

Geometry  
Parallel & Perpendicular Lines

Name: Key Date: \_\_\_\_\_

WARM-UP: What do you remember about slope?

Slope intercept form:  $y = mx + b$  \*remember: m is the slope and b is the y-intercept

What is the slope of the following equations? (you might need to solve for y first!)

a.  $y = 4x + 3$

$m = 4$

b.  $y + 3x = 4$

$-3x -3x$

$y = -3x + 4$

$m = -3$

c.  $2y - 5x = 12$

$5x 5x$

$\frac{2y}{2} = \frac{5x+12}{2}$

$y = \frac{5}{2}x + 6$

$m = \frac{5}{2}$

Slope between two points: Slope formula:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

\*remember: when you divide by 0, the slope is undefined

Find the slope between the following points:

a.  $(3, 5) (6, 9)$

$m = \frac{9-5}{6-3}$

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

b.  $(-3, 4) (2, 8)$

$m = \frac{8-4}{2-(-3)}$

$m = \frac{4}{5}$

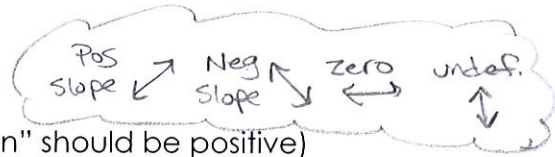
c.  $(7, 5) (7, -1)$

$m = \frac{-1-5}{7-7} = \frac{-6}{0}$

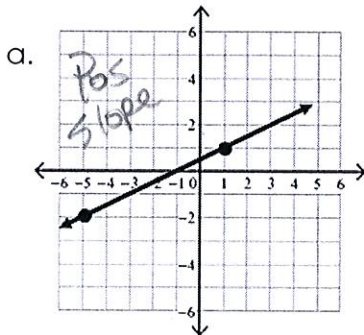
$m = \text{undefined}$

Slope on a graph: Slope:  $\frac{\Delta y}{\Delta x}$  or  $\frac{\text{rise}}{\text{run}}$  \*start with point on left

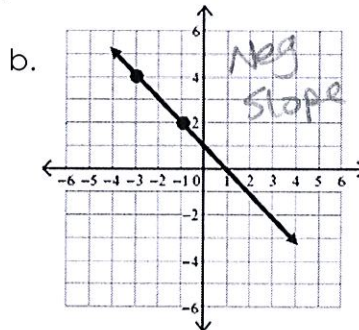
\*ALWAYS count from left to right. ("Run" should be positive)



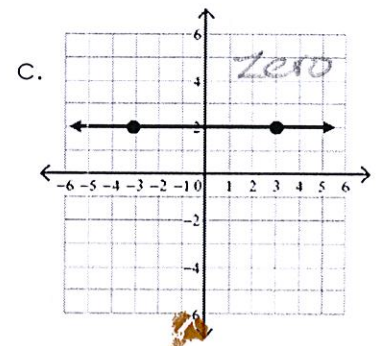
Find the slope from the following graphs:



$m = \frac{\text{Rise}}{\text{Run}} = \frac{3}{6} = \frac{1}{2}$



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



$m = 0$

## Parallel Lines

• **Graphs:**

- Lines never intersect and are in the same plane.

• **Equations:**

- same slopes
- different y - intercepts

Are these lines parallel?

1.  $y = -2x + 1$  and  $y = -2x - 4$

yes, they have the same slope.

2.  $y = 3x - 4$  and  $-x + 3y = 9$

Not Parallel  
-different slopes

$\frac{3y}{3} = \frac{x+9}{3}$   
 $y = \frac{1}{3}x + 3$

**Writing an Equation of a Line PARALLEL to another and given a point.**

- A. Given equation should be solved for y ( $y = mx + b$ ).
- B. Write down the slope of that line.
- C. Substitute m and (x, y) in  $y = mx + b$ . Solve for b.
- D. Write the equation using the slope and y-intercept.

3. Write a line parallel to the line  $2x + y = 3$  and passes through the point  $(-2, 5)$ .

A.  $2x + y = 3$   
 $y = -2x + 3$

B.  $m = -2$   
 $//m = -2$

C.  $5 = -2(-2) + b$   
 $5 = 4 + b$   
 $1 = b$

D.  $y = -2x + 1$

4. Write a line parallel to the line  $y = 3x - 5$  and passes through the point  $(-5, -2)$ .

A.  $y = 3x - 5$

B.  $m = 3$   
 $//m = 3$

C.  $-2 = 3(-5) + b$   
 $-2 = -15 + b$   
 $+15 \quad +15$   
 $13 = b$

D.  $y = 3x + 13$

5. Write a line parallel to the line  $y = -4x + 1$  and passes through the point  $(2, -1)$ .

A.  $y = -4x + 1$

B.  $m = -4$   
 $//m = -4$

C.  $-1 = -4(2) + b$   
 $-1 = -8 + b$   
 $+8 \quad +8$   
 $7 = b$

D.  $y = -4x + 7$

6. Write a line parallel to the line  $y = -x - 7$  and passes through the point  $(-4, -4)$ .

A.  $y = -x - 7$

B.  $m = -1$   
 $//m = -1$

C.  $-4 = -1(-4) + b$   
 $-4 = 4 + b$   
 $-4 \quad -4$   
 $-8 = b$

D.  $y = -x - 8$

## Perpendicular Lines

- Graphs:

- Lines intersect at a right angle.

*change sign + flip*

- Equations:

- opposite reciprocal slopes

$3, -\frac{1}{3}$

$-12, \frac{1}{12}$

- different y - intercepts

$-\frac{4}{3}, \frac{5}{4}$

### Writing an Equation of a Line PERPENDICULAR to another and given a point.

- Given equation should be solved for y. ( $y = mx + b$ ).
- Write down the perpendicular slope of that line.
- Substitute the new slope and (x, y) in  $y = mx + b$ . Solve for b.
- Write the equation using m and b.

7. Write a line perpendicular to the line  $y = \frac{1}{2}x - 2$  and passes through the point  $(1, 0)$ .

A.  $y = \frac{1}{2}x - 2$   
 $m = \frac{1}{2}$

B.  $\perp m = -2$

C.  $0 = -2(1) + b$   
 $0 = -2 + b$   
 $2 = b$

D.  $y = -2x + 2$

8. Write a line perpendicular to the line  $y = -3x + 2$  and passes through the point  $(6, 5)$ .

A.  $y = -3x + 2$   
 $m = -3$

B.  $\perp m = \frac{1}{3}$

C.  $5 = \frac{1}{3}(6) + b$   
 $5 = 2 + b$   
 $3 = b$

D.  $y = \frac{1}{3}x + 3$

9. Write a line perpendicular to the line  $2x + 3y = 9$  and passes through the point  $(6, -1)$ .

A.  $2x + 3y = 9$   
 $\frac{3y}{3} = \frac{-2x + 9}{3}$   
 $y = -\frac{2}{3}x + 3$

B.  $\perp m = \frac{3}{2}$

C.  $-1 = \frac{3}{2}(6) + b$   
 $-1 = 9 + b$   
 $-9 - 9$   
 $-10 = b$

D.  $y = \frac{3}{2}x - 10$

10. Write a line perpendicular to the line  $y = 2x - 1$  and passes through the point  $(2, 4)$ .

A.  $y = 2x - 1$   
 $m = 2$

B.  $\perp m = -\frac{1}{2}$

C.  $4 = -\frac{1}{2}(2) + b$   
 $4 = -1 + b$   
 $5 = b$

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