

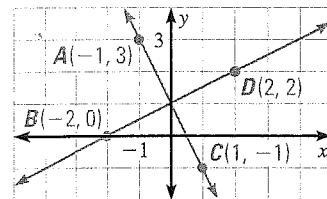
GUIDED PRACTICE

Vocabulary Check ✓

Concept Check ✓

Skill Check ✓

1. Define *slope of a line*.
2. The slope of line m is $-\frac{1}{5}$. What is the slope of a line perpendicular to m ?
3. In the coordinate plane shown at the right, is \overleftrightarrow{AC} perpendicular to \overleftrightarrow{BD} ? Explain.
4. Decide whether the lines with the equations $y = 2x - 1$ and $y = -2x + 1$ are perpendicular.
5. Decide whether the lines with the equations $5y - x = 15$ and $y + 5x = 2$ are perpendicular.
6. The line l_1 has the equation $y = 3x$. The line l_2 is perpendicular to l_1 and passes through the point $P(0, 0)$. Write an equation of l_2 .



PRACTICE AND APPLICATIONS

STUDENT HELP

Extra Practice to help you master skills is on p. 808.

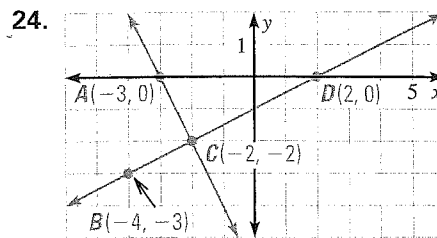
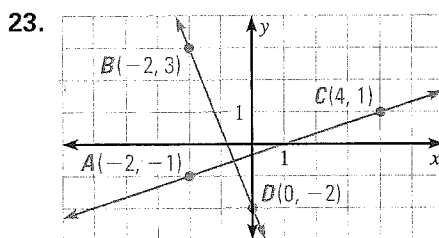
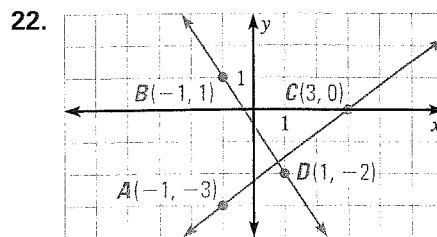
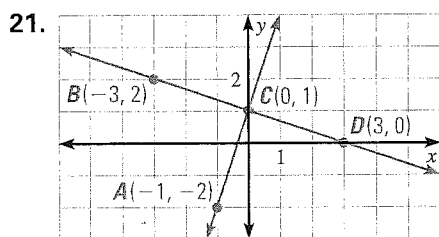
SLOPES OF PERPENDICULAR LINES The slopes of two lines are given. Are the lines perpendicular?

- | | | |
|---|--|----------------------------------|
| 7. $m_1 = 2, m_2 = -\frac{1}{2}$ | 8. $m_1 = \frac{2}{3}, m_2 = \frac{3}{2}$ | 9. $m_1 = \frac{1}{4}, m_2 = -4$ |
| 10. $m_1 = \frac{5}{7}, m_2 = -\frac{7}{5}$ | 11. $m_1 = -\frac{1}{2}, m_2 = -\frac{1}{2}$ | 12. $m_1 = -1, m_2 = 1$ |

SLOPES OF PERPENDICULAR LINES Lines j and n are perpendicular. The slope of line j is given. What is the slope of line n ? Check your answer.

- | | | | |
|-------------------|-------------------|--------------------|--------------------|
| 13. 2 | 14. 5 | 15. -3 | 16. -7 |
| 17. $\frac{2}{3}$ | 18. $\frac{1}{5}$ | 19. $-\frac{1}{3}$ | 20. $-\frac{4}{3}$ |

IDENTIFYING PERPENDICULAR LINES Find the slope of \overleftrightarrow{AC} and \overleftrightarrow{BD} . Decide whether \overleftrightarrow{AC} is perpendicular to \overleftrightarrow{BD} .



STUDENT HELP

HOMEWORK HELP

- Example 1: Exs. 7–20
- Example 2: Exs. 21–24, 33–37
- Example 3: Exs. 25–28, 47–50
- Example 4: Exs. 29–32
- Example 5: Exs. 38–41
- Example 6: Exs. 42–46

24 **USING ALGEBRA** Decide whether lines k_1 and k_2 are perpendicular. Then graph the lines to check your answer.

25. line $k_1: y = 3x$

line $k_2: y = -\frac{1}{3}x - 2$

27. line $k_1: y = -\frac{3}{4}x + 2$

line $k_2: y = \frac{4}{3}x + 5$

26. line $k_1: y = -\frac{4}{5}x - 2$

line $k_2: y = \frac{1}{5}x + 4$

28. line $k_1: y = \frac{1}{3}x - 10$

line $k_2: y = 3x$

25 **USING ALGEBRA** Decide whether lines p_1 and p_2 are perpendicular.

29. line $p_1: 3y - 4x = 3$

line $p_2: 4y + 3x = -12$

31. line $p_1: 3y + 2x = -36$

line $p_2: 4y - 3x = 16$

30. line $p_1: y - 6x = 2$

line $p_2: 6y - x = 12$

32. line $p_1: 5y + 3x = -15$

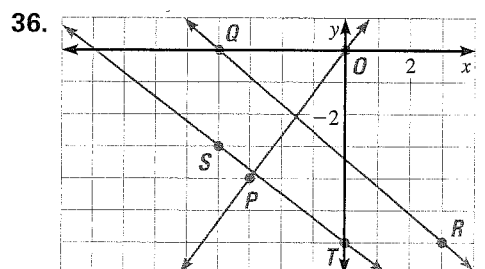
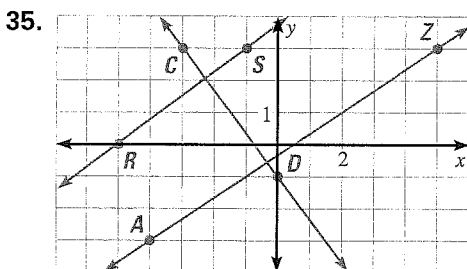
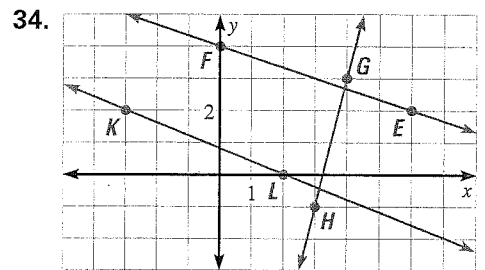
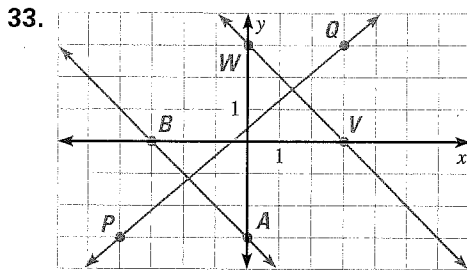
line $p_2: 3y - 5x = -33$

STUDENT HELP

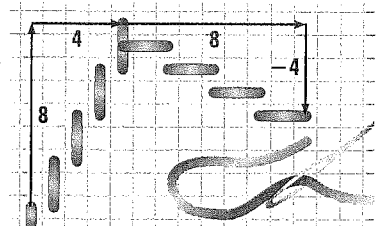


HOMWORK HELP
Visit our Web site
www.mcdougallittell.com
for help with Exs. 33–36.

LINE RELATIONSHIPS Find the slope of each line. Identify any parallel or perpendicular lines.



37. **NEEDLEPOINT** To check whether two stitched lines make a right angle, you can count the squares. For example, the lines at the right are perpendicular because one goes up 8 as it goes over 4, and the other goes over 8 as it goes down 4. Why does this mean the lines are perpendicular?



WRITING EQUATIONS Line j is perpendicular to the line with the given equation and line j passes through P . Write an equation of line j .

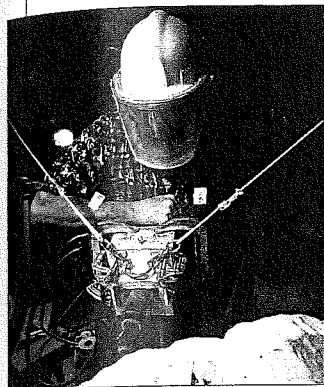
38. $y = \frac{1}{2}x - 1, P(0, 3)$

39. $y = \frac{5}{3}x + 2, P(5, 1)$

40. $y = -4x - 3, P(-2, 2)$

41. $3y + 4x = 12, P(-3, -4)$

FOCUS ON PEOPLE



HELAMAN FERGUSON'S stone drill is suspended by six cables. The computer uses the lengths of the cables to calculate the coordinates of the drill tip.

WRITING EQUATIONS The line with the given equation is perpendicular to line j at point R . Write an equation of line j .

42. $y = -\frac{3}{4}x + 6, R(8, 0)$

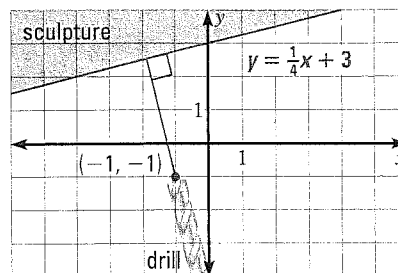
43. $y = \frac{1}{7}x - 11, R(7, -10)$

44. $y = 3x + 5, R(-3, -4)$

45. $y = -\frac{2}{5}x - 3, R(5, -5)$

46. **SCULPTURE** Helaman Ferguson designs sculptures on a computer. The computer is connected to his stone drill and tells how far he should drill at any given point. The distance from the drill tip to the desired surface of the sculpture is calculated along a line perpendicular to the sculpture.

Suppose the drill tip is at $(-1, -1)$ and the equation $y = \frac{1}{4}x + 3$ represents the surface of the sculpture. Write an equation of the line that passes through the drill tip and is perpendicular to the sculpture.



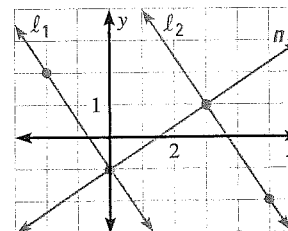
LINE RELATIONSHIPS Decide whether the lines with the given equations are *parallel, perpendicular, or neither*.

47. $y = -2x - 1$ 48. $y = -\frac{1}{2}x + 3$ 49. $y = -3x + 1$ 50. $y = 4x + 10$

$y = -2x - 3$ $y = -\frac{1}{2}x + 5$ $y = \frac{1}{3}x + 1$ $y = -2x + 5$

Test Preparation

51. **MULTI-STEP PROBLEM** Use the diagram at the right.

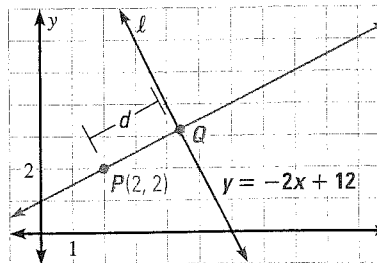


- Is $l_1 \parallel l_2$? How do you know?
- Is $l_2 \perp n$? How do you know?
- Writing* Describe two ways to prove that $l_1 \perp n$.

★ Challenge

DISTANCE TO A LINE In Exercises 52–54, use the following information.

The distance from a point to a line is defined to be the length of the perpendicular segment from the point to the line. In the diagram at the right, the distance d between point P and line l is given by QP .



- Find an equation of \overleftrightarrow{QP} .
- Solve a system of equations to find the coordinates of point Q , the intersection of the two lines.
- Use the Distance Formula to find QP .

EXTRA CHALLENGE

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