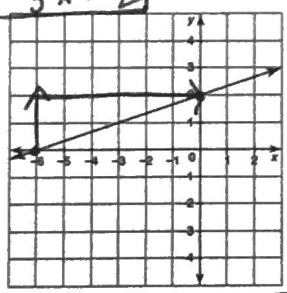
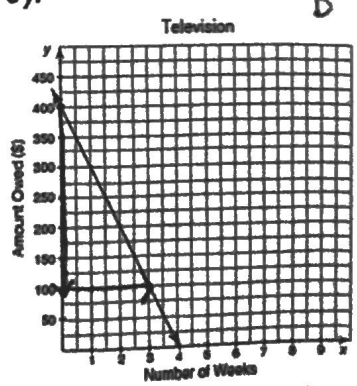
Foundations of Algebra
Unit 5 – Linear Functions

Name: KEY
Date: _____ Block: _____

Unit 5 – Linear Functions Study Guide

1. Draw Mr. Slope Man	Slopes: Positive, Negative, Undefined, Zero		
2. Calculate the slope	"rate of change" "m" in y=mx+b $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\frac{change\ in\ y}{change\ in\ x}$ $\frac{rise}{run}$	a. Calculate the slope. Then write the equation of the line. $y = \frac{1}{3}x + 2$  $\frac{up\ 2}{right\ 6} = \frac{+2}{+6} = \frac{+1}{+3} = m$ $b = 2$	b. Calculate the average rate of change (slope) between the following points on a line. $x_1\ y_1 \quad x_2\ y_2$ (0, 4) & (-3, 10) $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10-4}{-3-0} = \frac{6}{-3}$ $m = -2$
		c. Calculate the slope. Give a labeled answer. x y Number of Balloons / Total Cost of Balloons (in Dollars) 2 x_1 / 6 y_1 4 x_2 / 12 y_2 6 / 18 8 / 24 $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{12-6}{4-2} = \frac{6}{2}$ $m = 3$	d. Calculate the slope. Then write the equation of the line. The intercepts are (0,400) and (4, 0). b  $m = \frac{rise}{run} = \frac{down\ 300}{right\ 3} = \frac{-300}{+3}$ $m = -100$ $y = -100x + 400$

replaced with Matty?

3. Calculate the y-intercept	Point where graph crosses y-axis "b" in y=mx+b (0, b) "starting point, flat fee, initial fee"	a. Name the y-intercept: when $x=0$ | x	0	1	3	4
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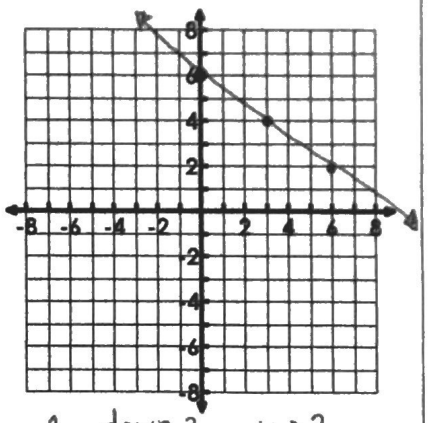
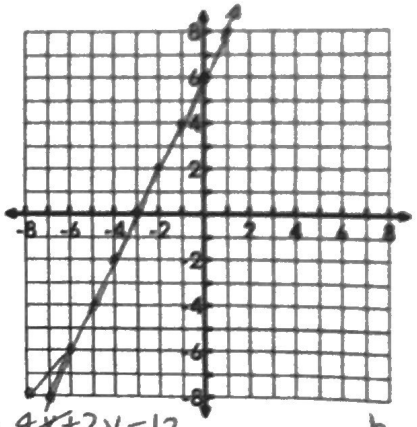
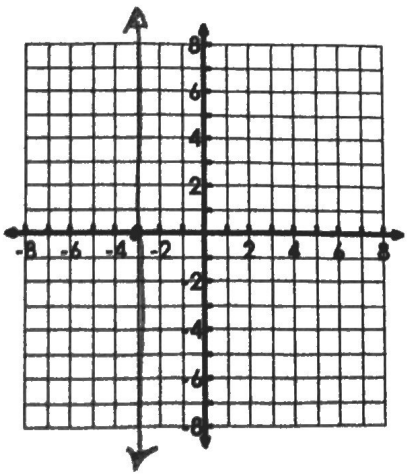
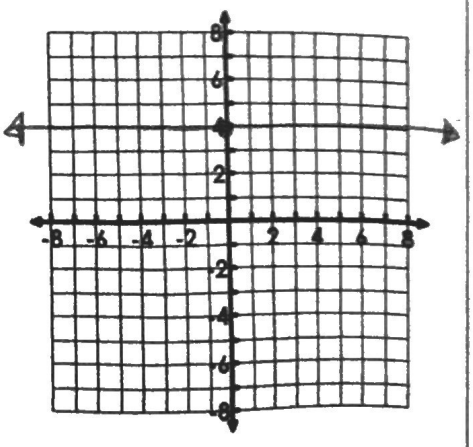
y	8	6	2	0	 $b=8$	b. A photography studio charges $50 that includes a sitting fee and 6 prints. Luigi increased his order to 11 prints and paid $65. How much was the sitting fee? $y=-3x+b$ $68=-3(14)+b$ $68=-42+b$ $\$110=b$
4. Graph a linear function	$y = mx + b$ 1. Graph y-intercept (0,b) 2. Use slope (m) to determine next point(s) 3. Connect dots to draw a line!	a. Graph: $y=-\frac{2}{3}x+6$ Name slope & y-intercept.  $m=-\frac{2}{3}$ down 2 right 3 OR up 2 left 3 $b=6 \Rightarrow (0,6)$	b. Graph: $-4x+2y=12$ Name slope & y-intercept.  $-4x+2y=12$ $+4x \quad +4x$ $\frac{2y}{2}=\frac{12}{2}+\frac{4x}{2}$ $y=6+2x$ b: 6, m: 2
		c. Graph $x=-3$ Name slope & y-intercept.  m = undefined b = 0	d. Graph $y=4$ Name slope & y-intercept.  m = 0 b = 4

5. Convert from standard to slope intercept form & Slope intercept form to standard form	Slope Intercept Form: $y = mx + b$ Standard Form: $Ax + By = C$ "A" in Ax cannot be negative	a. Solve for y. Determine the slope & y-intercept: $4x + 2y = 8$ $-4x \quad -4x$ $\frac{2y}{2} = \frac{8}{2} - \frac{4x}{2}$ $y = 4 - 2x$ OR $y = -2x + 4$ $m = \frac{-2}{1} \quad b = 4$	b. $y = 2x + 4$ $-2x \quad -2x$ $y - 2x = 4$ → *cannot be negative OR $\frac{-2x}{-1} + \frac{y}{-1} = \frac{4}{-1}$ $2x - y = -4$
6. Write the equation of a line	$y = mx + b$	a. Write the equation of the line that has a slope of $-\frac{1}{2}$ and contains the point (4, 6). $y = mx + b$ $6 = -\frac{1}{2}(4) + b$ $6 = -\frac{4}{2} + b$ $6 = -2 + b$ $+2 \quad +2$ $8 = b$ $y = -\frac{1}{2}x + 8$	b. Write the equation of the line that contains the points (-2, 2) and (2, -6). $m = \frac{-6-2}{2-(-2)} = \frac{-8}{4} = -2$ $2 = -2(-2) + b$ $2 = 4 + b$ $-4 \quad -4$ $-2 = b$ $y = -2x - 2$
		c. Write the equation of the line that has a slope of 5 and y-intercept at (0, 3). $y = mx + b$ $3 = 5(0) + b$ $3 = 0 + b$ $3 = b$ $y = 5x + 3$	d. Write the equation of the line the corresponds to the following table: $y = \frac{2}{3}x + \frac{22}{3}$ $m = \frac{-4-(-6)}{5-2} = \frac{2}{3}$ $0 = \frac{2}{3}(11) + b \quad b = \frac{22}{3}$
7. Determine x and y intercepts	<u>x-intercept(s):</u> -where the graph crosses the x-axis -where y=0 - (a, 0) <u>y-intercept(s):</u> -where the graph crosses the y-axis -where x=0 -(0, b)	a. Determine the x-intercept and y-intercept. (0, 5) y-intercept (-7, 0) x-intercept	b. Determine the x-intercept and y-intercept. (0, -2) y-intercept (-4, 0) x-intercept

x	2	5	8	11
y	-6	-4	-2	0

8. Determine x and y intercepts without a graph.		a. What are the x and y intercepts for the equation $2x + 3y = 48$? x-intercepts: $y = 0$ $2x = 48$ → $x = 24$ y-intercepts: $x = 0$ $0 + 3y = 48$ → $y = 16$	b. What are the x and y intercepts for the equation $3x - 6y = 24$? x-intercepts: $y = 0$ $3x = 24$ → $x = 8$ y-intercepts: $x = 0$ $0 - 6y = 24$ → $y = -4$
9. Creating & Solving Equations from a Word Problem	Standard Form: $Ax + By = C$ *Total *Two different amounts Slope Intercept Form: $y = mx + b$ *Rate *Starting Amount/ One Time Fee	a. Ed has \$36 to buy paints and brushes for a school project. Jars of paint cost \$4 each. The brushes are \$2 each. Write an equation to determine the combination of brushes and paint he can buy. If he buys 3 jars of paint, how many brushes can he buy? $4x + 2y = 36$ $4(3) + 2y = 36$ $12 + 2y = 36$ $2y = 24$ $y = 12$	b. Gail orders CDs for \$8 each plus a total shipping cost of \$5. Write an equation to determine the total cost of purchasing CDs. If Gail spent \$53, how many CDs did she order? $y = 8x + 5$ $53 = 8x + 5$ $-5 \quad -5$ $\frac{48}{8} = \frac{8x}{8}$ $6 = x$
10. Comparing Linear Functions	Determine what the slope and y-intercepts are and interpret them in a real world context before comparing.	a. Which function has the greater rate of change and y-intercept? (b) (m) $m = 2 \quad b = 3$ Function 1: $y = 2x + 3$ Function 2: (0, 4),(1, 8),(2, 12) $x_1\ y_1 \quad x_2\ y_2$ $m = \frac{8-4}{1-0} = \frac{4}{1} = 4$ greater slope: Function 2 $4 > 2$ y-intercept = 4 greater y-intercept: Function 2 $4 > 3$	b. The table to the right shows the distance (in meters) Runner A and Runner B ran at different time intervals. Which runner has a faster average speed from 20 to 31 seconds? slope

Time	Runner A	Runner B
0	0	0
9	120	120
20	168	213
31	287	287

A

$\frac{287 - 168}{31 - 20}$

$\frac{119\ m}{11\ sec} = 10.8$

B

$\frac{287 - 213}{31 - 20}$

$\frac{74\ m}{11\ sec} = 6.7$

Runner A is faster at 10.8 meters per second