Key

Math 1

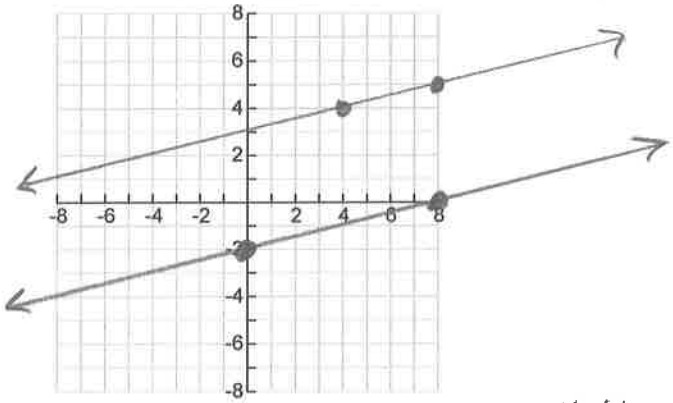
Name_____

5-2 Parallel and Perpendicular Lines

Date_____

- I can find the equation of a line parallel to another line through a given coordinate.
- I can find the equation of a line perpendicular to another line through a given coordinate.

1. *On the below coordinate plane, graph the following:*
   line (1): a line that passes through the points (4, 4) and (8, 5)
   line (2): a line that passes through the points (0, -2) and (8, 0)
   (be sure to extend the lines in both directions – so they are *lines*, not *line segments*)



2. How does it look like these lines are related? They are parallel!

3. Use the given points in number (1) to find the slope of line 1 and the slope of line 2. Write them below. What do you notice?

Slope of line 1

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5-4}{8-4} = \boxed{\frac{1}{4}}$

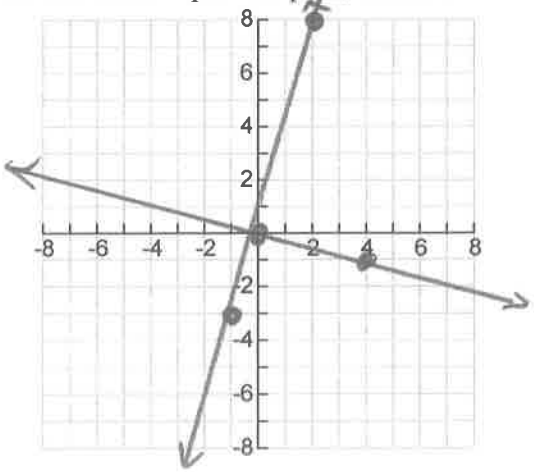
Slope of line 2

$\frac{0-2}{8-0} = \frac{2}{8} = \boxed{\frac{1}{4}}$

4. Fill in the blanks of the below statement:

   If two lines are Parallel, then their slopes will be equal (the same).

5. *On the below coordinate plane, graph the following:*
   line (3): a line that passes through the points (-1, -4) and (2, 8)
   line (4): a line that passes through the points (0, 0) and (4, -1)
   (be sure to extend the lines in both directions – past the point of intersection in both directions)



6. How does it look like these lines are related? ~~How see for number (2)~~

They appear to be perpendicular.

7. Use the given points in number (5) to find the slope of line 3 and line 4. What do you notice?

Slope of line 1 $m = \frac{8-(-4)}{2-(-1)} = \frac{12}{3} = \boxed{4}$

Slope of line 2 $m = \frac{-1-0}{4-0} = \boxed{\frac{-1}{4}}$

8. Multiply (slope of line 3) · (slope of line 4).

$4 \cdot \frac{-1}{4} = \boxed{-1}$

9. The following two functions are perpendicular (graph them on your calculator to check). Multiply their slopes. What do you get (again)?

$f(x) = -\frac{1}{8}x - 6$ $\quad$ $g(x) = 7 + 8x$

$-\frac{1}{8} \cdot \frac{8}{1} = \boxed{-1}$

10. Fill in the blanks of the below statement:

If two lines are perpendicular, then the product of their slopes will be -1.

This means that their slopes are ***opposite reciprocals***.

Point-slope: $y - y_1 = m(x - x_1)$ diff signs ↘ numerator + denominator flipped

Example: Find the equation of the line in both point – slope and slope – intercept form that passes through the point (4, 8) and is perpendicular to the line $y = \frac{3}{4}x - 12$

Point-slope:

$\boxed{y - 8 = \frac{-4}{3}(x-4)}$

Slope is opp reciprocal to $\frac{3}{4}$

So, $m = -\frac{4}{3}$

Slope-intercept: $y = \frac{-4}{3}x + \frac{16}{3} + 8 \rightarrow \boxed{y = -\frac{4}{3}x + \frac{40}{3}}$

11. Find the equation of a line in both point – slope and slope – intercept form that passes through the point (6, 10) and is ~~perpendicular~~ parallel to the line that passes through the points (2, 6) and (8, 12).

Line through (2,6) + (8,12):

$m = \frac{12-6}{8-2} = \frac{6}{6} = 1$

Parallel slope = 1

Point-slope:

$\boxed{y - 10 = 1(x-6)}$

Slope-intercept:

$y = x - 6 + 10$

$\boxed{y = x + 4}$

Practice:

1. Find the slope of all lines parallel to $y = 3 - 4x$

$m = -4$

2. Find the slope of all lines perpendicular to $y = \frac{5}{8}x + 2$

$m = -\frac{8}{5}$

3. Find the equation of the line that is parallel to $y = 2x - 6$ and passes through the point (4, 8).

$m = 2$

$\parallel\ m = 2$

$y - 8 = 2(x - 4)$

$y = 2x - 8 + 8$

$\boxed{y = 2x}$

4. Find the equation of the line that is parallel to $y = \frac{3}{4} - \frac{2}{3}x$ and passes through the point (5, 8).

$m = -\frac{2}{3}$

$\parallel\ m = -\frac{2}{3}$

$y - 8 = -\frac{2}{3}(x - 5)$

$y = -\frac{2}{3}x + \frac{10}{3} + 8$

$\boxed{y = -\frac{2}{3}x + \frac{34}{3}}$

5. Find the equation of the line that is perpendicular to $y = 7 - 2x$ and passes through the point (6, -3).

$m = -2$

$\perp\ m = \frac{1}{2}$

$y + 3 = \frac{1}{2}(x - 6)$

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

$\boxed{y = \frac{1}{2}x - 6}$

6. Find the equation of the line that is perpendicular to $y = \frac{3}{4}x - 6$ and passes through the point (-4, 5).

$m = \frac{3}{4}$

$\perp\ m = -\frac{4}{3}$

$y - 5 = -\frac{4}{3}(x + 4)$

$y = -\frac{4}{3}x - \frac{16}{3} + 5$

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

7. The slope of a line is 4, and the line passes through the points (5, 8) and (***a***, 6). Find *a*.

$4 = \frac{6 - 8}{a - 5} = \frac{-2}{a - 5}$

$(a-5)\cdot 4 = \frac{-2}{a-5}\cdot(a-5)$

$4(a - 5) = -2$

$4a - 20 = -2$

$4a = 18$

$a = \frac{18}{4} = \boxed{4.5}$

8. If the slope of a line is $\frac{2}{3}$ and the line passes through the points (***a***, 3) and (6, ***b***). Find *a* and *b*.

$\frac{2}{3} = \frac{b - 3}{6 - a}$

$b - 3 = 2$

$\boxed{b = 5}$

$6 - a = 3$

$-a = -3$

$\boxed{a = 3}$

There are unlimited possibilities for what a + b can equal.