Algebra 1 Midterm Review Name: _____

Directions: Read each question carefully. Answer each question completely. Show all of your work.

Chapter 1

1) Match the property with the equation illustrating the property. Please use CAPITAL letters!

K	$-a(-1)=a$	A. Associative Property of Addition
H	$0+a=a$	B. Associative Property of Multiplication
G	$a\times\frac{1}{a}=1$	C. Commutative Property of Addition
F	$a+(-a)=0$	D. Commutative Property of Multiplication
C	$a+b=b+a$	E. Distributive Property
A	$a+(b+c)=(a+b)+c$	F. Inverse Property of Addition
D	$(a\cdot b)\cdot c=c\cdot(a\cdot b)$	G. Inverse Property of Multiplication
E	$3(a-b)=3a-3b$	H. Identity Property of Addition
J	$a(0)=0$	I. Identity Property of Multiplication
B	$(ab)c=a(bc)$	J. Multiplication Property of Zero
I	$1\times(-a)=-a$	K. Multiplication Property of -1

2) Write an expression for the phrase *2 times the quantity x minus 7.* 2x - 7

3) Evaluate: $(ab)^2$ if a = 2 and b = -4 $(2\cdot-4)^2=(-8)^2=$ 64

4) Evaluate: $-x+2y$ if x = 8 and y = 5 2

$-(8)+2(5)=-8+10=2$

5) Simplify: $2[3^2\cdot32+12\div4]$ 582

$2[9\cdot32+3]$

$2[288+3]$

$2[291]=582$

6) Simplify: $\frac{1}{3}x(-6+27y-51z)$

$-2x+9xy-17xz$

7) Evaluate $\frac{a}{b}$ for a = $-\frac{4}{5}$ and b = $\frac{2}{15}$ **-6**

$-\frac{4}{5} \times \frac{15}{2} = -\frac{12}{2} = -6$

8) Evaluate -7^4 **2401**

Chapter 2

1) $\frac{2}{3}x - 3 = 7$ **x = 15**

$+3 \quad +3$

$\frac{2}{3}x = 10$

$2x = 30$

$x = 15$

2) $5(y+5) = 55$ **y = 6**

$5y + 25 = 55$

$5y = 30$

$y = 6$

3) $2 = \frac{10+y}{-3}$ **y = -16**

$\times -3 \quad \times -3$

$-6 = 10 + y$

$-16 = y$

4) $6x + 5 = 4x - 5$ **x = -5**

$-4x \quad -5 \quad -4x \quad -5$

$2x = -10$

$x = -5$

5) $7w + 8 - w = 8w - 2(w-4)$ **Inf Sols.**

$6w + 8 = 8w - 2w + 8$

$6w + 8 = 6w + 8$

$0 = 0$

6) $\left[\frac{2}{3}x - \frac{8}{3} = -4\right] \times 3$ **x = -2**

$2x - 8 = -12$

$2x = -4$

$x = -2$

7) The sum of four consecutive odd integers is -72. Write an equation to model this situation. Find the value of the four integers.

Let x = a even number

$(x+1) + (x+3) + (x+5) + (x+7) = -72$

$4x + 16 = -72$

$4x = -88$

$x = -22$

$x + 1 = -21$

Equation: $(x+1)+(x+3)+(x+5)+(x+7) = -72$

Integers: -21, -19, -17, -15

8) At 9:00 on Saturday morning, two bicyclists heading in opposite directions pass each other on a bicycle path. The bicyclist heading north is riding 7 km/hr faster than the bicyclist heading south. At 10:30, they are 43.5 km apart. Find the two bicyclists' rates.

$d = r \cdot t$

$d = 43.5$

$t = 1.5$

$r = ?$

North + South = 43.5

$(r+7)(1.5) + r(1.5) = 43.5$

$1.5r + 10.5 + 1.5r = 43.5$

$3r + 10.5 = 43.5$

$r = 11$

Equation: _____

Rate (North): 18 km/hr

Rate (South): 11 km/hr

9) Solve the formula for the area of a trapezoid $A=\frac{1}{2}(b_1+b_2)h$ for b_2.

$b_2 = \frac{2A}{h} - b_1$

$2 \cdot A = \frac{1}{2}(b_1+b_2)h \cdot 2$

$\frac{2A}{h} = \frac{(b_1+b_2)h}{h}$

$\frac{2A}{h} = b_1 + b_2$

$-b_1 \quad -b_1$

10) Solve the equation $5a+7b=8a-9$ for a.

$a = 3 + \frac{7}{3}b$

$-8a \quad -7b \quad -8a \quad -7b$

$\frac{-3a}{-3} = \frac{-9-7b}{-3}$

$a = 3 + \frac{7}{3}b$

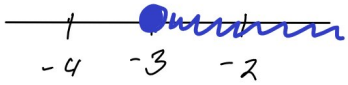
Chapter 3

Directions: Solve and graph.

1) $x-7 \geq -10$

$+7 \quad +7$

$x \geq -3$



2) $-\frac{x}{2} < -8$ $\cdot -2$

$x > 16$

FLIP!

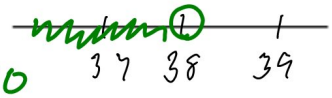
3) $x+10-2(x-14)>0$

$x+10-2x+28>0$

$-1x+38>0$

$-1x > -38$

FLIP $x < 38$



4) $12m+11-3m > 4m-(17-9m)$

$9m+11 > 4m-17+9m$

$9m+11 > 13m-17$

$-4m > -28$

$m < 7$

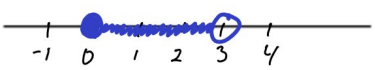
FLIP

5) $-4 \leq 2x-4 < 2$

$+4 \quad +4 \quad +4$

$\frac{0}{2} \leq \frac{2x}{2} < \frac{6}{2}$

$0 \leq x < 3$



6) $8x-15 < -15$ or $9x+11 \geq 20$

$+15 \quad +15 \qquad -11 \quad -11$

$8x < 0 \qquad 9x \geq 9$

$x < 0 \qquad x \geq 1$

Directions: Solve the following equations.

7) $|3x+9|<27$ SKIP

8) $|d+2|\geq 6$ SKIP

*We didn't do Abs Val Ineq.

9) $3|x|-16=26$

$+16 \quad +16$

$\frac{3|x|}{3}=\frac{42}{3}$

$|x|=14$

① $x=14$ ② $x=-14$

10) $-2|a-7|=-28$

$\div -2 \quad \div -2$

$|a-7|=14$

① $a-7=14$ $a=21$

② $a-7=-14$ $a=-7$

Chapter 5

1) Define *function*: Every input has one output

2) What is the vertical line test: To be a function, a graph must pass VLT (Any vert line will only cross graph once)

3) Evaluate $g(x)=-x^2+5$ for x = -3.

$g(-3)=-(-3)^2+5=-(9)+5=-4$

$g(-3)=-4$

4) Evaluate $h(x)=5x+7$ for x = 8.

$h(8)=5(8)+7=47$

$h(8)=47$

5) Write the function rule for the table.

x	y
-1	2
0	4
1	6
2	8

+1 +2 +1 +2 +2

y-int

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

$f(x)=2x+4$

6) Write the function rule for the table.

x	f(x)
-1	9
1	9
3	17
5	33

+2 +2 +2 +0 +8 +16

Not Linear

7) Find the range of $f(x) = -x + 22$ for the domain {-8, -6, 4, 7}.

$\{15, 18, 28, 30\}$

$f(-8) = -(-8) + 22 = 30$ $\quad f(4) = -(4) + 22 = 18$

$f(-6) = -(-6) + 22 = 28$ $\quad f(7) = -(7) + 22 = 15$

8) Find the domain and range of the relation. Is it a function?

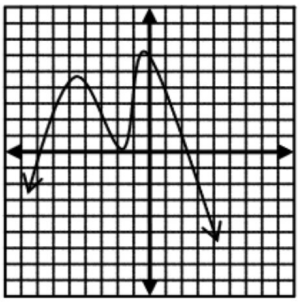
{(-4, 6), (-2, 6), (0, 4), (3, 4)}

Domain: $\{-4, -2, 0, 3\}$

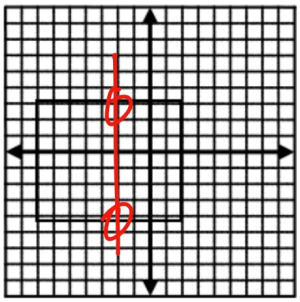
Range: $\{4, 6\}$

Function? yes

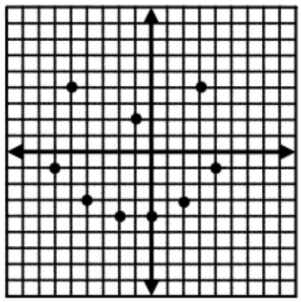
9) Are the following graphs a function?



Yes (pass VLT)



No, (Fails VLT)



Yes (pass VLT)

10) Nick earns $6.00 per hour for mowing lawns.

a. Write a function rule to describe the amount of money *m* earned is a function of the number of hours *h* spent mowing lawns.

$m(h) = 6h$

b. How much does Nick earn if he works 2 hours and 30 minutes?

#15

$m(2.5) = 6(2.5)$

8) Find the constant of variation for $6x = -y$

$y = -6x$

$k = -6$

9) Find the constant of variation for $7x + 6y = 0$

$6y = -7x$

$y = -\frac{7}{6}x$

$k = -\frac{7}{6}$

11) Write the equation of the direct variation that includes the point (-2, 20)

$y = kx$

$20 = k(-2)$

$k = -10$

$y = -10x$

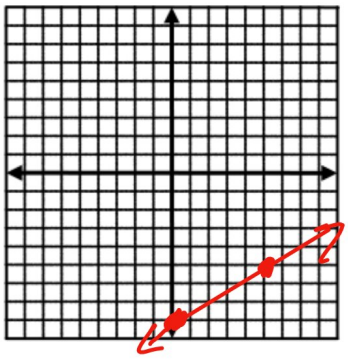
Chapter 6

1) Graph the following equations in slope-intercept form.

a. $y = \frac{3}{5}x - 8$

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

b = -8

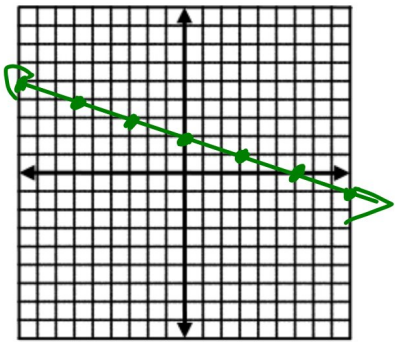


b. $3y = -x + 6$

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

m = $-\frac{1}{3}$

b = 2

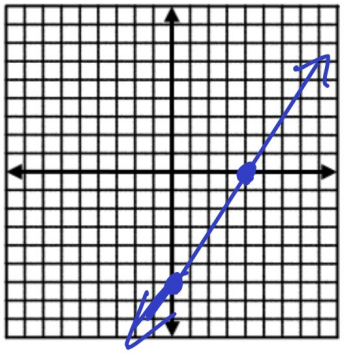


2) Graph the following equations in standard form.

a. $6x - 4y = 24$

x-int = 4

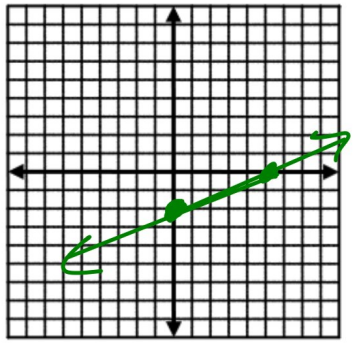
y-int = -6



b. $-6x + 15y = -30$

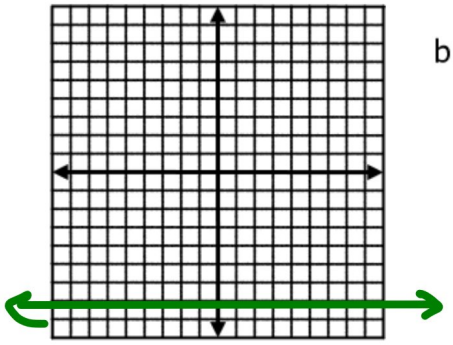
x-int = 5

y-int = -2

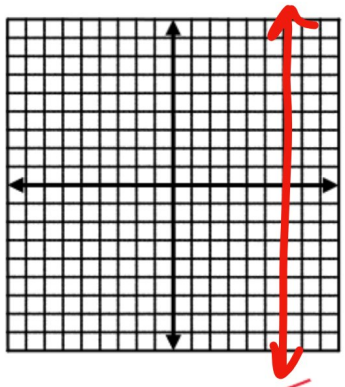


3) Graph the following equations.

a. $y = -7$

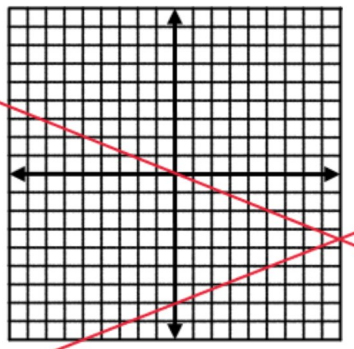


b. $x = 6$

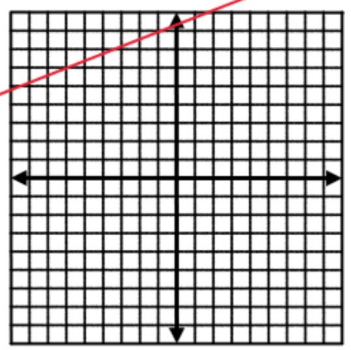


4) Graph the following equations.

a. $y = |x - 2|$



b. $y = |x + 3| + 4$



5) Write the equation for each translation of $y = |x|$.

a. 9 units down _____

b. left 2 units and up 3 units _____

6) Tell whether the lines for each pair of equations are *parallel*, *perpendicular*, or *neither*.

a. $y = 3x - 8$, $3x - y = -1$ → $m = 3$

$-y = -3x - 1$

$y = 3x + 1 \rightarrow m = 3$

parallel (same slope)

b. $3x + 2y = -5$, $3y - 18 = 2x$ → $m = -\frac{3}{2}$

$y = \frac{3}{3}x + 6$

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

perpendicular (opp recip slope)

7) Write an equation for the line parallel to each given line and the point that passes through the given point.

a. $y = 2x - 7$ thru (3, 4) _____

$m = 2 \quad x_1 = 3 \quad y_1 = 4$

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

$y = 2x - 2$

b. $-7x - 3y = 3$ thru (9, -7) _____

$y = -\frac{7}{3}x + 14$

$m = -\frac{7}{3} \quad x_1 = 9 \quad y = -7$

$-7 = -\frac{7}{3}(9) + b$

$-7 = -21 + b \qquad b = 14$

8) Write an equation for the line perpendicular to each given line and the point that passes through the given point.

a. $y = -\frac{1}{4}x + 7$ thru (1, 1) _____

$m = 4 \quad x_1 = 1 \quad y_1 = 1$

$1 = 4(1) + b$

$-3 = b$

$y = 4x - 3$

b. $y - 1 = 4x$ thru (12, -6) _____

$m = -\frac{1}{4} \quad x_1 = 12 \quad y_1 = -6$

$y + 6 = -\frac{1}{4}(x - 12)$

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

$y = -\frac{1}{4}x - 3$

9) Write the following equations in slope-intercept form.

a. $y - 8 = \frac{-1}{3}(x + 18)$ _____

$y - 8 = -\frac{1}{3}x - 6$

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

b. $-2x - 3y = -12$ _____

$+2x \quad +2x$

$-3y = 2x - 12$

$\frac{-3y}{-3} = \frac{2x}{-3} - \frac{12}{-3}$

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

10) Write the following in standard form using only integers.

a. $y = -\frac{4}{5}x + \frac{6}{5}$ $\times 5$ _____

$5y = -4x + 6$

$+4x \quad +4x$

$4x + 5y = 6$

b. $y = \frac{5}{2}x - 22$ $\times 2$ _____

$2y = 5x - 44$

$5x - 2y = 44$

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

11) Write an equation in point-slope form using the given information.

a. (4, 7); $m = -\frac{1}{2}$ (x_1, y_1)

$y - 7 = -\frac{1}{2}(x - 4)$

b. (-3, 4) & (1, 6)

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

$y - 4 = \frac{1}{2}(x + 3)$ or $y - 6 = \frac{1}{2}(x - 1)$

12) Write the equation of the line that passes through the points (-2, 1) and (6, -1) in slope-intercept form.

$m = \frac{-1-1}{6-(-2)} = \frac{-2}{8} = -\frac{1}{4}$

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

$y - 1 = -\frac{1}{4}x - \frac{2}{4}$

$+1 \quad +1$

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

13) Find the slope of the following linear function.

a. $9x + 4y = -36$

$m = -\frac{A}{B}$

$m = -\frac{9}{4}$

14) Find the x and y-intercepts for the following equation.

a. $y = \frac{2}{3}x - 8$ y-int

x-intercept 12

y-intercept -8

x-int: ($y = 0$)

$0 = \frac{2}{3}x - 8$

$8 = \frac{2}{3}x \quad x = 12$

15) Is the relationship shown by the data linear? If so, write the equation in point-slope form.

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

$\frac{4}{1} = \frac{4}{1} = \frac{8}{2}$

x	y	
2	3	
3	7	+4
4	11	+4
6	19	+8
+1	+1	+2

Linear $m = 4$

b. Not Linear $\frac{3}{2} \neq \frac{3}{4} \neq \frac{4}{4}$

x	y	
-7	-3	
-5	0	+3
-1	3	+3
3	7	+4
+2	+4	+4

16) Find the rate of change: You burn 400 calories in one hour and you burn 1200 calories in 3 hours.

y_1 x_1 y_2 x_1

$m = \frac{1200-400}{3-1} = \frac{800}{2} = 400$

Chapter 7

1) Is (40, 30) a solution to the system $\begin{cases} 3x-4y=0 \\ 2x+y=110 \end{cases}$? (Prove your answer.) YES

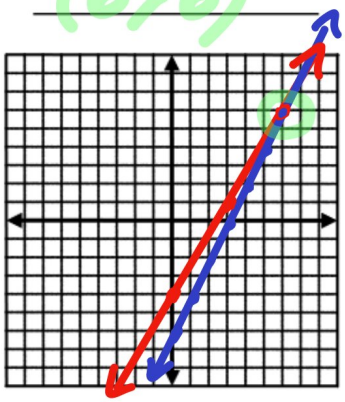
$3(40)-4(30)=0$
$120-120=0$
$0=0$ ✓

$2(40)+30=110$
$80+30=110$
$110=110$ ✓

2) Solve the following systems of equations by graphing.

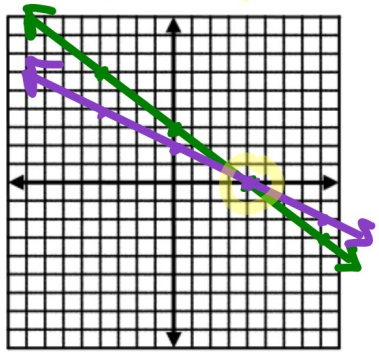
a. $y=\frac{5}{3}x-4$
$y=2x-6$

(6, 6)



b. $3x+4y=12$
$4y-8=-2x$

(4, 0)



3) Solve the following systems by substitution.

a. $y=5x+5$
$y=15x-1$

$(\frac{3}{5}, 8)$

$5x+5=15x-1$
$-10x=-6$
$x=\frac{6}{10}=\frac{3}{5}$
$y=5(\frac{3}{5})+5=8$

b. $5x+6y=-76$
$x+2y=-44$

(28, -36)

$x=-44-2y$
$5(-44-2y)+6y=-76$
$-220-10y+6y=-76$
$-4y=144$
$y=-36$

$x=-44-2(-36)$
$x=-44+72$
$x=28$

4) Solve the following systems by elimination.

a. $7x+15y=32$
$(x-3y=20)\times 5$

(11, -3)

$7x+15y=32$
$+\ 5x-15y=100$
$12x=132$
$x=11$

$11-3y=20$
$-3y=9$
$y=-3$

b. $9x-34=-5y$
$-2y+8x=-2$

(1, 5)

$(9x+5y=34)\times 2 \rightarrow 18x+10y=68$
$(8x-2y=-2)\times 5 \rightarrow 40x-10y=-10$
$+$
$58x=58$
$x=1$

$8(1)-2y=-2$
$8-2y=-2$
$-2y=-10$
$y=5$

5) Is (2, -3) a solution to the system $\begin{matrix} y < -x+3 \\ -2x+4y \geq 0 \end{matrix}$? (Prove your answer.)

x y

No

$-3 < -(2)+3$

$-3 < 1$ ✓

$-2(2)+4(-3) \geq 0$

$-4-12 \geq 0$

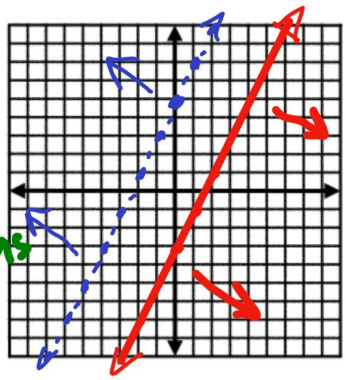
$-16 \geq 0$ ✗

6) Solve the following systems of inequalities.

a. $y \leq 2x-3$

$-2x+y>5$

$y > 2x+5$



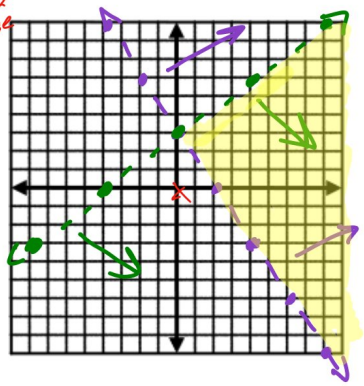
No Solutions

b. $6x+4y>12$

$-3x+4y<12$

$0 > 12$ False

$0 < 12$ True



7) A jar containing only nickels and dimes contains a total of 60 coins. The value of all the coins in the jar is $4.45. Write and solve a system of equations to find the number of nickels and dimes in the jar.

31 nickels 29 dimes

Let n = # of nickels

d = # of dimes

$n+d=60$

$.05+.10d=4.45$

$\times 10$

$n+d=60$

$-.5n+d=44.5$

$.5n=15.5$

$n=31$

$31+d=60$

$d=29$

8) At a local ballpark, the team charges $5 for each ticket and expects to make $1400 in concessions. The team must pay its players $2000 and pay all other workers $1600. Each fan gets a free bat that costs the team $3 each. How many tickets must be sold to break even?

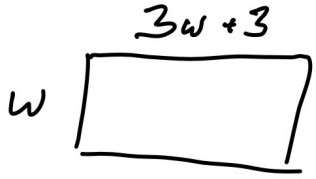
Let x = tickets

$5x+1400-2000-1600-3x=0$

$2x=2200$

$x=1100$

9) The length of a rectangle is 3 feet more than three times the width. If the perimeter of the rectangle is 46 feet, find the dimensions of the rectangle. (Write and solve a system of equations.)



$2(w)+2(3w+3)=46$

$2w+6w+6=46$

$8w=40$

$w=5$

$l=18$