CHAPTER 8

Chapter Summary

WHAT did you learn?	*WHY did you learn it?*
Write and simplify the ratio of two numbers. **(8.1)**	Find the ratio of the track team's wins to losses. **(p. 461)**
Use proportions to solve problems. **(8.1)**	Use measurements of a baseball bat sculpture to find the dimensions of Babe Ruth's bat. **(p. 463)**
Understand properties of proportions. **(8.2)**	Determine the width of the actual Titanic ship from the dimensions of a scale model. **(p. 467)**
Identify similar polygons and use properties of similar polygons. **(8.3)**	Determine whether two television screens are similar. **(p. 477)**
Prove that two triangles are similar using the definition of similar triangles and the AA Similarity Postulate. **(8.4)**	Use similar triangles to determine the altitude of an aerial photography blimp. **(p. 482)**
Prove that two triangles are similar using the SSS Similarity Theorem and the SAS Similarity Theorem. **(8.5)**	Use similar triangles to estimate the height of the Unisphere. **(p. 494)**
Use proportionality theorems to solve problems. **(8.6)**	Explain why the diagonal cuts on insulation strips have the same length. **(p. 501)**
Identify and draw dilations and use properties of dilations. **(8.7)**	Understand how the shadows in a shadow puppet show change size. **(p. 508)**

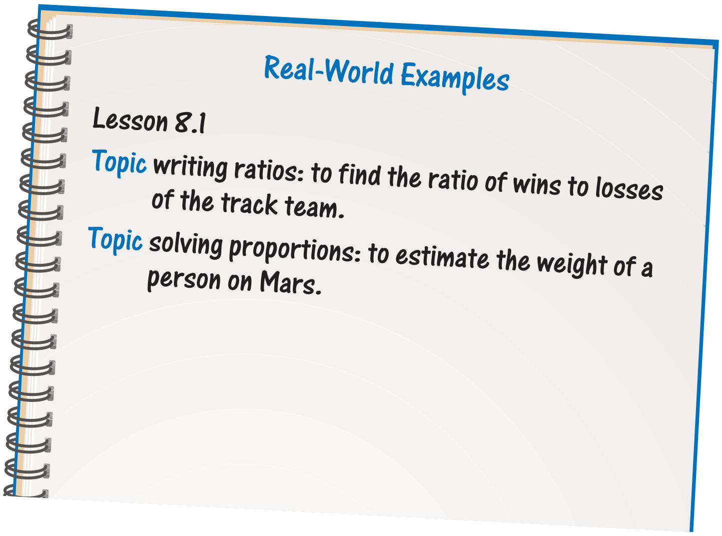
How does Chapter 8 fit into the BIGGER PICTURE of geometry?

In this chapter, you learned that if two polygons are similar, then the lengths of their corresponding sides are proportional. You also studied several connections among real-life situations, geometry, and algebra. For instance, solving a problem that involves similar polygons (geometry) often requires the use of a proportion (algebra). In later chapters, remember that the measures of corresponding angles of similar polygons are equal, but the lengths of corresponding sides of similar polygons are proportional.

STUDY STRATEGY

How did you use your list of real-world examples?

The list of the main topics of the chapter with corresponding real-world examples that you made following the **Study Strategy** on page 456, may resemble this one.



CHAPTER 8

Chapter Review

VOCABULARY

- ratio, p. 457
- proportion, p. 459
- extremes, p. 459
- means, p. 459
- geometric mean, p. 466
- similar polygons, p. 473
- scale factor, p. 474
- dilation, p. 506
- reduction, p. 506
- enlargement, p. 506

8.1 Ratio and Proportion

Examples on pp. 457–460

EXAMPLE You can solve a proportion by finding the value of the variable.

$\frac{x}{12} = \frac{x+6}{30}$	Write original proportion.
$30x = 12(x+6)$	Cross product property
$30x = 12x + 72$	Distributive property
$18x = 72$	Subtract $12x$ from each side.
$x = 4$	Divide each side by 18.

Solve the proportion.

1. $\frac{3}{x} = \frac{2}{7}$

2. $\frac{a+1}{5} = \frac{2a}{9}$

3. $\frac{2}{x+1} = \frac{4}{x+6}$

4. $\frac{d-4}{d} = \frac{3}{7}$

8.2 Problem Solving in Geometry with Proportions

Examples on pp. 465–467

EXAMPLE In 1997, the ratio of the population of South Carolina to the population of Wyoming was 47 : 6. The population of South Carolina was about 3,760,000. You can find the population of Wyoming by solving a proportion.

$$\frac{47}{6} = \frac{3{,}760{,}000}{x}$$

$$47x = 22{,}560{,}000$$

$x = 480{,}000$ The population of Wyoming was about 480,000.

5. You buy a 13 inch scale model of the sculpture *The Dancer* by Edgar Degas. The ratio of the height of the scale model to the height of the sculpture is 1 : 3. Find the height of the sculpture.

6. The ratio of the birth weight to the adult weight of a male black bear is 3 : 1000. The average birth weight is 12 ounces. Find the average adult weight in pounds.

8.3 SIMILAR POLYGONS

Examples on pp. 473–475

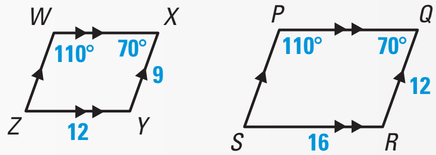
EXAMPLE The two parallelograms shown are similar because their corresponding angles are congruent and the lengths of their corresponding sides are proportional.

$$\frac{WX}{PQ} = \frac{ZY}{SR} = \frac{XY}{QR} = \frac{WZ}{PS} = \frac{3}{4}$$

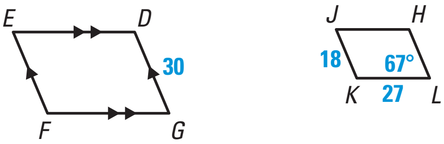
$m\angle P = m\angle R = m\angle W = m\angle Y = 110°$

$m\angle Q = m\angle S = m\angle X = m\angle Z = 70°$

The scale factor of $\square WXYZ$ to $\square PQRS$ is $\frac{3}{4}$.



In Exercises 7–9, $\square DEFG \sim \square HJKL$.



7. Find the scale factor of $\square DEFG$ to $\square HJKL$.

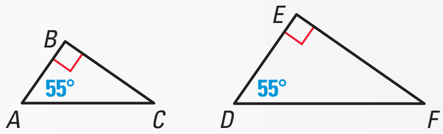
8. Find the length of $\overline{DE}$ and the measure of $\angle F$.

9. Find the ratio of the perimeter of $\square HJKL$ to the perimeter of $\square DEFG$.

8.4 SIMILAR TRIANGLES

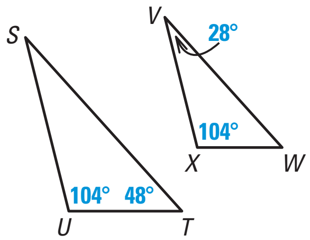
Examples on pp. 480–482

EXAMPLE Because two angles of $\triangle ABC$ are congruent to two angles of $\triangle DEF$, $\triangle ABC \sim \triangle DEF$ by the Angle-Angle (AA) Similarity Postulate.



Determine whether the triangles can be proved similar or not. Explain why or why not. If they are similar, write a similarity statement.

10.



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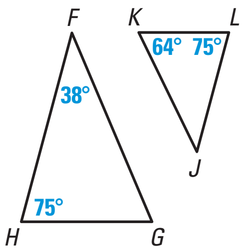

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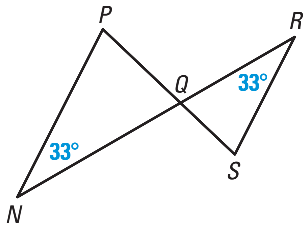
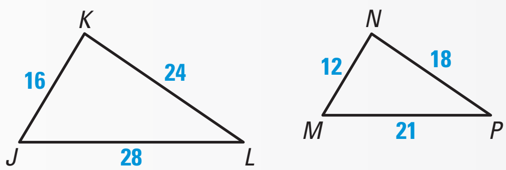


8.5 PROVING TRIANGLES ARE SIMILAR

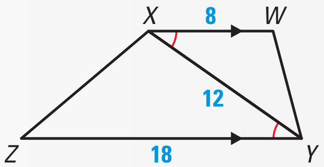
Examples on pp. 488–491

EXAMPLES Three sides of $\triangle JKL$ are proportional to three sides of $\triangle MNP$, so $\triangle JKL \sim \triangle MNP$ by the Side-Side-Side (SSS) Similarity Theorem.



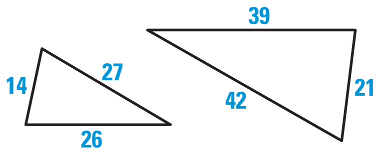
8.5 continued

Two sides of $\triangle XYZ$ are proportional to two sides of $\triangle WXY$, and the included angles are congruent. By the Side-Angle-Side (SAS) Similarity Theorem, $\triangle XYZ \sim \triangle WXY$.



Are the triangles similar? If so, state the similarity and a postulate or theorem that can be used to prove that the triangles are similar.

13.



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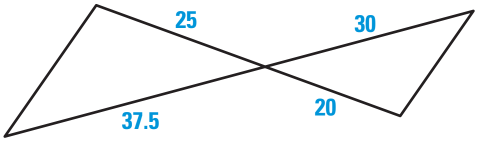
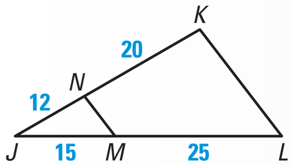
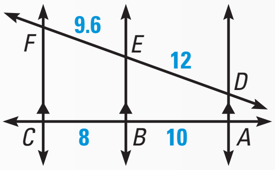


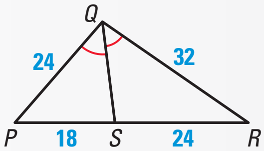
8.6 Proportions and Similar Triangles

Examples on pp. 498–501

EXAMPLES You can use proportionality theorems to compare proportional lengths.



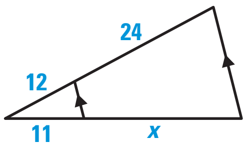




$\frac{JN}{NK} = \frac{12}{20} = \frac{3}{5}$ $\frac{JM}{ML} = \frac{15}{25} = \frac{3}{5}$ $\frac{AB}{BC} = \frac{10}{8} = \frac{5}{4}$ $\frac{DE}{EF} = \frac{12}{9.6} = \frac{5}{4}$ $\frac{QP}{QR} = \frac{24}{32} = \frac{3}{4}$ $\frac{SP}{SR} = \frac{18}{24} = \frac{3}{4}$

Find the value of the variable.

15.



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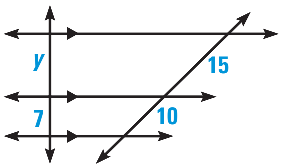

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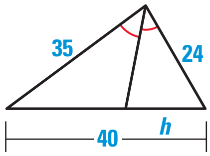
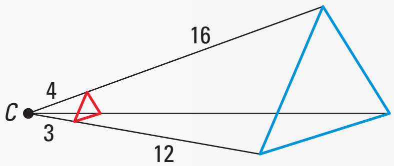


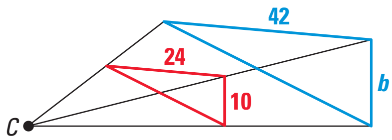
8.7 Dilations

Examples on pp. 506–508

EXAMPLE The blue triangle is mapped onto the red triangle by a dilation with center C. The scale factor is $\frac{1}{5}$, so the dilation is a reduction.



18. Identify the dilation, find its scale factor, and find the value of the variable.



CHAPTER 8

Chapter Test

In Exercises 1–3, solve the proportion.

1. $\frac{x}{3} = \frac{12}{9}$

2. $\frac{18}{y} = \frac{15}{20}$

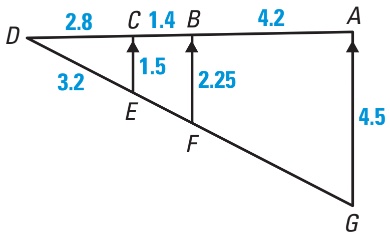
3. $\frac{11}{110} = \frac{z}{10}$

Complete the sentence.

4. If $\frac{5}{2} = \frac{a}{b}$, then $\frac{5}{a} = \frac{?}{b}$.

5. If $\frac{8}{x} = \frac{3}{y}$, then $\frac{8+x}{x} = \frac{?}{y}$.

In Exercises 6–8, use the figure shown.

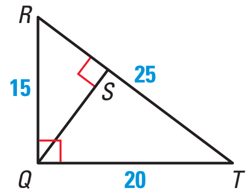


6. Find the length of $\overline{EF}$.

7. Find the length of $\overline{FG}$.

8. Is quadrilateral *FECB* similar to quadrilateral *GFBA*? If so, what is the scale factor?

In Exercises 9–12, use the figure shown.



9. Prove that $\triangle RSQ \sim \triangle RQT$.

10. What is the scale factor of $\triangle RSQ$ to $\triangle RQT$?

11. Is $\triangle RSQ$ similar to $\triangle QST$? Explain.

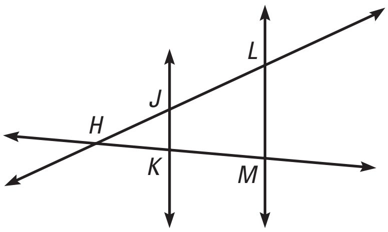
12. Find the length of $\overline{QS}$.

In Exercises 13–15, use the figure shown to decide if you are given enough information to conclude that $\overline{JK} \parallel \overline{LM}$. If so, state the reason.

13. $\frac{LJ}{JH} = \frac{MK}{KH}$

14. $\angle HJK \cong \angle HLM$

15. $\frac{LH}{JH} = \frac{MH}{KH}$



16. The triangle $\triangle RST$ is mapped onto $\triangle R'S'T'$ by a dilation with $RS = 24$, $ST = 12$, $RT = 20$, and $R'S' = 6$. Find the scale factor k, and side lengths $S'T'$ and $R'T'$.

17. Two sides of a triangle have lengths of 14 inches and 18 inches. The measure of the angle included by the sides is 45°. Two sides of a second triangle have lengths of 7 inches and 8 inches. The measure of the angle included by the sides is 45°. Are the two triangles similar? Explain.

18. You shine a flashlight on a book that is 9 inches tall and 6 inches wide. It makes a shadow on the wall that is 3 feet tall and 2 feet wide. What is the scale factor of the book to its shadow?