Name _____ Class _____ Date _____

Reteaching 5-5

Parallel and Perpendicular Lines

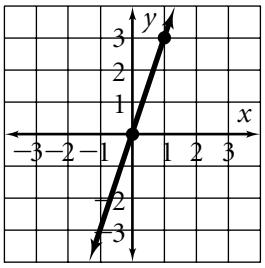
OBJECTIVE: Writing equations for parallel and perpendicular lines

MATERIALS: Graph paper and two items that can be used to represent lines such as pencils, straws, or coffee stirrers

Example

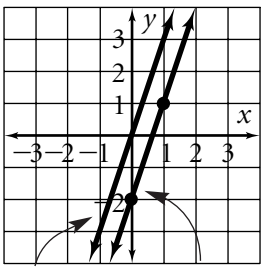
Write an equation for the line that is parallel to $y = 3x$, and contains $(0, -2)$. Then, write an equation for the line that is perpendicular to $y = 3x$ and contains $(0, -2)$.

On a piece of graph paper, draw a grid like the one shown below. Comparing $y = 3x$ to $y = mx + b$, we see that the line has y-intercept 0 and its slope is 3 or $\frac{3}{1}$. This means that the graph contains $(0, 0)$ and a point 3 units up and 1 unit right from there, $(1, 3)$. Place a pencil or other object on the grid that joins the points $(0, 0)$ and $(1, 3)$.



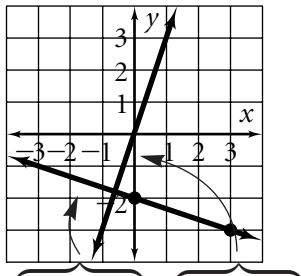
$y = 3x$

Place a second pencil on the grid so that it is parallel to the first pencil. Notice that you can move your second pencil to many other places on the grid and still have it parallel to your first pencil. Now, place your second pencil so that it contains $(0, -2)$, keeping it parallel to your first pencil. You have only one correct placement. Count units to verify that the slope of the line represented by your second pencil is also $\frac{3}{1}$ or 3. This line has slope $m = 3$ and y-intercept $b = -2$. So, its equation is $y = 3x - 2$.



$y = 3x$ $\quad$ $y = 3x - 2$

Leaving your first pencil in place, move the second pencil so that it is perpendicular to the first. Now, place your second pencil so that it contains $(0, -2)$, keeping it perpendicular to the first pencil. You have only one correct placement. Count units to verify that the slope of the line represented by your second pencil is $-\frac{1}{3}$. Recall that the product of the slopes of perpendicular lines is -1, so $3(-\frac{1}{3}) = -1$. This line has slope $m = -\frac{1}{3}$ and y-intercept $b = -2$. So, its equation is $y = -\frac{1}{3}x - 2$.



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

Exercises

Follow the steps above to find an equation of the line parallel to the given line that contains the given *y*-intercept. Then find an equation of the line perpendicular to the given line that contains the given *y*-intercept.

1. $y = 5x; (0, -1)$

2. $y = -3x; (0, 4)$

3. $y = 2x + 1; (0, -3)$

4. $y = -\frac{1}{4}x - 2; (0, 2)$

5. $y = \frac{1}{2}x + 2; (0, -1)$

6. $y = -\frac{1}{2}x; (0, 2)$

7. $y = -3x - 1; (0, 2)$

8. $y = \frac{2}{3}x + 1; (0, -2)$

9. $y = 3x - 4; (0, 6)$

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