Writing Equations of Lines Given Slope & a Point

So far in Unit 5, you have been able to determine the y-intercept from either a graph or an equation in slope intercept form. How will you find the y-intercept or equation of a line without a graph or equation? You can use the slope intercept form or point slope form to find the y-intercept or equation of a line if you know the slope and a point on the line.

Method 1: Writing Equations Using Slope Intercept Form: $y = mx + b$	Method 2: Writing Equations Using Point Slope Form: $(y - y_1) = m(x - x_1)$
1. Write the formula: $y = mx + b$.	
2. Substitute the value of the slope in for m and the value of the point in for x and y.	1. Write the formula: $(y - y_1) = m(x - x_1)$
3. Solve the equation for b.	2. Substitute the value of the slope in for m and the value of the point in for x_1 and y_1.
4. Substitute the value of m and the newly founded b into the formula: $y = mx + b$.	3. Solve the equation for y

Ex 1: Write the equation of a line if $m = 9$ and passes through the point $(2, 11)$.

Method 1:

1.) $y = mx + b$

2.) $11 = 9(2) + b$

3.) $11 = 18 + b$
$\quad -18 \quad -18$
$\overline{\quad -7 = b \quad}$

4.) $m = 9 \quad b = -7$

$\boxed{y = 9x - 7}$

Method 2:

1.) $(y - y_1) = m(x - x_1)$

2.) $(y - 11) = 9(x - 2)$

3.) $y - 11 = 9x - 18$
$\quad +11 \qquad +11$
$\boxed{y = 9x - 7}$

Ex 2: Write the equation of a line with $m = -8$ and passes through the point $(3, 12)$.

Method 1:

1.) $y = mx + b$

2.) $12 = -8(3) + b$

3.) $12 = -24 + b$
$\quad +24 \quad +24$
$\overline{\quad 36 = b \quad}$

4.) $m = -8 \quad b = 36$

$\boxed{y = -8x + 36}$

Method 2:

1.) $(y - y_1) = m(x - x_1)$

2.) $(y - 12) = -8(x - 3)$

3.) $y - 12 = -8x + 24$
$\quad +12 \qquad +12$
$\boxed{y = -8x + 36}$

Ex 3: Write the equation of a line with $m = 4$ and passing through the point $(2, 5)$.

Method 1:

1.) $y = mx + b$

2.) $5 = 4(2) + b$

3.) $5 = 8 + b$
$\quad -8 \quad -8$
$\overline{\quad -3 = b \quad}$

4.) $m = 4 \quad b = -3$

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

Method 2:

1.) $(y - y_1) = m(x - x_1)$

2.) $(y - 5) = 4(x - 2)$

3.) $y - 5 = 4x - 8$
$\quad +5 \qquad +5$
$\boxed{y = 4x - 3}$

Applications of Slope Intercept Form

Y	=	M	X	+	B
Output		Slope	Input		Y-intercept (0, b)
Dependent Variable		Rate	Independent Variable		Starting Amount One Time Fee
Range		$\frac{change\ in\ y}{change\ in\ x}$	Domain		

When a problem involves a **constant rate or speed and a beginning amount**, it can be written using slope intercept form. You need to recognize which value is the slope and which is the y-intercept.

(b)

Example 1: Suppose you receive $100 for a graduation present, and you deposit it into a savings account. Then each week after that, you add $20 to your savings account.

(x) (m)

Complete the following (some may need to be calculated):

Independent Quantity: (x) weeks

Dependent Quantity: (y) # in savings

Slope: (m) #20

Y-intercept: (b) #100

Equation: $y = mx + b$

$y = 20x + 100$

When will you have $460?

* plug 460 in for y

$$y = 20x + 100$$
$$460 = 20x + 100$$
$$-100 \qquad -100$$
$$\frac{360}{20} = \frac{20x}{20}$$
$$18 = x$$
weeks

When a word problem involves a **constant rate or speed and gives a relationship at some point in time between each variable**, you need to use y = mx + b to find the b value/y-intercept to create an equation to model the relationship.

(m) x y

Example 2: Marty is spending money at an average rate of $3 per day. After 14 days, he has $68 left. How much money did he begin with?

(b)

Complete the following (some may need to be calculated):

Independent Quantity: (x) 14 days

Dependent Quantity: (y) # left — #68

Slope: (m) $3

Y-intercept: (b) ?

Point(s): $(14, 68)$

Equation: $y = mx + b$ $y = 3x + 26$

$$68 = 3(14) + b$$
$$68 = 42 + b$$
$$-42 \qquad -42$$
$$26 = b$$

→ # began with

After 6 days, how much money does he have remaining?

* plug 6 in for x

$$y = 3x + 26$$
$$y = 3(6) + 26$$
$$y = 18 + 26 = \$44$$