Name _____ Date _____

LESSON 6.6

Study Guide

For use with pages 396–403

GOAL **Use proportions with a triangle or parallel lines.**

Vocabulary

Theorem 6.4 Triangle Proportionality Theorem: If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.

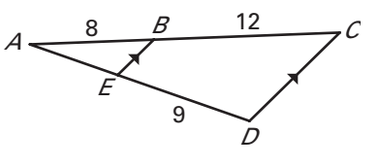
Theorem 6.5 Converse of the Triangular Proportionality Theorem: If a line divides the two sides of a triangle proportionally, then it is parallel to the third side.

Theorem 6.6: If three parallel lines intersect two transversals, then they divide the transversals proportionally.

Theorem 6.7: If a ray bisects an angle of a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

EXAMPLE 1 Find the length of a segment

In the diagram, $\overline{BE} \parallel \overline{CD}$, $AB = 8$, $BC = 12$, and $ED = 9$. What is the length of $\overline{AE}$?



Solution

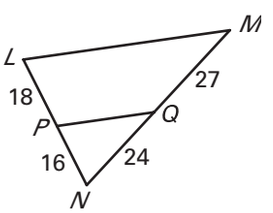
$\frac{AE}{ED} = \frac{AB}{BC}$ Triangle Proportionality Theorem

$\frac{AE}{9} = \frac{8}{12}$ Substitute.

$AE = 6$ Solve for AE.

EXAMPLE 2 Determine whether line segments are parallel

In the diagram, $\overline{PQ}$ divides sides $\overline{LN}$ and $\overline{MN}$ into the lengths shown. Determine whether $\overline{PQ} \parallel \overline{LM}$.



Solution

Find and simplify the ratios of lengths determined by $\overline{PQ}$.

$\frac{LP}{PN} = \frac{18}{16} = \frac{9}{8}$ $\frac{MQ}{QN} = \frac{27}{24} = \frac{9}{8}$

Because $\frac{LP}{PN} = \frac{MQ}{QN}$, $\overline{PQ} \parallel \overline{LM}$ by the Converse of the Triangle Proportionality Theorem.

Name _____ Date _____

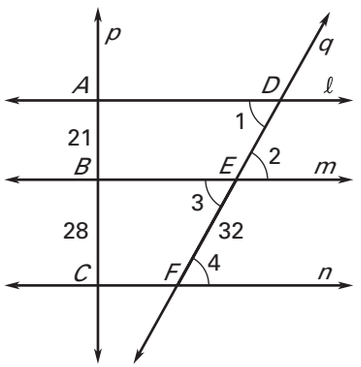
LESSON 6.6

Study Guide *continued*

For use with pages 396–403

EXAMPLE 3 Use Theorem 6.6

In the diagram, ∠1, ∠2, ∠3, and ∠4 are all congruent and *AB* = 21, *BC* = 28, and *EF* = 32. Find the length of $\overline{DE}$.



Alternate interior angles are congruent, so $\ell \parallel m \parallel n$. Use Theorem 6.6.

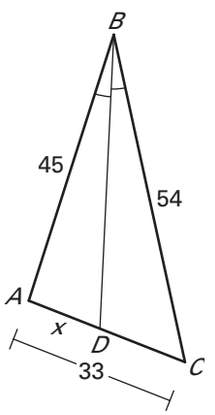
$\frac{AB}{BC} = \frac{DE}{EF}$ Parallel lines divide transversals proportionally.

$\frac{21}{28} = \frac{DE}{32}$ Substitute.

$DE = 24$ Solve for DE.

EXAMPLE 4 Use Theorem 6.7

In the diagram, ∠*ABD* ≅ ∠*CBD*. Use the given side lengths to find the length of $\overline{AD}$.



Because $\overrightarrow{BD}$ is an angle bisector of ∠ABC, you can apply Theorem 6.7. Let $AD = x$. Then $DC = 33 - x$.

$\frac{DC}{AD} = \frac{BC}{BA}$ Angle bisector divides opposite side proportionally.

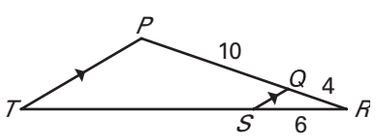
$\frac{33 - x}{x} = \frac{54}{45}$ Substitute.

$54x = 1485 - 45x$ Cross Products Property

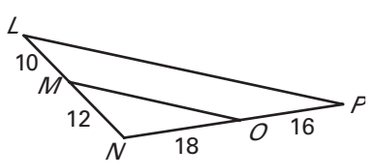
$x = 15$ Solve for x.

Exercises for Examples 1, 2, 3, and 4

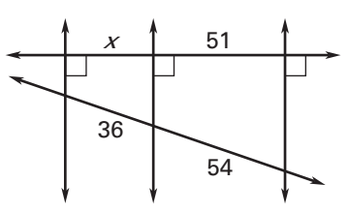
1. Find the length of $\overline{ST}$.



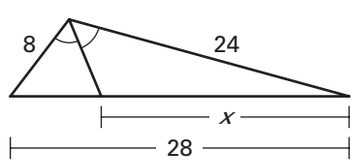
2. Determine whether $\overline{MO} \parallel \overline{LP}$.



3. Find the value of x.



4. Find the value of x.



LESSON 6.6