymnasium is 96 feet long and 75 feet wide. On a blueprint, the gymnasium is 5.5 inches long. To the nearest tenth of an inch, what is the width of the gymnasium on the blueprint?

F 3.7 in. H 7.0 in.

G 4.3 in. J 13.6 in.

7. $\triangle QRS \sim \triangle TUV$. Find the value of *y*.



A 3.6 C 19

B 5.5 D 33

8. $\triangle ABC$ has side lengths 14, 8, and 10.4. What are possible side lengths of $\triangle DEF$ if $\triangle ABC \sim \triangle DEF$?

F 28, 20, 20.8

G 35, 16, 20.8

H 28, 20, 26

J 35, 20, 26

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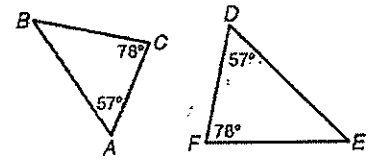
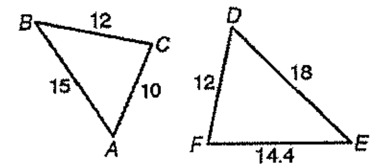
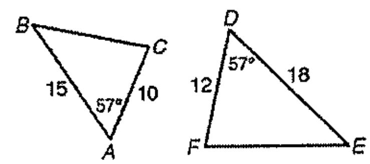
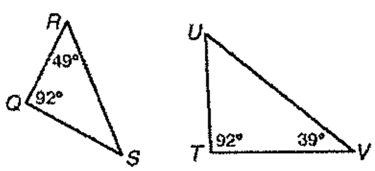
LESSON 7-3

Reteach

Triangle Similarity: AA, SSS, and SAS

Angle-Angle (AA) Similarity	If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Side-Side (SSS) Similarity	If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Angle-Side (SAS) Similarity	If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$

Explain how you know the triangles are similar, and write a similarity statement.

1. 

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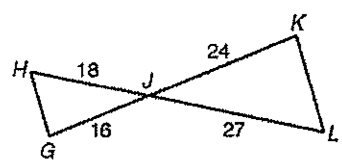
2. 

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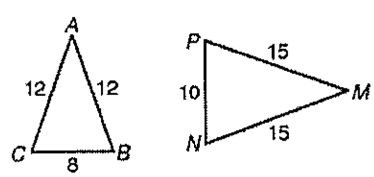
3. Verify that $\triangle ABC \sim \triangle MNP$.



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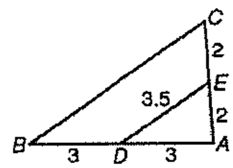
LESSON 7-3

Reteach

Triangle Similarity: AA, SSS, and SAS continued

You can use AA Similarity, SSS Similarity, and SAS Similarity to solve problems. First, prove that the triangles are similar. Then use the properties of similarity to find missing measures.

Explain why $\triangle ADE \sim \triangle ABC$ and then find BC.



Step 1 Prove that the triangles are similar.

$\angle A \cong \angle A$ by the Reflexive Property of $\cong$.

$$\frac{AD}{AB} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{AE}{AC} = \frac{2}{4} = \frac{1}{2}$$

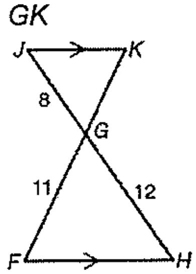
Therefore, $\triangle ADE \sim \triangle ABC$ by SAS ~.

Step 2 Find BC.

$\frac{AD}{AB} = \frac{DE}{BC}$	Corresponding sides are proportional.
$\frac{3}{6} = \frac{3.5}{BC}$	Substitute 3 for *AD*, 6 for *AB*, and 3.5 for *DE*.
$3(BC) = 6(3.5)$	Cross Products Property
$3(BC) = 21$	Simplify.
$BC = 7$	Divide both sides by 3.

Explain why the triangles are similar and then find each length.

4. *GK*



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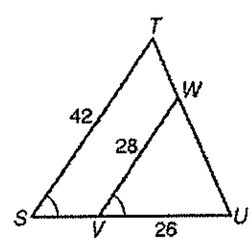
5. *US*



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LESSON 7-3

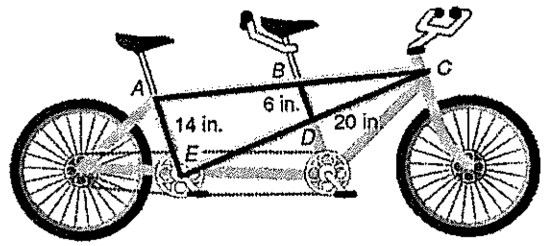
Problem Solving

Triangle Similarity: AA, SSS, and SAS

Use the diagram for Exercises 1 and 2.

In the diagram of the tandem bike, $\overline{AE} \parallel \overline{BD}$.

1. Explain why $\triangle CBD \sim \triangle CAE$.



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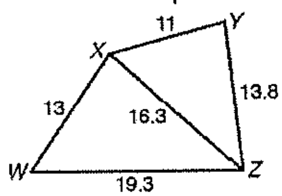
2. Find *CE* to the nearest tenth. ______________________

3. Is $\triangle WXZ \sim \triangle XYZ$? Explain.



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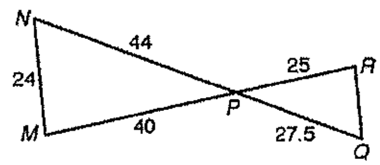
4. Find *RQ*. Explain how you found it.



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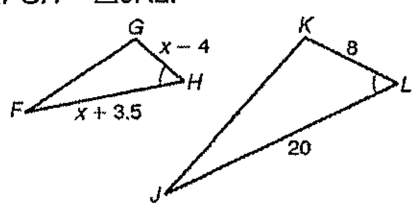
Choose the best answer.

5. Find the value of *x* that makes $\triangle FGH \sim \triangle JKL$.



A 8 C 12

B 9 D 16

6. Triangle *STU* has vertices at *S*(0, 0), *T*(2, 6), and *U*(8, 2). If $\triangle STU \sim \triangle WXY$ and the coordinates of *W* are (0, 0), what are possible coordinates of *X* and *Y*?

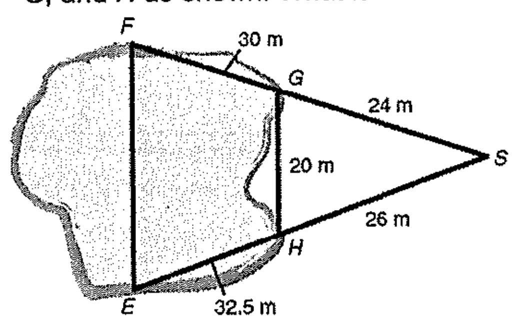
F *X*(1, 3) and *Y*(4, 1)

G *X*(1, 3) and *Y*(2, 0)

H *X*(3, 1) and *Y*(2, 4)

J *X*(0, 3) and *Y*(4, 0)

7. To measure the distance *EF* across the lake, a surveyor at *S* locates points *E*, *F*, *G*, and *H* as shown. What is *EF*?



A 25 m C 45 m

B 36 m D 90 m

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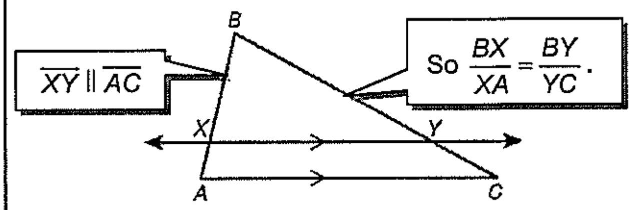
LESSON 7-4

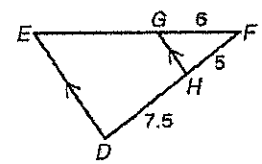
Reteach

Applying Properties of Similar Triangles

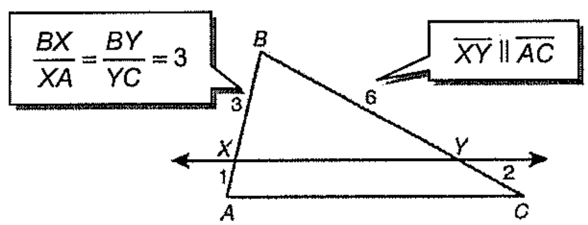
Triangle Proportionality Theorem	Example
If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	

You can use the Triangle Proportionality Theorem to find lengths of segments in triangles.

Find *EG*.

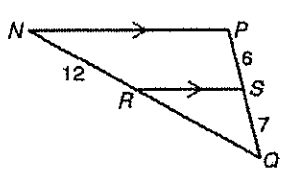


$\frac{EG}{GF} = \frac{DH}{HF}$	Triangle Proportionality Theorem
$\frac{EG}{6} = \frac{7.5}{5}$	Substitute the known values.
$EG(5) = 6(7.5)$	Cross Products Property
$5(EG) = 45$	Simplify.
$EG = 9$	Divide both sides by 5.

Converse of the Triangle Proportionality Theorem	Example
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	

Find the length of each segment in Exercises 1 and 2.

1. $\overline{RQ}$



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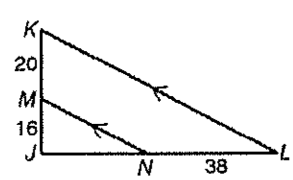
2. $\overline{JN}$



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3. Show that $\overline{TU}$ and $\overline{WX}$ are parallel.

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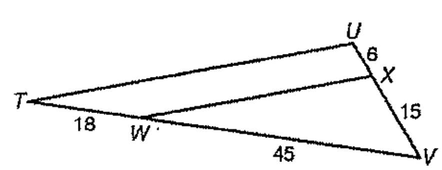

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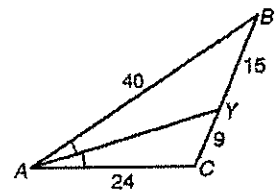
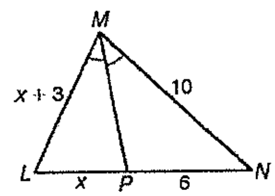
LESSON 7-4

Reteach

Applying Properties of Similar Triangles *continued*

Triangle Angle Bisector Theorem	Example
An angle bisector of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides. ($\triangle \angle$ Bisector Thm.)	 $\frac{BY}{YC}=\frac{15}{9}=\frac{5}{3}$ $\frac{AB}{AC}=\frac{40}{24}=\frac{5}{3}$

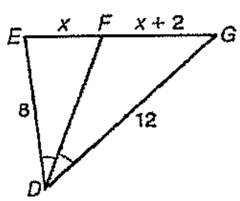
Find *LP* and *LM*.



$\frac{LP}{PN}=\frac{ML}{NM}$	$\triangle \angle$ Bisector Thm.
$\frac{x}{6}=\frac{x+3}{10}$	Substitute the given values.
$x(10)=6(x+3)$	Cross Products Property
$10x=6x+18$	Distributive Property
$4x=18$	Simplify.
$x=4.5$	Divide both sides by 4.
$LP=x=4.5$	
$LM=x+3=4.5+3=7.5$	

Find the length of each segment.

4. $\overline{EF}$ and $\overline{FG}$



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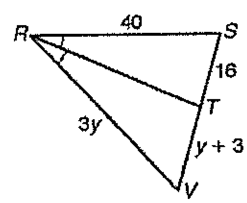
5. $\overline{RV}$ and $\overline{TV}$



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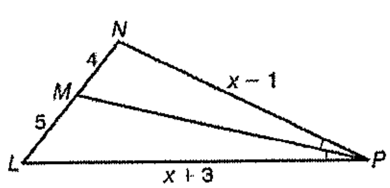
6. $\overline{NP}$ and $\overline{LP}$



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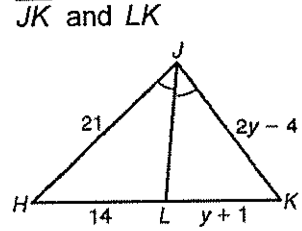
7. $\overline{JK}$ and $\overline{LK}$



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LESSON 7-4

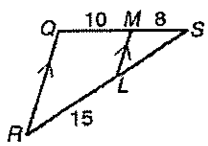
Practice A

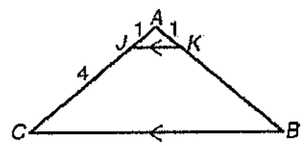
Applying Properties of Similar Triangles

Fill in the blanks to complete each theorem.

1. If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides ____________________.
2. If three or more parallel lines intersect two transversals, then they divide the ____________________ proportionally.
3. An ____________________ of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides.
4. If a line divides two sides of a triangle proportionally, then it is parallel to the ____________________.

In Exercises 5 and 6, set up a ratio and substitute values from the figure to find each length.

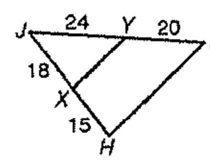




5. *LS* ____________________

6. *BK* ____________________

Complete Exercises 7 and 8 to verify that $\overline{HI} \parallel \overline{XY}$.



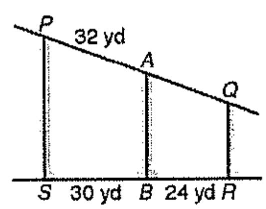
7. Check that the sides are proportional.

$\frac{JX}{XH}$ = ________ = ________ $\frac{JY}{YI}$ = ________ = ________

8. If the two ratios in Exercise 7 are equal, then sides $\overline{HJ}$ and $\overline{IJ}$ are divided proportionally. If the sides are proportional, then $\overline{HI}$ is parallel to $\overline{XY}$. Tell whether $\overline{HI}$ is parallel to $\overline{XY}$.

____

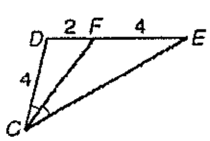
Use the figure for Exercise 9. The figure shows part of a freeway interchange. The raised freeway is supported by vertical, parallel pillars. Set up a ratio and solve to find the length.

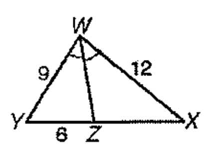


9. Use a calculator to find *AQ* to the nearest tenth of a yard.

____

In Exercises 10 and 11, set up a ratio and substitute values from the figure to find each length.





10. *CE* ____________________

11. *XZ* ____________________

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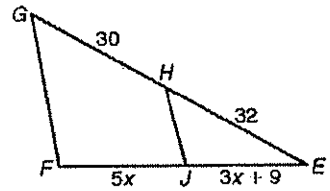
LESSON 7-4

Problem Solving

Applying Properties of Similar Triangles

1. Is $\overline{GF} \parallel \overline{HJ}$ if $x = 5$? Explain.



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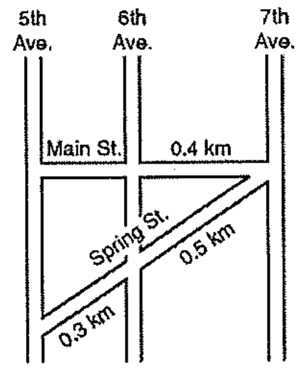
2. On the map, 5th Ave., 6th Ave., and 7th Ave. are parallel. What is the length of Main St. between 5th Ave. and 6th Ave.?



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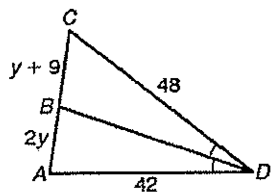
3. Find the length of $\overline{BC}$.



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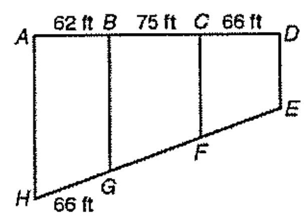
4. The figure shows three lots in a housing development. If the boundary lines separating the lots are parallel, what is *GF* to the nearest tenth?



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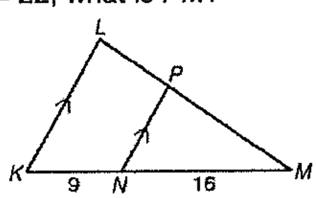
Choose the best answer.

5. If $LM = 22$, what is PM?



A 7.92   C 14.08

B 12.38   D 29.92

6. In $\triangle QRS$, the bisector of $\angle R$ divides $\overline{QS}$ into segments with lengths 2.1 and 2.8. If $RQ = 3$, which is the length of $\overline{RS}$?

F 2   H 4

G 2.25   J 4.5

7. In $\triangle CDE$, the bisector of $\angle C$ divides $\overline{DE}$ into segments with lengths $4x$ and $x + 13$. If $CD = 24$ and $CE = 32$, which is the length of $\overline{DE}$?

A 20   C 26

B 24   D 28

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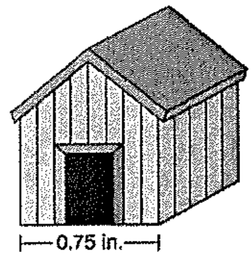
LESSON 7-5

Reteach

Using Proportional Relationships

A **scale drawing** is a drawing of an object that is smaller or larger than the object's actual size. The drawing's scale is the ratio of any length in the drawing to the actual length of the object.

The scale for the diagram of the doghouse is 1 in : 3 ft.
Find the length of the actual doghouse.



First convert to equivalent units: 1 in : 36 in. (3 ft × 12 in./ft).

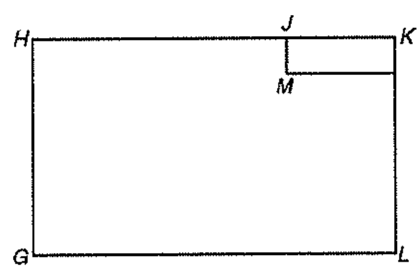
diagram length → / actual length → $\frac{1}{36} = \frac{0.75}{x}$ ← diagram length / ← actual length

$1x = 36(0.75)$ Cross Products Property

$x = 27$ in. Simplify.

The actual length of the doghouse is 27 in., or 2 ft 3 in.

The scale of the cabin shown in the blueprint is 1 cm : 2 m. Find the actual lengths of the following walls.



1. $\overline{HG}$ ______________
2. $\overline{GL}$ ______________
3. $\overline{HJ}$ ______________
4. $\overline{JM}$ ______________

A rectangular fitness room in a recreation center is 45 feet long and 28 feet wide. Find the length and width for a scale drawing of the room, using the following scales.

5. 1 in : 1 ft ______________
6. 1 in : 2 ft ______________
7. 1 in : 3 ft ______________
8. 1 in : 6 ft 8 in. ______________

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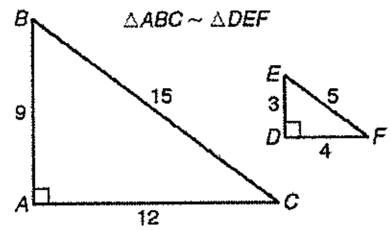
LESSON 7-5

Reteach

Using Proportional Relationships continued

Proportional Perimeters and Areas Theorem

If two figures are similar and their similarity ratio is $\frac{a}{b}$, then the ratio of their perimeters is $\frac{a}{b}$ and the ratio of their areas is $\left(\frac{a}{b}\right)^2$.

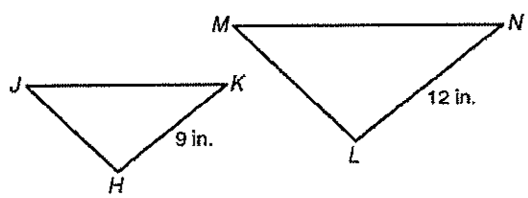


$$\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{36}{12} = \frac{3}{1}$$

$$\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{54}{6} = \frac{9}{1} = \left(\frac{3}{1}\right)^2$$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{3}{1}$$

△*HJK* ~ △*LMN*. The perimeter of △*HJK* is 30 inches, and the area of △*HJK* is 36 square inches. Find the perimeter and area of △*LMN*.

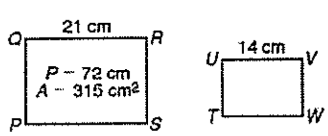


The similarity ratio of △*HJK* to △*LMN* = $\frac{9}{12} = \frac{3}{4}$.

$\frac{\text{perimeter of } \triangle HJK}{\text{perimeter of } \triangle LMN} = \frac{3}{4}$	The ratio of the perimeters equals the similarity ratio.
$\frac{30}{P} = \frac{3}{4}$	Substitute the known values.
$30(4) = P(3)$	Cross Products Property
$40 = P$	Simplify.
$\frac{\text{area of } \triangle HJK}{\text{area of } \triangle LMN} = \left(\frac{3}{4}\right)^2$	The ratio of the areas equals the square of the similarity ratio.
$\frac{36}{A} = \frac{9}{16}$	Substitute the known values.
$36(16) = A(9)$	Cross Products Property
$64 = A$	Simplify.

The perimeter of △*LMN* is 40 in., and the area is 64 in^2.

9. ▭ *PQRS* ~ ▭ *TUVW*. Find the perimeter and area of ▭ *TUVW*.



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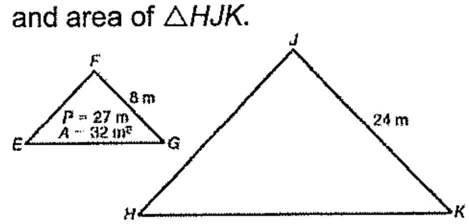
10. △*EFG* ~ △*HJK*. Find the perimeter and area of △*HJK*.



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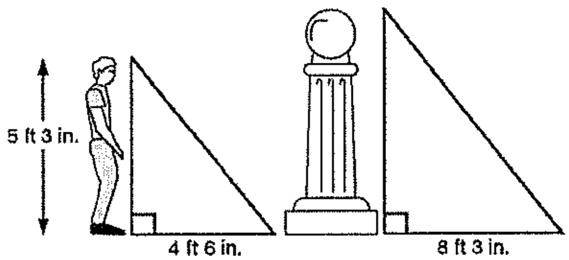
LESSON 7-5

Problem Solving

Using Proportional Relationships

1. A student is standing next to a sculpture. The figure shows the shadows that they cast. What is the height of the sculpture?



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2. At the halftime show during a football game, a marching band is to form a rectangle 50 yards by 16 yards. The conductor wants to plan out the band members' positions using a 14- by 8.5-in. sheet of paper. What scale should she use to fit both dimensions of the rectangle on the page? (Use whole inches and yards.)

____

3. An artist makes a scale drawing of a new lion enclosure at the zoo. The scale is 1 in : 25 ft. On the drawing, the length of the enclosure is $7\frac{1}{4}$ inches. What is the actual length of the lion enclosure?

____

4. A room is 14 feet long and 11 feet wide. If you made a scale drawing of the top view of the room using the scale $\frac{1}{2}$ in = 2 ft, what would be the length and width of the room in your drawing?

____

Choose the best answer.

5. A visual-effects model maker for a movie draws a spaceship using a ratio of 1 : 24. The drawing of the spaceship is 22 inches long. What is the length of the spaceship in the movie?

   A 4 ft   C 44 ft

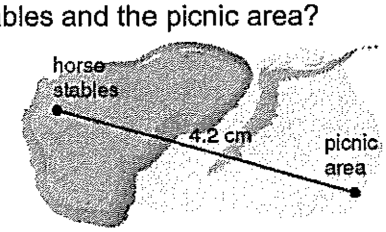
   B 8 ft   D 528 ft

6. A free-fall ride at an amusement park casts a shadow $43\frac{2}{3}$ feet long. At the same time, a 6-foot-tall person standing in line casts a shadow 2 feet long. What is the height of the ride?

   F $21\frac{5}{6}$ ft   H $98\frac{1}{4}$ ft

   G $65\frac{1}{2}$ ft   J 131 ft

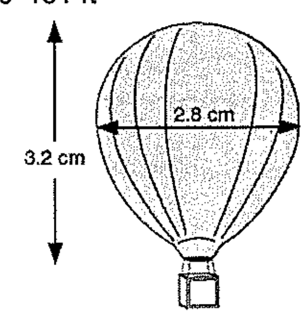
7. The scale of the park map is 1.5 cm = 60 m. Which is the best estimate for the actual distance between the horse stables and the picnic area?



   A 21.4 m   C 168.0 m

   B 90.0 m   D 288.0 m

8. A hot-air balloon is 26.8 meters tall. Use the scale drawing to find the actual distance across the hot-air balloon.



   F 23.45 m   H 75.0 m

   G 30.6 m   J 85.8 m

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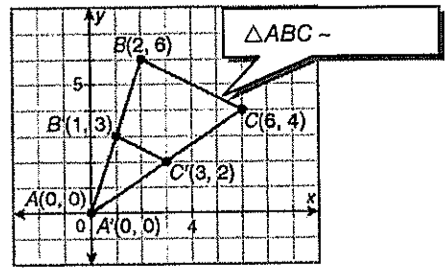
LESSON 7-6

Reteach

Dilations and Similarity in the Coordinate Plane

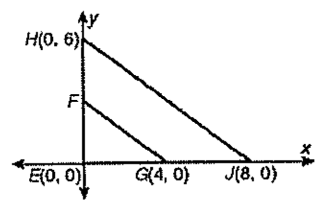
A **dilation** is a transformation that changes the size of a figure but not its shape. The preimage and image are always similar. A **scale factor** describes how much a figure is enlarged or reduced.



Triangle *ABC* has vertices *A*(0, 0), *B*(2, 6), and *C*(6, 4). Find the coordinates of the vertices of the image after a dilation with a scale factor $\frac{1}{2}$.

Preimage		Image
△*ABC*		△*A′B′C′*
A(0, 0) →	$\left(0 \cdot \frac{1}{2}, 0 \cdot \frac{1}{2}\right)$ →	*A′*(0, 0)
B(2, 6) →	$\left(2 \cdot \frac{1}{2}, 6 \cdot \frac{1}{2}\right)$ →	*B′*(1, 3)
C(6, 4) →	$\left(6 \cdot \frac{1}{2}, 4 \cdot \frac{1}{2}\right)$ →	*C′*(3, 2)

△*FEG* ~ △*HEJ*. Find the coordinates of *F* and the scale factor.



$\frac{FE}{HE} = \frac{EG}{EJ}$	Write a proportion.
$\frac{FE}{6} = \frac{4}{8}$	*HE* = 6, *EG* = 4, and *EJ* = 8.
$8(FE) = 24$	Cross Products Property
$FE = 3$	Divide both sides by 8.

So the coordinates of *F* are (0, 3). Since *F*(0, 3) → (0 • 2, 3 • 2) → *H*(0, 6), the scale factor is $\frac{2}{1}$.

1. Triangle *EFG* has vertices *E*(0, 0), *F*(1, 5), and *G*(7, 2). Find the coordinates of the image after a dilation with a scale factor $\frac{2}{1}$.

____

____

2. Rectangle *LMNP* has vertices *L*(–6, 0), *M*(6, 0), *N*(6, –3), and *P*(–6, –3). Find the coordinates of the image after a dilation with a scale factor $\frac{1}{3}$.

____

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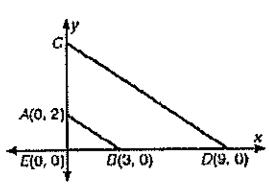
3. Given that △*AEB* ~ △*CED*, find the coordinates of *C* and the scale factor.



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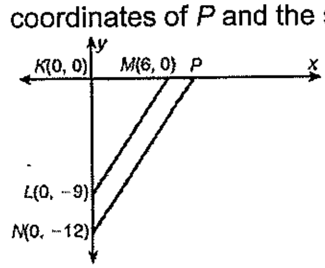
4. Given that △*LKM* ~ △*NKP*, find the coordinates of *P* and the scale factor.



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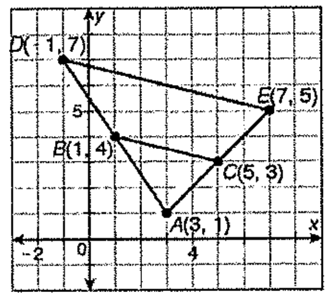
LESSON 7-6

Reteach

Dilations and Similarity in the Coordinate Plane *continued*

You can prove that triangles in the coordinate plane are similar by using the Distance Formula to find the side lengths. Then apply SSS Similarity or SAS Similarity.

Use the figure to prove that $\triangle ABC \sim \triangle ADE$.



Step 1 Determine a plan for proving the triangles similar.

$\angle A \cong \angle A$ by the Reflexive Property. If $\frac{AB}{AD} = \frac{AC}{AE}$, then the triangles are similar by SAS ~.

Step 2 Use the Distance Formula to find the side lengths.

$AB = \sqrt{(1-3)^2 + (4-1)^2} = \sqrt{13}$

$AC = \sqrt{(5-3)^2 + (3-1)^2} = \sqrt{8} = 2\sqrt{2}$

$AD = \sqrt{(-1-3)^2 + (7-1)^2} = \sqrt{52} = 2\sqrt{13}$

$AE = \sqrt{(7-3)^2 + (5-1)^2} = \sqrt{32} = 4\sqrt{2}$

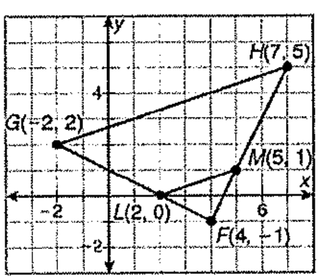
Step 3 Compare the corresponding sides to determine whether they are proportional.

$\frac{AB}{AD} = \frac{\sqrt{13}}{2\sqrt{13}} = \frac{1}{2}$

$\frac{AC}{AE} = \frac{2\sqrt{2}}{4\sqrt{2}} = \frac{1}{2}$

The similarity ratio is $\frac{1}{2}$, and $\frac{AB}{AD} = \frac{AC}{AE}$. So $\triangle ABC \sim \triangle ADE$ by SAS ~.

5. Prove that $\triangle FGH \sim \triangle FLM$.



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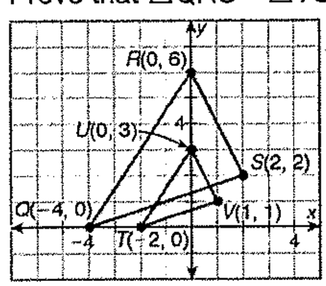
6. Prove that $\triangle QRS \sim \triangle TUV$.



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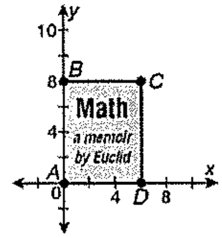
Name ______________________ Date ______________ Class ______________

LESSON 7-6

Practice A

Dilations and Similarity in the Coordinate Plane

A publisher is preparing the marketing plan for a new book. The actual cover of the book measures 6 inches by 8 inches, as shown in the figure. The publisher needs to make a reduced image of the book cover for advertisements. Complete Exercises 1–4 to draw the outline of the reduced cover.



1. Use the figure to find the coordinates of each vertex.

   A(______, ______) *B*(______, ______)

   C(______, ______) *D*(______, ______)

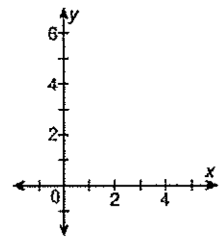
2. The publisher wants to make a reduction using a dilation with a scale factor of $\frac{1}{2}$.

   Multiply the coordinates by the scale factor to find the coordinates of the reduction.

   A′(______, ______) *B′*(______, ______)

   C′(______, ______) *D′*(______, ______)

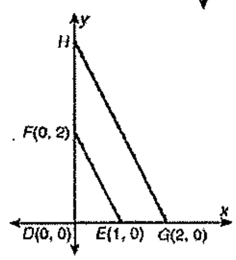
3. Plot the coordinates of the reduction and draw the new outline of the book cover.



In the figure, △*DGH* is a dilation image of △*DEF*.

4. Find the scale factor and the coordinates of *H*.

   ____



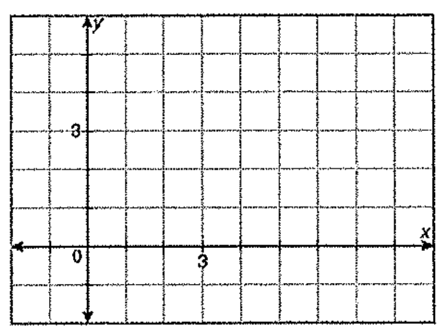
Complete Exercises 5–7 to prove that △*JKL* ~ △*JMN* using the SAS Similarity Theorem.

5. Plot the points *J*(1, 1), *K*(2, 3), *L*(4, 1), *M*(3, 5), *N*(7, 1). Draw △*JKL* and △*JMN*.

6. ∠*J* is common to both triangles. So if the side lengths are proportional, then △*JKL* ~ △*JMN* by SAS ~. Use the distance formula to find *JK*, *JM*, *JL*, and *JN*.

   JK = ______________ *JM* = ______________

   JL = ______________ *JN* = ______________



7. Show that the side lengths are proportional $\left(\frac{JK}{JM} = \frac{JL}{JN}\right)$. ______________________

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