Notes: Point-Slope Form

Part 1: Recap Your 6.3 Notes....

- What kind of function best represents the path of each ditch digger?

A LINEAR FUNCTION

- Every function is based on an equation that represents all of the equation's solutions.

- Describe some aspects of the first ditch digger's path.
  - Constant rate: change in y for every two x's: $m = \frac{1}{2}$
  - Linear!
  - y-intercept: (0,2) → starting point

So one way we can write an equation of a line is by creating an equivalent equation with the slope formula.

Using the formula for slope to make the equation for a linear function

- *Slope formula*
  - $m = \frac{y_2 - y_1}{x_2 - x_1}$
- *Substitute the slope of ditch digger 1*
  $m = \frac{1}{2}$
  - $\frac{1}{2} = \frac{y_2 - y_1}{x_2 - x_1}$
- *Get this formula in function form. (Get $y_2 - y_1$ by itself)*
  - $(x_2 - x_1) \cdot \frac{1}{2} = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x_2 - x_1)$
- *Equation*
  - $(x_2 - x_1)\frac{1}{2} = y_2 - y_1$

x_1, y_1
$(6, 5)$

Part 2: Point-Slope Form

Point-Slope Form: *how an equation can be written if one point on the line is known and the slope is known.* $\frac{1}{2}$

where...

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

(x_1, y_1) ← coord of known point

m ← slope of line

$$y - 5 = \frac{1}{2}(x - 6)$$

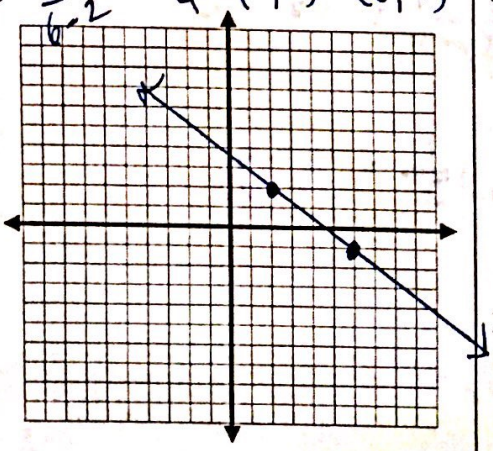
Find the equation for the line that represents the path of the *second ditch digger.*

- Slope:
- Given the ordered pairs the line goes through, how many different equations can we write to represent the line that contains them? *6: one for each ordered pair.*
- Points:

	Point	*Using the slope and point, write the equation of the line in point-slope form*
Day 0		
Day 1		
Day 2		
Day 3		
Day 4		
Day 5		

Write two equations in point-slope form for the graphed line.

$m = \frac{-1-2}{6-2} = -\frac{3}{4}$ (2,2) (6,-1)



(2,2) $y - y_1 = m(x - x_1)$

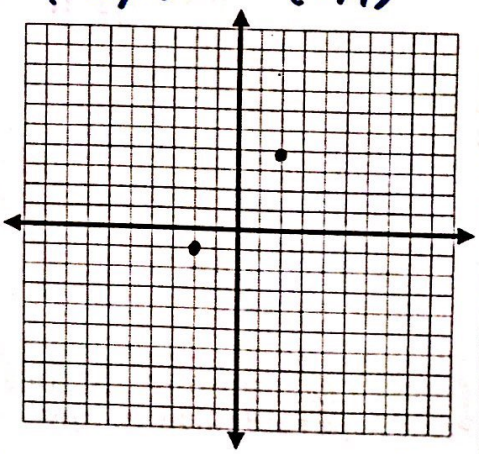
$y - 2 = -\frac{3}{4}(x - 2)$

(-1,6)

$y + 1 = -\frac{3}{4}(x - 6)$

1. *Calculate the slope*
   a. *Use the formula*
   b. *Or count: start with point on left, and find the slope using rise over run.*
2. *Choose the coordinates of one of the points the line goes through.*
3. *Substitute the slope and the point into the point-slope form.*

x_1, y_1 (-2,1) x_2, y_2 (2,4)



1) $m = \frac{4-1}{2-2} \rightarrow \frac{3}{4} = m$

2). (x_1, y_1 -2,1) OR (x_1, y_1 2,4)

$y - 1 = \frac{3}{4}(x - 2)$ OR $y - 4 = \frac{3}{4}(x - 2)$

$y - 1 = \frac{3}{4}(x + 2)$

$y - 4 = \frac{3}{4}(x - 2)$

How to find the equation of a line between two points: *Write in Point-Slope Form*

Ex 1: $(-6,-6)$, $(2,-2)$

x_1, y_1 x_2, y_2

$m = \frac{-2+6}{2+6} = \frac{4}{8}$

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

1. *Calculate the slope*

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2. *Choose one of the two points*

3. *Substitute the slope and the coordinates of the chosen point into point-slope form.*

$(-6,-6)$

Equation 1:

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

OR

$(2,-2)$

Equation 2:

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

Ex 2: $(1,7)$, $(2,3)$

x_1, y_1 x_2 y_2

$m = \frac{3-7}{2-1} = \frac{-4}{1}$

$m = -4$

x_1, y_1

$(1,7)$

Equation 1:

$y - 7 = -4(x-1)$

OR

x_1, y_1

$(2,3)$

Equation 2:

$y - 3 = -4(x-2)$

$f(x) = y$

How to find the equation of a line using function form: *Write in Point-Slope Form*

Ex 3: $f(-1) = -4 \rightarrow (-1,-4)$ (x_1, y_1)

$f(6) = 10 \rightarrow (6,10)$ (x_2, y_2)

$m = \frac{10 - -4}{6 - -1} = \frac{14}{7}$

$m = 2$

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

Equation 1:

$(-1,-4)$ (x, y)

$y + 4 = 2(x+1)$

OR

Equation 2:

$(6,10)$

$y - 10 = 2(x-6)$

1. *Interpret the function form as ordered pairs (x, y)*

f(x) = y

Rewrite function form as two ordered pairs.

2. *Calculate slope using the coordinates and the formula for slope.* $m = \frac{y_2 - y_1}{x_2 - x_1}$

3. *Choose the coordinates of one point.*

4. *Substitute the slope calculated and the coordinates of the point into point-slope form.*

Ex 4: $f(3) = 4$ $(3,4)$ (x_1, y_1)

$f(-6) = 16$ $(-6,16)$ (x_2, y_2)

$f(x) = y$

$m = \frac{16-4}{-6-3} = \frac{12}{-9} \rightarrow \frac{-4}{3}$

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

x_1, y_1

$(3,4)$

Equation 1:

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

OR

x_1, y_1

$(-6,16)$

Equation 2:

$y - 16 = -\frac{4}{3}(x - -6)$

$y - 16 = -\frac{4}{3}(x+6)$

Using point-slope form to model

1. Toni is finishing a scarf at a constant rate. The table shows the number of hours Toni has spent knitting this week and the corresponding number of rows in the scarf.

Hours	x_1 2	x_2 4	6
Rows of Knitting	38 (y_1)	44 (y_2)	50

a. Identify the independent and dependent variables; identify which one is x and which one is y.

x : hours

y : rows of knitting

b. Find the rate of change from the table's data.

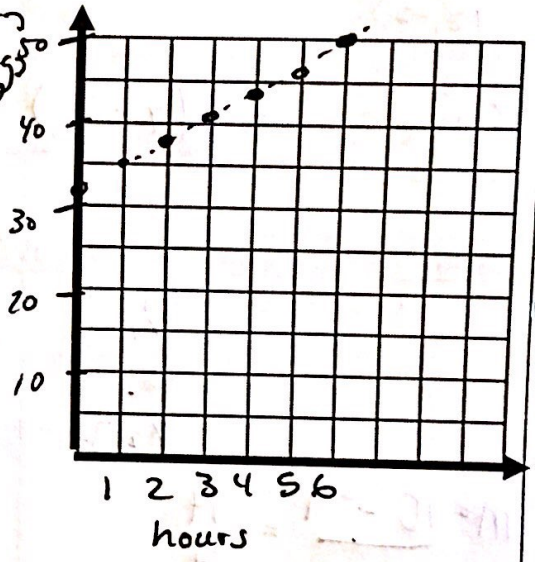
(2, 38) (x_1 y_1)
(4, 44) (x_2 y_2)

$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow m = \frac{44-38}{4-2} = \frac{6}{2} = 3$

c. Write an equation in point-slope form representing the line.

$m = 3$

(2, 38): $y - 38 = 3(x-2)$ or (4, 44): $y - 44 = 3(x-4)$ or (6, 50): $y - 50 = 3(x-6)$



d. Use the equation to find the total rows if Toni knitted for 9 hours.

$y - 38 = 3(9-2)$
$y - 38 = 3(7)$
$y - 38 = 21$
$+38 \quad +38$
$y = 59$ rows

e. What does the y-intercept of the function represent?

THE y-INTERCEPT REPRESENTS THE NUMBER OF ROWS TONI HAD AT THE BEGINNING OF THE WEEK.

Exit Ticket: What do you know about the graph of a line if its written in point-slope form?