## Lesson 6-2

### Example 1

**Find the slope ($m_1$) of a line parallel to the given line and the slope ($m_2$) of a line perpendicular to the given line.**

**a.** The line containing points *A*(1, -2) and *B*(4, 0).

**b.** The line containing points *C*(3, -2) and *D*(-4, -2).

**c.** $x = 3$

### Solution

| | $m$ | $m_1$ | $m_2$ |
|---|---|---|---|
| **a.** | $\frac{0 - (-2)}{4 - 1} = \frac{2}{3}$ | $\frac{2}{3}$ | $-\frac{3}{2}$ |
| **b.** | $\frac{-2 - (-2)}{-4 - 3} = \frac{0}{-7} = 0$ | 0 | undefined |
| **c.** | undefined | undefined | 0 |

## Example 2

**Determine whether each pair of lines is *parallel*, *perpendicular*, or *neither*.**

**a.** $3x + y = 12$
$6y = 3x - 6$

**b.** $-2x + 6y = 3$
$3x - 9y = 15$

**c.** $4x - 3y = 6$
$3x - 4y = 4$

### Solution

Rewrite each equation in slope-intercept form and find the slope of each line.

**a.** $3x + y = 12$ □ $y = -3x + 12$ $m_1 = -3$

$6y = 3x - 6$ □ $y = \frac{1}{3}x - 1$ $m_2 = \frac{1}{3}$

$m_1 \neq m_2$

$m_1 \cdot m_2 = \frac{-3}{1} \cdot \frac{1}{3} = -1$

Because $m_1 \cdot m_2 = -1$, the lines are perpendicular.

**b.** $-2x + 6y = 3$ □ $y = \frac{1}{3}x + \frac{1}{2}$ $m_1 = \frac{1}{3}$

$3x - 9y = 15$ □ $y = \frac{1}{3}x - \frac{5}{3}$ $m_2 = \frac{1}{3}$

$m_1 = m_2$

Because $m_1 = m_2$, the lines are parallel.

**c.** $4x - 3y = 6$ □ $y = \frac{4}{3}x - 2$ $m_1 = \frac{4}{3}$

$3x - 4y = 4$ □ $y = \frac{3}{4}x - 1$ $m_2 = \frac{3}{4}$

$m_1 \neq m_2$

$m_1 \cdot m_2 = \frac{4}{3} \cdot \frac{3}{4} = 1$

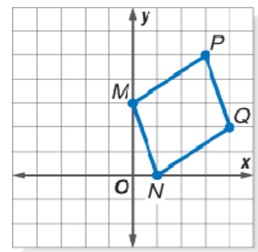
Because $m_1 \neq m_2$ and $m_1 \cdot m_2 \neq -1$, the lines are neither parallel nor perpendicular.

## Example 3

**ELECTRONICS** A manufacturer of circuit boards uses a grid system to insert connecting pins. The design for a board requires pins at points, $M(0, 3)$, $N(1, 0)$, $P(3, 5)$ and $Q(4, 2)$. When the pins are connected, will *MPQN* be a parallelogram?

### Solution

Plot the points and draw the quadrilateral Find the slope of $\overline{MP}$ and $\overline{NQ}$, and the slope of $\overline{MN}$ and $\overline{PQ}$.




$$m_{MP} = \frac{5 - 3}{3 - 0} = \frac{2}{3} \qquad m_{MN} = \frac{0 - 3}{1 - 0} = \frac{-3}{1} = -3$$

$$m_{NQ} = \frac{2 - 0}{4 - 1} = \frac{2}{3} \qquad m_{PQ} = \frac{5 - 2}{3 - 4} = \frac{3}{-1} = -3$$

Because the slopes of $\overline{MP}$ and $\overline{NQ}$ are the same, $\overline{MP}$ ॐ $\overline{NQ}$.

Because the slopes of $\overline{MN}$ and $\overline{PQ}$ are the same, $\overline{MN}$ ॐ $\overline{PQ}$.

Thus, opposite sides of the quadrilateral are parallel. Therefore, *MPQN* is a parallelogram.