

## Section 1.2: Slope of a line

### Essential Question:

- ① How do you find slope?
- ② What are the 4 types of slope?

### SLOPE

- Measures steepness of a line in relation to the x-axis

- Slope =  $\frac{\text{change in } y}{\text{change in } x} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$  symbol slope = m

- Slope is constant (same value) between any 2 points

### Examples

Find the slope of the line passing through the given points.

1)  $\begin{matrix} x_1 & y_1 & x_2 & y_2 \\ (2, -4) & & (8, 3) & \end{matrix}$

$$m = \frac{-4 - 3}{2 - 8} = \frac{-7}{-6} = \frac{7}{6} \quad \begin{matrix} \text{rise } \uparrow \\ \text{run } \rightarrow \end{matrix}$$

2)  $\begin{matrix} x & y & x & y \\ (-1, 5) & & (3, 0) & \end{matrix}$

$$m = \frac{5 - 0}{-1 - 3} = \frac{5}{-4} = \frac{-5}{4} \quad \begin{matrix} \text{rise } \downarrow \\ \text{run } \rightarrow \end{matrix}$$

3)  $\begin{matrix} x & y & x & y \\ (4, 2) & & (4, -3) & \end{matrix}$

$$m = \frac{2 - (-3)}{4 - 4} = \frac{5}{0} = \text{undefined or NO slope}$$

4)  $\begin{matrix} x & y & x & y \\ (3, -1) & & (-4, -1) & \end{matrix}$

$$m = \frac{-1 - (-1)}{3 - (-4)} = \frac{0}{7} = 0$$

### SLOPE-INTERCEPT FORM

$$y = mx + b \quad \text{or}$$

$$y = mx + k$$

$$m = \text{slope}$$

$$b = \text{y-intercept}$$

### Example 5

What is the slope and y-intercept of  $5x + 3y = -8$ ?

1st change to  $y = mx + b$   
Slope - intercept form

2nd write as...

$$m =$$

$$b =$$

$$\begin{aligned} 5x + 3y &= -8 \\ -5x & \quad -5x \\ \hline 3y &= -5x - 8 \\ \frac{3y}{3} &= \frac{-5x}{3} - \frac{8}{3} \\ y &= \frac{-5}{3}x - \frac{8}{3} \end{aligned}$$

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

$$b = \frac{-8}{3}$$

Parallel Lines: have equal slopes, never intersect

Perpendicular Lines: slopes are opposite reciprocals, intersect @  $90^\circ$

Ex: If line A and line B are perpendicular and line A has  $m = -2$  then line B has  $m = \boxed{+\frac{1}{2}}$   
 $m = \frac{-2}{1}$  opposite = +  
reciprocal  $\rightarrow$  flip

Example 6  
Which lines are parallel? Perpendicular? Or neither?

Line A  
 $y = \frac{3}{4}x + 5$   
 $m = \frac{3}{4}$

Line B  
 $4x + 3y = 3$   
 $3y = -4x + 3$   
 $y = -\frac{4}{3}x + 1$   
 $m = -\frac{4}{3}$

Line C  
 $3x - 4y = 5$   
 $-4y = -3x + 5$   
 $y = \frac{3}{4}x + -\frac{5}{4}$   
 $m = \frac{3}{4}$

$A \parallel C$  (same slope)  
 $A \perp B$   
 $B \perp C$  } slopes are opposite reciprocals

Section 1.2 Summary:

EQ1) Find slope using  $m = \frac{y_1 - y_2}{x_1 - x_2}$

