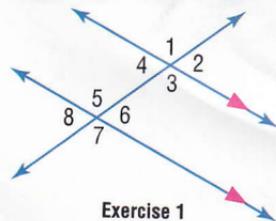


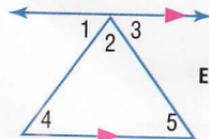
Check for Understanding

Concept Check

- Determine** whether $\angle 1$ is *always*, *sometimes*, or *never* congruent to $\angle 2$. Explain.
- OPEN ENDED** Use a straightedge and protractor to draw a pair of parallel lines cut by a transversal so that one pair of corresponding angles measures 35° .
- Determine** the minimum number of angle measures you would have to know to find the measures of all of the angles in the figure for Exercise 1.
- State** the postulate or theorem that allows you to conclude $\angle 3 \cong \angle 5$ in the figure at the right.



Exercise 1

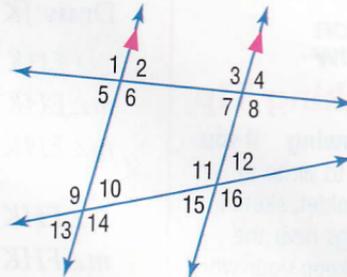


Exercise 4

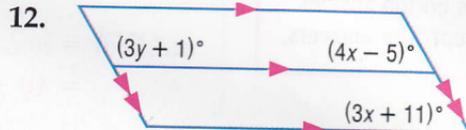
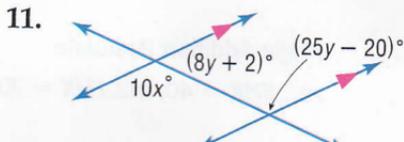
Guided Practice

In the figure, $m\angle 3 = 110$ and $m\angle 12 = 55$. Find the measure of each angle.

- | | |
|----------------|-----------------|
| 5. $\angle 1$ | 6. $\angle 6$ |
| 7. $\angle 2$ | 8. $\angle 10$ |
| 9. $\angle 13$ | 10. $\angle 15$ |



Find x and y in each figure.



Practice and Apply

Homework Help

For Exercises

See Examples

14–31

1, 2

32–37

3

Extra Practice
See page 759.

In the figure, $m\angle 9 = 75$. Find the measure of each angle.

14. $\angle 3$

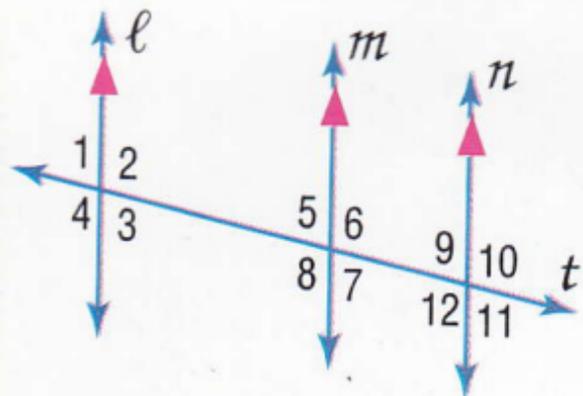
15. $\angle 5$

16. $\angle 6$

17. $\angle 8$

18. $\angle 11$

19. $\angle 12$



In the figure, $m\angle 3 = 43$. Find the measure of each angle.

20. $\angle 2$

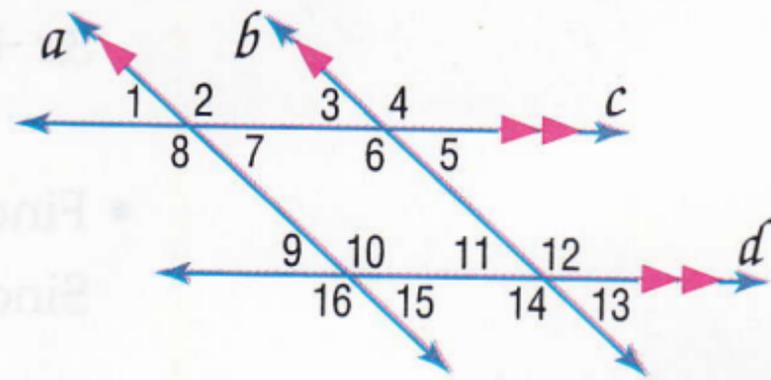
21. $\angle 7$

22. $\angle 10$

23. $\angle 11$

24. $\angle 13$

25. $\angle 16$



In the figure, $m\angle 1 = 50$ and $m\angle 3 = 60$. Find the measure of each angle.

26. $\angle 4$

27. $\angle 5$

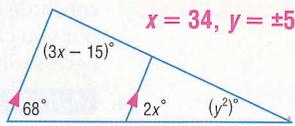
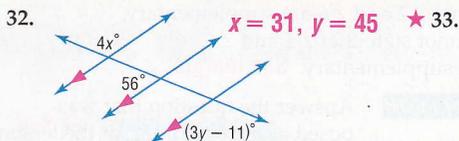
28. $\angle 2$

29. $\angle 6$

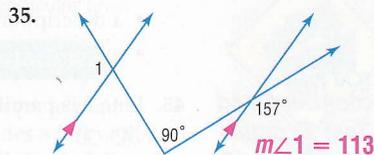
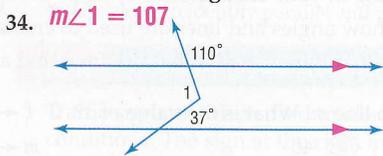
30. $\angle 7$

31. $\angle 8$

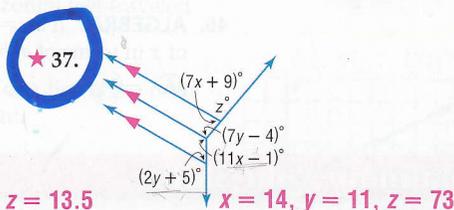
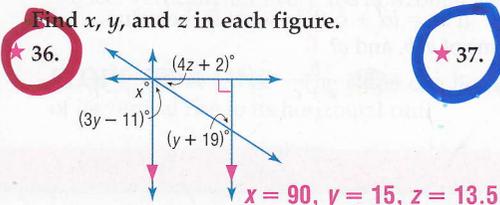
Find x and y in each figure.



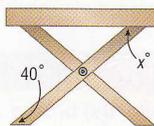
Find $m\angle 1$ in each figure.



Find $x, y,$ and z in each figure.



38. **CARPENTRY** Anthony is building a picnic table for his patio. He cut one of the legs at an angle of 40° . At what angle should he cut the other end to ensure that the top of the table is parallel to the ground? 140°



39. **PROOF** Copy and complete the proof of Theorem 3.3.

Given: $\ell \parallel m$

Prove: $\angle 1 \cong \angle 8$

$\angle 2 \cong \angle 7$

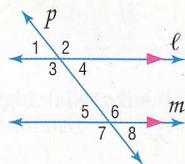
Proof:

Statements

- $\ell \parallel m$
- $\angle 1 \cong \angle 5, \angle 2 \cong \angle 6$
- $\angle 5 \cong \angle 8, \angle 6 \cong \angle 7$
- $\angle 1 \cong \angle 8, \angle 2 \cong \angle 7$

Reasons

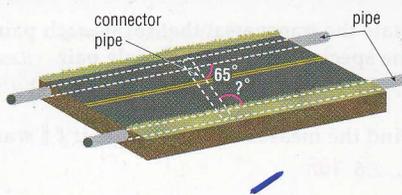
- ? **Given**
- ? **Corresponding Angles Postulate**
- ? **Vertical Angles Theorem**
- ? **Transitive Property**



40. **PROOF** Write a two-column proof of Theorem 3.2. See p. 173A.

41. **PROOF** Write a paragraph proof of Theorem 3.4. See margin.

42. **CONSTRUCTION** Parallel drainage pipes are laid on each side of Polaris Street. A pipe under the street connects the two pipes. The connector pipe makes a 65° angle as shown. What is the measure of the angle it makes with the pipe on the other side of the road? 115



Lesson 3-2 Angles and Parallel Lines 137

Study Guide and Intervention, p. 131 (shown) and p. 132

Parallel Lines and Angle Pairs When two parallel lines are cut by a transversal, the following pairs of angles are congruent.

- corresponding angles
- alternate interior angles
- alternate exterior angles

Also, consecutive interior angles are supplementary.

Example In the figure, $m\angle 2 = 75$. Find the measures of the remaining angles.

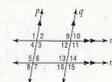
- $m\angle 1 = 105$ $\angle 1$ and $\angle 2$ form a linear pair.
- $m\angle 3 = 105$ $\angle 3$ and $\angle 2$ form a linear pair.
- $m\angle 4 = 75$ $\angle 4$ and $\angle 2$ are vertical angles.
- $m\angle 5 = 105$ $\angle 5$ and $\angle 3$ are alternate interior angles.
- $m\angle 6 = 75$ $\angle 6$ and $\angle 2$ are corresponding angles.
- $m\angle 7 = 105$ $\angle 7$ and $\angle 3$ are corresponding angles.
- $m\angle 8 = 75$ $\angle 8$ and $\angle 6$ are vertical angles.



Exercises

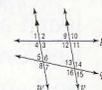
In the figure, $m\angle 3 = 102$. Find the measure of each angle.

- $\angle 5$ 102
- $\angle 6$ 78
- $\angle 11$ 102
- $\angle 7$ 102
- $\angle 15$ 102
- $\angle 14$ 78



In the figure, $m\angle 9 = 80$ and $m\angle 5 = 68$. Find the measure of each angle.

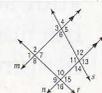
- $\angle 12$ 100
- $\angle 1$ 80
- $\angle 4$ 100
- $\angle 3$ 80
- $\angle 7$ 68
- $\angle 16$ 112



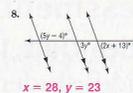
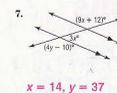
Skills Practice, p. 133 and Practice, p. 134 (shown)

In the figure, $m\angle 2 = 92$ and $m\angle 12 = 74$. Find the measure of each angle.

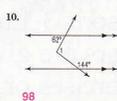
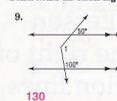
- $\angle 10$ 92
- $\angle 6$ 92
- $\angle 9$ 88
- $\angle 5$ 106
- $\angle 11$ 106
- $\angle 13$ 106



Find x and y in each figure.



Find $m\angle 1$ in each figure.



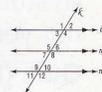
11. **PROOF** Write a paragraph proof of Theorem 3.3.

Given: $\ell \parallel m, m \parallel n$

Prove: $\angle 1 \cong \angle 12$

Sample proof:

It is given that $\ell \parallel m$, so $\angle 1 \cong \angle 8$ by the Alternate Exterior Angles Theorem. Since it is given that $m \parallel n$, $\angle 8 \cong \angle 12$ by the Corresponding Angles Postulate. Therefore, $\angle 1 \cong \angle 12$, since congruence of angles is transitive.



12. **FENCING** A diagonal brace strengthens the wire fence and prevents it from sagging. The brace makes a 50° angle with the wire as shown. Find y . 130



Reading to Learn Mathematics, p. 135

ELL

Pre-Activity How can angles and lines be used in art?

Read the introduction to Lesson 3-2 at the top of page 133 in your textbook.

- Your textbook shows a painting that contains two parallel lines and a transversal. What is the name for $\angle 1$ and $\angle 2$? **corresponding angles**
- What is the relationship between these two angles? **They are congruent.**

Reading the Lesson

- Choose the correct word to complete each sentence.
 - If two parallel lines are cut by a transversal, then alternate exterior angles are congruent (congruent/complementary/supplementary).
 - If two parallel lines are cut by a transversal, then corresponding angles are congruent (congruent/complementary/supplementary).
 - If parallel lines are cut by a transversal, then consecutive interior angles are supplementary (congruent/complementary/supplementary).
 - In a plane, if a line is perpendicular to one of two parallel lines, then it is perpendicular (parallel/perpendicular/skew) to the other.

Use the figure for Exercises 2 and 3.

- Name four pairs of vertical angles. $\angle 1$ and $\angle 3, \angle 2$ and $\angle 4, \angle 5$ and $\angle 7, \angle 6$ and $\angle 8$
- Name all angles that form a linear pair with $\angle 7, \angle 6, \angle 8$
- Name all angles that are congruent to $\angle 1, \angle 3, \angle 6, \angle 8$
- Name all angles that are congruent to $\angle 4, \angle 2, \angle 5, \angle 7$
- Name all angles that are supplementary to $\angle 3, \angle 2, \angle 4, \angle 5, \angle 7$
- Name all angles that are supplementary to $\angle 2, \angle 1, \angle 3, \angle 6, \angle 8$

- Which conclusion(s) could you make about lines s and t if $m\angle 4 = m\angle 1$? **B, D**

Helping You Remember

- How can you use an everyday meaning of the adjective *alternate* to help you remember the types of angle pairs for two lines and a transversal?

Sample answer: One meaning of *alternate* is "obtained by switching back and forth from one thing to another." The angle pairs in this lesson all use angles with different vertices, and those whose names contain the adjective *alternate* can be located in a figure by switching from one side of the transversal to the other. The pairs whose names do not include the word *alternate* are found on the same side of the transversal.



Enrichment, p. 136

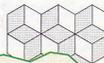
More Optical Illusions

In drawings, diagonal lines may create the illusion of depth. For example, the figure at the right can be thought of as picturing a flat figure or a cube. The optical illusions on this page involve depth perception.

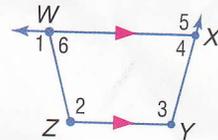


Answer each question.

- How many cubes do you see in the drawing? **5 or 6**
- Can this figure show an actual object? **no**



43. **CRITICAL THINKING** Explain why you can conclude that $\angle 2$ and $\angle 6$ are supplementary, but you cannot state that $\angle 4$ and $\angle 6$ are necessarily supplementary.



44. **WRITING IN MATH** Answer the question that was posed at the beginning of the lesson.

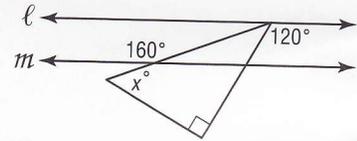
How can angles and lines be used in art?

Include the following in your answer:

- a description of how angles and lines are used to create patterns, and
- examples from two different artists that use lines and angles.

45. Line ℓ is parallel to line m . What is the value of x ?

- (A) 30 (B) 40
(C) 50 (D) 60



46. **ALGEBRA** If $ax = bx + c$, then what is the value of x in terms of a , b , and c ?

- (A) $\frac{c}{a+b}$ (B) $\frac{b}{a+c}$ (C) $\frac{c}{a-b}$ (D) $\frac{b+c}{a}$

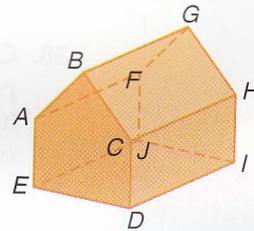


Maintain Your Skills

Mixed Review

For Exercises 47–50, refer to the figure at the right. (Lesson 3-1)

47. Name all segments parallel to \overline{AB} .
48. Name all segments skew to \overline{CH} .
49. Name all planes parallel to AEF .
50. Name all segments intersecting \overline{GH} .

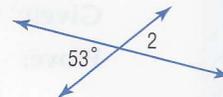


Find the measure of each numbered angle. (Lesson 2-8)

51.



52.



Identify the hypothesis and conclusion of each statement. (Lesson 2-3)

53. If it rains this evening, then I will mow the lawn tomorrow.
54. A balanced diet will keep you healthy.

Getting Ready for the Next Lesson

PREREQUISITE SKILL Simplify each expression.

(To review **simplifying expressions**, see pages 735 and 736.)

55. $\frac{7-9}{8-5}$ 56. $\frac{-3-6}{2-8}$ 57. $\frac{14-11}{23-15}$ 58. $\frac{15-23}{14-11}$ 59. $\frac{2}{9} \cdot \left(-\frac{18}{5}\right)$

Practice Quiz 1

Lessons 3-1 and 3-2

State the transversal that forms each pair of angles. Then identify the special name for the angle pair. (Lesson 3-1)

1. $\angle 1$ and $\angle 8$ 2. $\angle 6$ and $\angle 10$ 3. $\angle 11$ and $\angle 14$

Find the measure of each angle if $\ell \parallel m$ and $m\angle 1 = 105$. (Lesson 3-2)

4. $\angle 6$ 5. $\angle 4$

