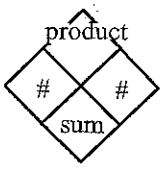
Midterm Study Guide

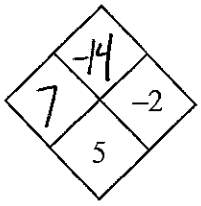
Skills Required….

- **Be able to fill in the blank for Diamond Problems…**

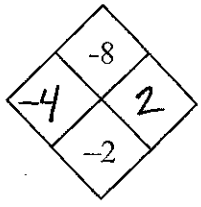
1.



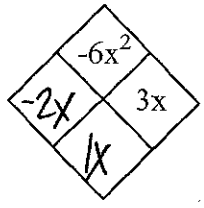
a.



b.



c.



- **Be able to identify and name the y-intercept (starting point) and slope (growth rate) for multiple representations of linear functions.**

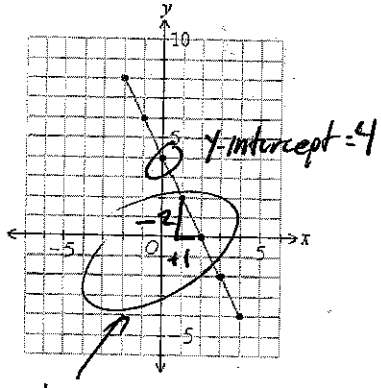
2. For each linear model, write the y-intercept and the slope.

a. $y = 2x + 9$

Slope 2

y-intercept

b.



c.

in (x)	out (y)
-3	9
-2	5
-1	1
0	-3
1	-7
2	-11

Slope -4

y-intercept -3

- **Be able to evaluate an expression for a given value…**

3. a. $3(2x + 1)$ for $x = -8$

$3(2 \cdot -8 + 1)$

$3(-16 + 1)$

$3(-15) = -45$

b. $\frac{x-6}{4} - 1$ for $x = -14$

$\frac{-14-6}{4} - 1 = \frac{-20}{4} - 1 = -5 - 1 = -6$

c. $-2m^2 + 10$ for $m = -6$

$-2(-6^2) + 10$

$-2(36) + 10$

$-72 + 10 = -62$

d. $k \cdot k \div k \cdot k \div k$ for $k = 9$

$k \cdot 1 \cdot 1$

$9 \cdot 1 \cdot 1 = 9$

➢ **Be able to solve a for the missing values in an area model…**

4. Find the perimeter of the entire rectangle shown below (that is, the outside boundary of the figure). Notice that the areas of two of the parts have been labeled inside the rectangle. Also find the total area.

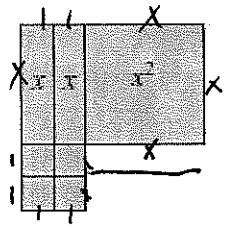
	5	
8	40	56
6	30	42
	7	

40+30+56+42

168

➢ **Be able to find the area and perimeter of a figure…**

5. Write an expression that represents the perimeter and the area of the shape built with algebra tiles below.



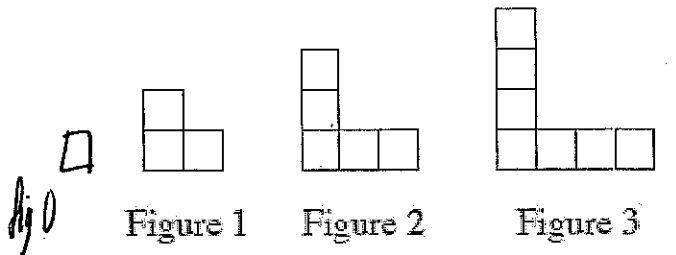
Perimeter: $4x+8$ Area: x^2+2x+4

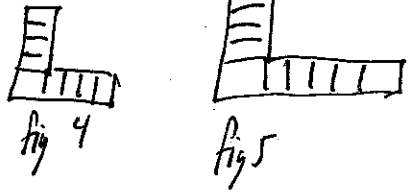
Find the perimeter if x = 3:

➢ **Be able to analyze a pattern…**

6. Examine the tile pattern…

a. Sketch Figures 0, 4 and 5.





b. Write a rule for the pattern.

$y = 2x+1$

c. Use the rule to find how many tiles are in the 21st figure.

43 tiles

➢ **Be able to simplify exponential terms.**

7.

a. $(5x^3)^2 = 25x^6$

b. $\frac{14a^3b^2}{21a^4b} = \frac{2b}{3a}$

c. $2m^3n^2 \cdot 3mn^4 = 6m^4n^6$

d. $(3x^2y)(5x) = 15x^3y$

e. $(x^2y^3)(x^{-2}y^{-2}) = y$

f. $(-6xy^2)^0 = 1$

➢ **Be able to simplify polynomial expressions…**

8. a. $3y-(y+5x-3)-7x$

$3y - y - 5x + 3 - 7x$

$2y - 12x + 3$

b. $-(1-5x)-2x+2x^2+7$

$-1 + 5x - 2x + 2x^2 + 7$

$3x + 2x^2 + 6$

c. $6x+2-1-4x-3-2x+2$

$0x + 0 = 0$

➢ **Be able to determine if a point lies on a given line …**

9. Which point lies on both $y + 8 = 2x$ and $y = -3x + 7$?

a. (1, 2) b. (2, 6) c. (3, -2) d. (4, 14) e. (3, 10)

➢ **Be able to rewrite each of these products as a sum.**

10. a. $6x(2x+y-5)$

$12x^2 + 6xy - 30x$

b. $(2x^2-11)(x^2+4)$

$2x^4 - 11x^2 + 8x^2 - 44 = 2x^4 - 3x^2 - 44$

c. $(7x)(2xy)$

$14x^2y$

d. $(x-2)(3+y)$

$3x + xy - 6 - 2y$

➢ **Be able to determine to solve an equation for x & check to see your solution is correct.**

11. Solve the equations below for x and check your solutions.

a. $-3 + x = -2x + 6$

$+2x \quad +2x$

$-3 + 3x = +6$

$+3 \quad +3$

$\frac{3x}{3} = \frac{9}{3}$

$x = 3$

b. $2(x + 1) + 3 = 3(x - 1)$

$2x + 2 + 3 = 3x - 1$

$2x + 5 = 3x - 1$

$-2x \quad -2x$

$5 = x - 1$

$+1 \quad +1$

$6 = x$

c. $-4x = 2x + 9$

$-2x \quad -2x$

$\frac{-6x}{-6} = \frac{9}{-6}$

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

d. $-10 + 5x = 7x - 4$

$-5x \quad -5x$

$-10 = 2x - 4$

$+4 \quad +4$

$\frac{-6}{2} = \frac{2x}{2}$

$-3 = x$

e. $28 - 6x + 4 = 3(10 - x)$

$32 - 6x = 30 - 3x$

$+6x \quad +6x$

$32 = 30 + 3x$

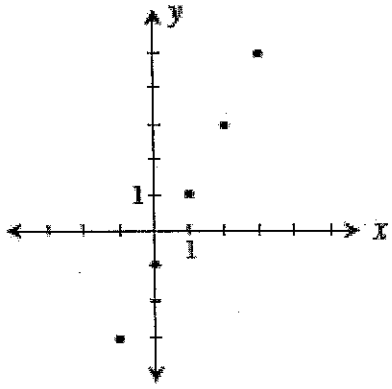
$-30 \quad -30$

$\frac{2}{3} = \frac{3x}{3}$

$\frac{2}{3} = x$

➢ **Know how to use different representations …**

12. Examine the graph below.



a. Use the graph to complete the table:

IN (x)	-1	0	1	2	3
OUT (y)	-3	-1	1	3	5

b. Use the graph to find the rule: $y =$ $2x - 1$

➢ **Be able to find the slope and equation of a line given two points.**

SLOPE → Rate of Change → Growth Factor

$$\text{Slope} = \frac{RISE}{RUN} \rightarrow \frac{\Delta y}{\Delta x} \rightarrow \frac{y_2 - y_1}{x_2 - x_1}$$

13. Find the slope of the line passing through each pair of points below.

A. (1, 2) and (4, −1) -1

B. (55, 67) and (50, 68) $-\frac{1}{5}$

C. (−6, 8) and (−8, 5) $\frac{3}{2}$

d. Write the equation of the line that goes through the points (1,2) and (4,-1).

Remember y = mx + b

$y = mx + b$ (m: slope, b: y-intercept)

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

$y = -1x + b$

$2 = -1(1) + b$

$2 = -1 + b$

$+1 \quad +1$

$3 = b$

$y = -1x + 3$

➢ **Be able to write the rules for linear functions …**

14. Two caterpillars are crawling toward each other on the stem of a tomato plant. The big caterpillar started at a height of 36 inches off the ground and is crawling down the stem at a rate of four inches per hour. The little caterpillar is crawling up from 1 inch off the ground at a rate of three inches per hour.

a. Write two equations. One for each caterpillar.

$y = -4x + 36$ $y = 3x + 1$

b. When will the two caterpillar's meet?

in 5 hours at 16 inches off the ground

➢ **Be able to rewrite a linear equation from standard form to y = mx + b form.**

15. For each equation below, solve for y.

a. $6x - 2y = 4$

$-6x \quad -6x$

$-2y = -6x + 4$ → $\frac{-2y}{-2} = \frac{-6x}{-2} + \frac{4}{-2}$ → $y = 3x - 2$

b. $6x + 3y = 4x - 2y + 8$

$+2y \quad +2y$

$6x + 5y = 4x + 8$ → $-6x \quad -6x$ → $5y = -2x + 8$ → $\frac{5y}{5} = \frac{-2x}{5} + \frac{8}{5}$ → $y = -\frac{2}{5}x + \frac{8}{5}$

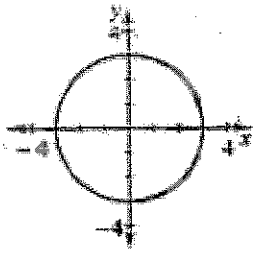
c. Find the slope and y-intercepts for the equations in parts (a) and (b).

a. Slope = 3, y-intercept = -2, b. slope = $\frac{-2}{5}$, y-intercept = $\frac{8}{5}$

➢ **Be able to determine if whether or not a relation is a function and write the domain and range.**

16. Write domain and range of each relationship below. Then state whether or not the relationship is also a function.

a.

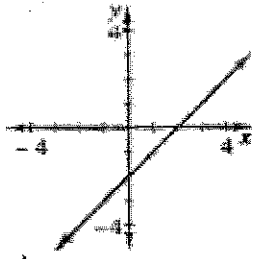


domain: $-3 \le x \le 3$

range: $-3 \le y \le 3$

not a function

b.

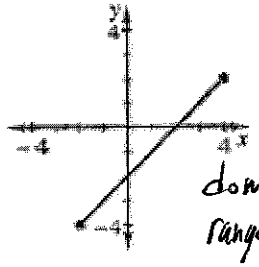


domain: all numbers

range: all numbers

yes a function

c.



domain: $-2 \le x \le 4$

range: $-4 \le y \le 2$

➢ **Be able to graph a rule …**

17. Consider the two rules,

$$y = -x + 2 \text{ and } y = 2x - 7.$$

a. Find the point of intersection by creating a graph.

(3, -1)