Name: Key Algebra Review: **PACKET #1**

The Real Number System

THE REAL NUMBERS ($\mathbb{R}$): set of all real numbers

IRRATIONAL NUMBERS ($\mathbb{I}$): $\pi, \sqrt{2}, \sqrt[3]{7}$ RATIONAL NUMBERS ($\mathbb{Q}$): $-\frac{1}{3}, \frac{1}{2}, 0.8, 0.\overline{3}$

INTEGERS ($\mathbb{Z}$): $\{\ldots -2, -1, 0, 1, 2, \ldots\}$

WHOLE NUMBERS ($\mathbb{W}$): $\{0, 1, 2, 3, \ldots\}$

NATURAL NUMBERS ($\mathbb{N}$): $\{1, 2, 3, 4, \ldots\}$

Name all sets to which each number belongs:

1. $\frac{2}{3}$ $\mathbb{R}, \mathbb{Q}$.
2. 13 $\mathbb{N}, \mathbb{W}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$
3. 0 $\mathbb{W}, \mathbb{Z}, \mathbb{Q}, \mathbb{R}$
4. $-\sqrt{50}$ $\mathbb{I}, \mathbb{R}$
5. $-\frac{28}{7}$ $\mathbb{Z}, \mathbb{Q}, \mathbb{R}$
6. π $\mathbb{I}, \mathbb{R}$

Properties

COMMUTATIVE:
- Order of values doesn't matter $2+3=3+2$
- $2 \cdot 4 = 4 \cdot 2$

ASSOCIATIVE:
- Order of values doesn't matter
- $(2+3)+1 = 2+(3+1)$ $2(4 \cdot 3) = (2 \cdot 4) \cdot 3$

IDENTITY:
- $5+0=5$
- $5(1)=5$

INVERSE:
- $6+(-6)=0$
- $4 \cdot \left(\frac{1}{4}\right) = 1$

ZERO PRODUCT:
- $3(0)=0$
-

DISTRIBUTIVE:
- $2(2x+3) = 4x+6$
- $-4(4x-6) = -16x+24$

REFLEXIVE:
- $x=x$
- $3=3$

SYMMETRIC:
- $a=b$ then $b=a$
- $a=2$, then $2=a$

TRANSITIVE:

- a=b and b=c then a=c
- 5=2+3 and 2+3=5 then 5=5

Identify the following properties:

1. $5x + 1 = 1 + 5x$ Commutative of add.
2. $17 = 17$ Reflexive
3. $10y^2 \cdot 0 = 0$ Zero product
4. $-3(x + 8) = -3x - 24$ Distributive
5. If $2^5 = 32$ and $32 = 8 \cdot 4$, then $2^5 = 8 \cdot 4$ Transitive
6. $8k + 0 = 8k$ Identity of Add.
7. If $-2x = 20$, then $20 = -2x$ Symmetric
8. $\frac{4}{9} \cdot \frac{9}{4} = 1$ Mult. Inv

CLOSURE: *Answer yes or no. If no, give a counterexample.*

- Are **natural numbers** closed under **subtraction**? No $3-4=-1$
- Are **integers** closed under **addition**? Yes
- Are **irrational numbers** closed under **division**? No $\frac{\pi}{\pi}=1$
- Are **whole numbers** closed under **multiplication**? Yes

Square Roots & Cube Roots

1. $\sqrt{25}$ 5	2. $\sqrt{144}$ 12	3. $\sqrt{64}$ 8	4. $\sqrt{\frac{16}{49}}$ $\frac{4}{7}$
5. $\sqrt[3]{27}$ 3	6. $\sqrt[3]{216}$ 6	7. $\sqrt[3]{8}$ 2	8. $\sqrt[3]{1000}$ 10

Evaluating Expressions (Numerical & Algebraic)

1. $2^3 \cdot (9-2) + \frac{12}{4} - |-5|$

$8 \cdot 7 + 3 - 5$

$56 + 3 - 5$

$59 - 5$

54

2. $8 - [12 \div (\sqrt{49} - 1)] + 1$

$8 - [12 \div 6] + 1$

$8 - 2 + 1$

$6 + 1$

7

3. $\frac{5^3 - 42 \div 6}{\sqrt[3]{8}}$ $\frac{125-42\div 6}{2}$ $\frac{125-7}{2} = \frac{118}{2} = 59$	4. $w^2 - 5xy$ *if x = -3, w = -2 and y = 1* $(-2)^2 - 5(-3)(1)$ $4 + 15 = 19$
5. $\frac{7c^2+5}{4a-b}$ *if a = 1, b = -5 and c = -4* $\frac{7(-4)^2+5}{4(1)-(-5)} = \frac{7(16)+5}{4+5} = \frac{112+5}{9} = \frac{117}{9}$ 13	6. $2\|y\| - x^2$ *if x = 6 and y = -3* $2\|-3\| - (6)^2$ $2(3) - 36$ $6 - 36$ -30

Translating Equations & Inequalities

1. The quotient of twice a number and 7 is 20. $\frac{2x}{7} = 20$	2. Five less than the product of a number and 3 is 14. $3n - 5 = 14$
3. Seven times the difference of x and 4 is -10. $7(x-4) = -10$	4. The product of a number and four increased by one is at least 7. $4n + 1 \geq 7$

Equations

1. $18 = 3 - 3a$ $-3 \quad -3$ $\frac{15}{-3} = \frac{-3a}{-3}$ $a = -5$	2. $4 - \frac{1}{2}n = -12$ $-4 \quad -4$ $-2 \cdot -\frac{1}{2}n = -16 \cdot -2$ $n = 32$
3. $\frac{3}{4}x + 17 = 23$ $-17 \quad -17$ $\frac{4}{3} \cdot \frac{3}{4}x = 6 \cdot \frac{4}{3}$ $x = 8$	4. $9y - 4(y+1) = 31$ $9y - 4y - 4 = 31$ $5y - 4 = 31$ $+4 \quad +4$ $\frac{5y}{5} = \frac{35}{5}$ $y = 7$
5. $-6(w-4) + 8w = 2(w+9)$ $-6w + 24 + 8w = 2w + 18$ $2w + 24 = 2w + 18$ $-2w \quad -2w$ $24 = 18$ $\emptyset$	6. $3m - (7m + 12) = 2(m-3)$ $3m - 7m - 12 = 2m - 6$ $-4m - 12 = 2m - 6$ $-2m \quad -2m$ $-6m - 12 = -6$ $+12 \quad +12$ $-6m = 6$ $\frac{-6m}{-6} = \frac{6}{-6}$ $m = -1$ $M = -1$

7. $2x - 2(4x - 3) = 6 - 6x$

$2x - 8x + 6 = 6 - 6x$

$-6x + 6 = -6x + 6$

∞

8. $\frac{7}{x-8} = \frac{3}{x}$

$7x = 3x - 24$

$-3x \quad -3x$

$\frac{4x}{4} = \frac{-24}{4}$

$x = -6$

9. Given $A = \frac{1}{2}bh$, solve for h

$2 \cdot A = \frac{1}{2}bh \cdot 2$

$\frac{2A}{b} = \frac{bh}{b}$

$h = \frac{2A}{b}$

10. Given $K = \frac{mv^2}{2}$, solve for m

$2 \cdot K = \frac{mv^2}{2} \cdot 2$

$\frac{2K}{v^2} = \frac{mv^2}{v^2}$

$m = \frac{2K}{v^2}$

Inequalities

1. $11x + 13 \geq -20$

$-13 \quad -13$

$\frac{11x}{11} \geq \frac{-33}{11}$

$x \geq -3$

2. $-2x + 6 > 3x - 34$

$-3x \quad -3x$

$-5x + 6 > -34$

$-6 \quad -6$

$\frac{-5x}{-5} > \frac{-40}{-5}$

$x < 8$

3. $3x - 7(x + 3) \geq -13$

$3x - 7x - 21 \geq -13$

$-4x - 21 \geq -13$

$+21 \quad +21$

$\frac{-4x}{-4} \geq \frac{8}{-4}$

$x \leq -2$

4. $4 - 8x < 2(5 - 3x)$

$4 - 8x < 10 - 6x$

$+6x \quad +6x$

$4 - 2x < 10$

$-4 \quad -4$

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

$x > -3$

5. $x + 7 \leq 2$ or $x + 5 \geq 3$

$-7 \quad -7 \qquad -5 \quad -5$

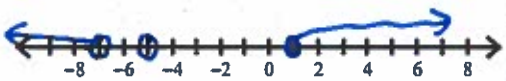
$x \leq -5 \qquad x \geq -2$

6. $3x + 5 < -16$ or $-5x - 8 \leq -13$

$-5 \quad -5 \qquad +8 \quad +8$

$\frac{3x}{3} < \frac{-21}{3} \qquad \frac{-5x}{-5} \leq \frac{-5}{-5}$

$x < -7 \qquad x \geq 1$



7. $-2 \le 3x - 2 < 10$

$+2 \quad +2 \quad +2$

$0 \le 3x < 12$

$\frac{0}{3} \le \frac{3x}{3} < \frac{12}{3}$

$0 \le x < 4$

8. $3 < 2x + 1 < 13$

$-1 \quad -1 \quad -1$

$2 < 2x < 12$

$\frac{2}{2} < \frac{2x}{2} < \frac{12}{2}$

$1 < x < 6$

Using Algebra to Solve Word Problems

1. Max is making a rectangular garden that is 5 feet less than twice its width. If the perimeter of the garden is 80 feet, what will be its dimensions? $l = 2w - 5$

$2w + 2(2w - 5) = 80$

$2w + 4w - 10 = 80$

$6w - 10 = 80$

$+10 \quad +10$

$6w = 90$

$w = 15$

$l = 2(15) - 5$

$l = 30 - 5$

$l = 25$

2. Amie published her first book. She was given $20,000 and an additional $0.15 for each copy of the book that sold. Her earnings, d, in dollars, from the publication of the book are given by $d = 20{,}000 + 0.15n$ where n is the number of copies sold. During the first year, Amie earned $22,100 from the publication and sale of her book. How many copies of her book were sold? $22100 = 20000 + 0.15n$

$-20000 \quad -20000$

$2100 = 0.15n$

$\frac{2100}{0.15} = \frac{0.15n}{0.15}$

14000 copies

3. The pay, P, at a certain job is calculated by the formula $P = Bh$, where B is the base pay and h is the number of hours worked. If an employee works more than 40 hours in a week, the formula changes to $P = 40B + 1.5B(h - 40)$. If Susan had a base pay of $12.50 and worked 46 hours, what would be her pay for the week? $P = 40(12.50) + 1.5(12.50)(46 - 40)$

$P = 500 + 112.50$

$P = \$612.50$

4. The pay, P, at a certain job is calculated by the formula $P = Bh$, where B is the base pay and h is the number of hours worked. If an employee works more than 40 hours in a week, the formula changes to $P = 40B + 1.5B(h - 40)$. If Tom had a base pay of $6.35 and worked 28 hours, what would be his pay for the week? $P = 40(6.35) + 1.5(6.35)(28 - 40)$ $P = 6.35(28)$

$\$177.80$

Name: _____ Algebra Review: **PACKET #2**

Relations & Functions

Domain: all x values in set **Range:** all y values in set

A relation is a function if it doesn't have any repeating x **-** values

or passes the vertical line test **!**

1.

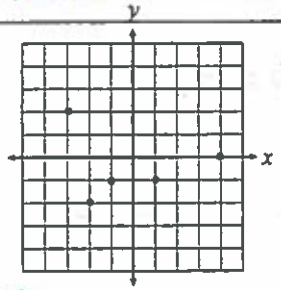
x	-1	2	5	-1
y	7	3	0	2

D = {-1, 2, 5}

R = {0, 2, 3, 7}

Function? No

2.

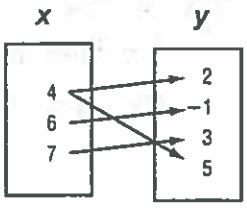


D = {-3, -2, -1, 1, 4}

R = {-2, -1, 0, 2}

Function? Yes

3.

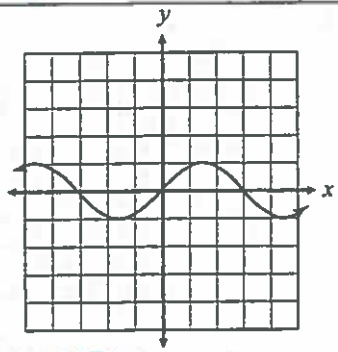


D = {4, 6, 7}

R = {-1, 2, 3, 5}

Function? No

4.

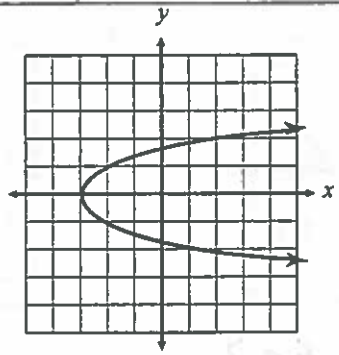


D = ℝ

R = $-1 \leq y \leq 1$

Function? Yes

5.



D = $x \geq -3$

R = ℝ

Function? No

Function Notation & Evaluating Functions

1. If $f(x) = -x - 7$, find $f(5)$

$f(5) = -5 - 7$

$f(5) = -12$

2. If $f(x) = x^2 - 2x + 11$, find $f(-2)$

$f(-2) = (-2)^2 - 2(-2) + 11$

$f(-2) = 4 + 4 + 11$

$f(-2) = 19$

3. If $f(x) = 2x^2 - x$, find $f(-4) - f(9)$

$f(-4) = 2(-4)^2 - (-4)$ $f(9) = 2(9)^2 - 9$

$f(-4) = 32 + 4$ $f(9) = 162 - 9$

$f(-4) = 36$ $f(9) = 153$

$36 - 153 = -117$

4. If $f(x) = \frac{2}{3}x + 1$, find $f(-6)$

$f(-6) = \frac{2}{3}(-6) + 1$

$f(-6) = -4 + 1$

$f(-6) = -3$

5. Find the range of the function $f(x) = -x^2 + 4x$ if the domain is {-2, 0, 1}

$-(-2)^2 + 4(-2)$
$-4 - 8 = -12$
$-1 + 4 = 3$

$R = \{-12, 0, 3\}$

6. Find the range of the function $f(x) = \frac{1}{3}x - 5$, if the domain is {-3, 0, 6}

$\frac{1}{3}(-3) - 5$
$-1 - 5 = -6$
$0 - 5 = -5$
$\frac{1}{3} \cdot 6 - 5 = -3$

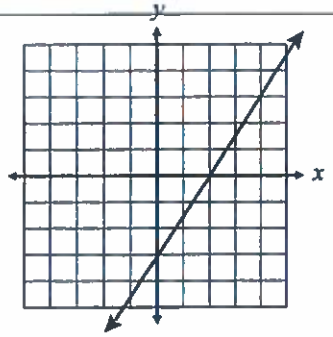
$R = \{-6, -5, -3\}$

Zeros of Functions

The zeros of a function are where it passes through the X-axis.

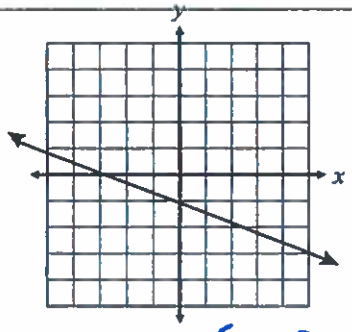
To find zeros, set the equation equal to 0, **and solve!**

1.



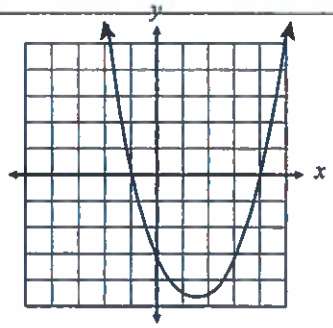
$X = \{2\}$

2.



$X = \{-3\}$

3.



$X = \{-1, 4\}$

4. $f(x) = 2x + 2$

$0 = 2x + 2$
$-2 \quad -2$
$\frac{-2}{2} = \frac{2x}{2}$
$x = -1$

5. $f(x) = \frac{2}{5}x - 4$

$0 = \frac{2}{5}x - 4$
$+4 \quad +4$
$\frac{5}{2} \cdot 4 = \frac{2}{5}x \cdot \frac{5}{2}$
$x = 10$

6. $f(x) = x^2 + 3x - 40$

$0 = x^2 + 3x - 40$
$0 = (x + 8)(x - 5)$
$0 = x + 8 \quad 0 = x - 5$

$X = \{-8, 5\}$

7. $f(x) = 2x^2 - 72$

$0 = 2x^2 - 72$
$+72 \quad +72$
$\frac{72}{2} = \frac{2x^2}{2}$
$\sqrt{36} = x^2$

$X = \{\pm 6\}$

8. $f(x) = x^2 - 10x + 25$

$0 = x^2 - 10x + 25$
$0 = (x - 5)(x - 5)$
$0 = x - 5$

$X = \{5\}$

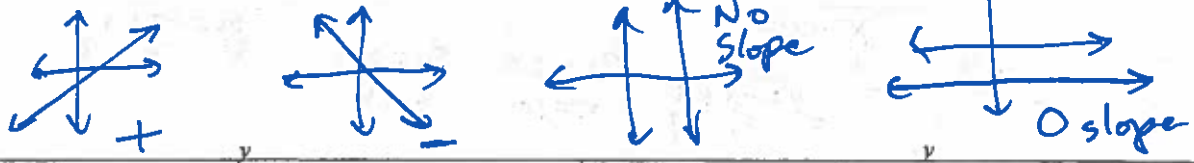
9. $f(x) = 5x^2 + 5x - 30$

$\frac{0}{5} = \frac{5x^2}{5} + \frac{5x}{5} - \frac{30}{5}$
$0 = x^2 + x - 6$
$0 = (x + 3)(x - 2)$
$0 = x + 3 \quad x - 2 = 0$

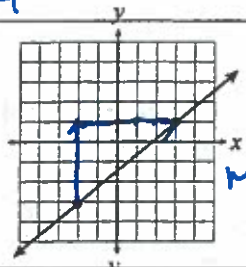
$X = \{-3, 2\}$

Slope

There are 4 types of slope. Sketch them below:

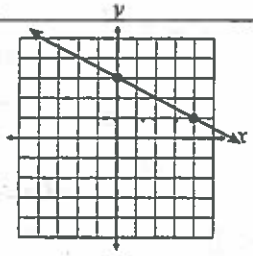


1. Find the slope:



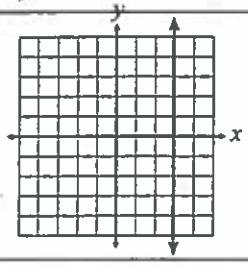
$m = \frac{4}{5}$

2. Find the slope:



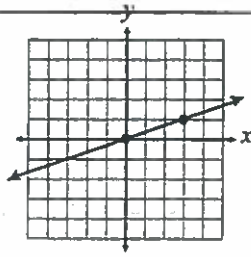
$m = \frac{-2}{4} = -\frac{1}{2}$

3. Find the slope:



No Slope

4. Find the slope:



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

The Slope Formula

When given two points (x_1, y_1) and (x_2, y_2) and asked to find the slope, use the formula:

1. (-12, -1) and (-3, -4)

$m = \frac{-4+(+1)}{-3+(+12)} = \frac{-3}{9} = -\frac{1}{3}$

2. (-11, 7) and (-11, -2)

$\frac{-2-7}{-11+(+11)} = \frac{-9}{0}$ No Slope

3. (9, -3) and (11, -7)

$m = \frac{-7+(+3)}{11-9} = \frac{-4}{2} = -2$

24. (12, 11) and (-9, 11)

$\frac{11-11}{-9-12} = \frac{0}{-21}$ 0 Slope

Slope-Intercept Form

Slope Intercept Form: $y = mx + b$

1. Write a linear equation with a slope of -1 and a y- intercept of 4.

$y = -1x + 4$

2. Write a linear equation with a slope of ¾ and a y-intercept of -5

$y = \frac{3}{4}x - 5$

Standard Form

Standard Form: $Ax + By = C$

1. $x - y = 3$

$x = 3$ $\quad -y = 3$ $\quad y = -3$

$x - 4 = 3$ $\quad -y = -x + 3$

x-intercept= 3 y-intercept = −3

Slope-Intercept Form: $y = x - 3$

2. $2x + 5y = 20$

$2x = 20$ $\quad 5y = 20$

$x = 10$ $\quad y = 4$

$\frac{5y}{5} = \frac{-2x}{5} + \frac{20}{5}$

x-intercept= 10 y-intercept = 4

Slope-Intercept Form: $y = -\frac{2}{5}x + 4$

3. $4x + y = 8$

$4x = 8$ $\quad y = 8$

$x = 2$

$y = -4x + 8$

x-intercept= 2 y-intercept = 8

Slope-Intercept Form: $y = -4x + 8$

4. $x - 3y = 6$

$x = 6$ $\quad -3y = 6$

$y = -2$

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

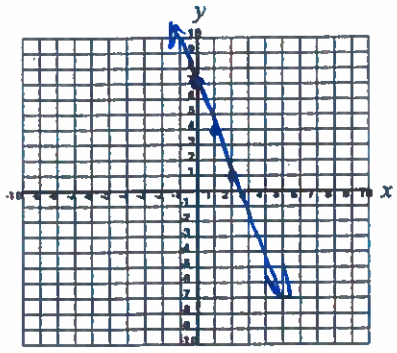
$y = \frac{1}{3}x - 2$

x-intercept= 6 y-intercept = −2

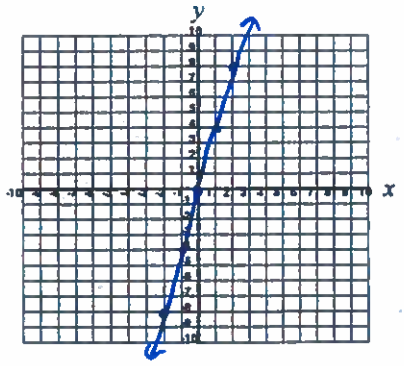
Slope-Intercept Form: $y = \frac{1}{3}x - 2$

Graphing Linear Equations (Always use y = mx + b form!)

1. $y = -3x + 7$



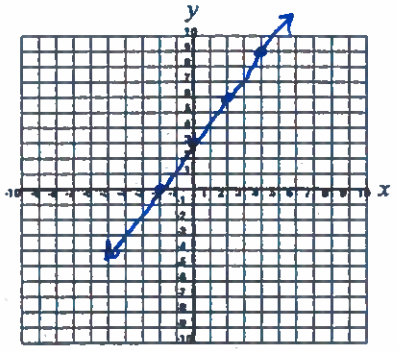
2. $y = 4x$



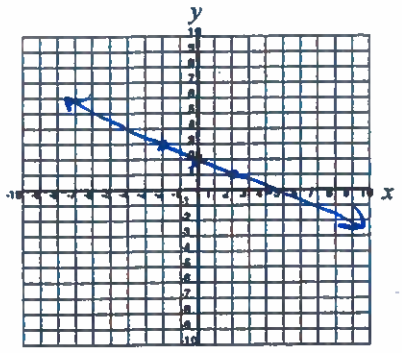
3. $3x - 2y = -6$

$-2y = -3x - 6$

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



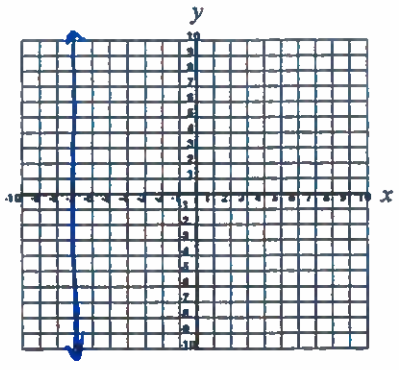
4. $x + 2y = 4$



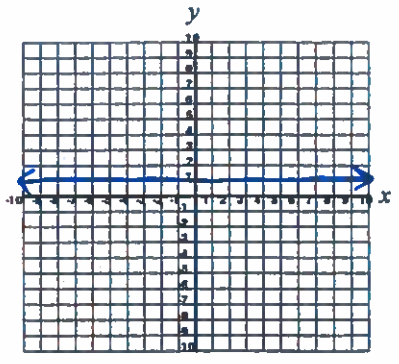
$2y = -x + 4$

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

5. $x = -7$



6. $y = 1$



Name: _____ Algebra Review: **PACKET #3**

Writing Linear Equations - Given a Point & Slope

When given a point (x_1, y_1) and the slope, m, use the formula: $y - y_1 = m(x - x_1)$

1. (2, 7); slope = 3

$y - 7 = 3(x - 2)$

$y - 7 = 3x - 6$

$+7 \quad +7$

$y = 3x + 1$

2. (1, 4); slope = -1

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

$y - 4 = -1x + 1$

$+4 \quad +4$

$y = -1x + 5$

3. (4, -2); slope = $-\frac{1}{2}$

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

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

$-2 \quad -2$

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

4. (6, -1); slope = $\frac{2}{3}$

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

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

$-1 \quad -1$

$y = \frac{2}{3}x - 5$

Writing Linear Equations - Given Two Points

When given two ordered pairs (x_1, y_1) and (x_2, y_2), use the <u>slope formula</u> followed by <u>point-slope formula</u>:

$m = \frac{y_2 - y_1}{x_2 - x_1}$ ➡ $y - y_1 = m(x - x_1)$

1. (-1, 1) and (-3, -7)

$\frac{-7-1}{-3-(-1)} = \frac{-8}{-2} = 4$

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

$y - 1 = 4x + 4$

$+1 \quad +1$

$y = 4x + 5$

2. (0, 3) and (5, 1)

$\frac{1-3}{5-0} = \frac{-2}{5}$

$y - 3 = -\frac{2}{5}(x - 0)$

$y - 3 = -\frac{2}{5}x$

$y = -\frac{2}{5}x + 3$

3. (-2, -3) and (1, 2)

$\frac{2+3}{1+2} = \frac{5}{3}$

$y + 3 = \frac{5}{3}(x + 2)$

$y + 3 = \frac{5}{3}x + \frac{10}{3} - 3$

$-3 \quad -3$

$y = \frac{5}{3}x + \frac{1}{3}$

4. (4, 1) and (-6, -4)

$\frac{-4-1}{-6-4} = \frac{-5}{-10} = \frac{1}{2}$

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

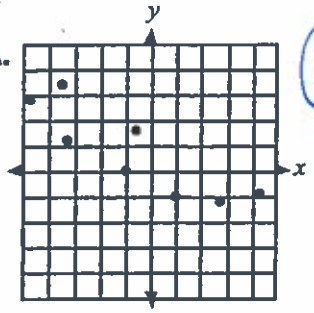
$y - 1 = \frac{1}{2}x - 2$

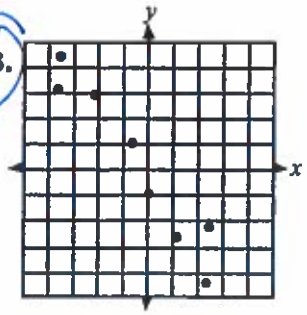
$+1 \quad +1$

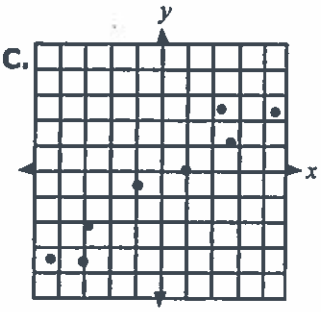
$y = \frac{1}{2}x - 1$

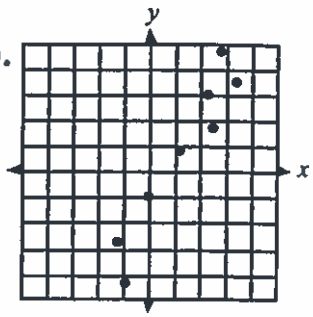
Line of Best Fit

1. Which scatterplot most likely has a line of best fit represented by $y = -2x - 1$?

A. 

B. 

C. 

D. 

2. The table below shows the predicted annual cost to raise a child from birth until adulthood.

Year Born	1988	1991	1994	1997	2000
Annual Cost ($)	10,700	11,700	12,600	15,000	16,700

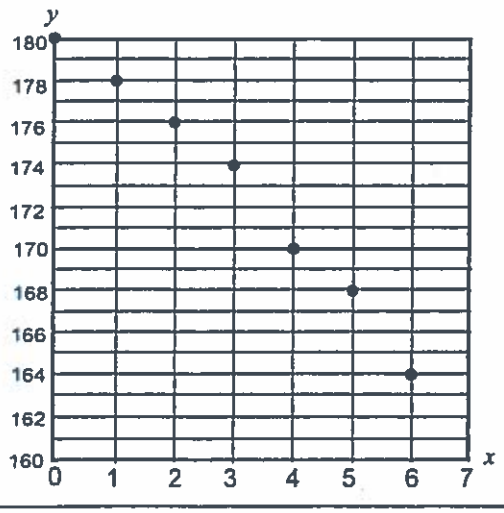
a. Find the equation for the line of best fit.

$y = 510x - 1003600$

b. Predict the cost to raise a child born in 2011.

22,010

3. The scatter plot shows the weight loss per week of a diet. In the graph, y represents the person's weight in pounds and x represents the weeks of the diet.



a. Find the equation for the line of best fit.

$y = -2.6429x + 180$

b. Predict the person's weight after 10 weeks.

153.6 lbs

Direct Variation Vs. Inverse Variation

	DIRECT VARIATION	INVERSE VARIATION
Equation Form	$y = kx$	$y = \frac{k}{x}$
How do you test for it?	k is constant for all ordered pairs!	k is constant for all ordered pairs!
Graph	straight line through origin	
How do you solve for missing values?	$k = \frac{y}{x}$	$k = y \cdot x$

PRACTICE!

Determine whether the following equations represent direct variation, inverse variation, or neither.

1. $y = -2x$ DV

2. $xy = -18$ $y = \frac{-18}{x}$ IV

3. $y = \frac{36}{x}$ IV

4. $\frac{y}{4} = x$ $y = 4x$ DV

5. $y = -\frac{2}{5}x + 1$ Neither

6. $x + 3y = 0$ $\frac{3y}{3} = \frac{-x}{3}$ DV $y = -\frac{1}{3}x$

Determine whether the following ordered pairs represent direct variation, inverse variation, or neither.

7. {(-6, 8), (-4, 12), (-3, 16), (-2, 24)} IV

8.

x	y
12	84
17	119
20	140
31	217

DV

9.

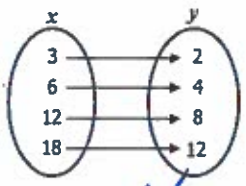
x	y
1.5	20
2.5	12
4	7.5
5	6

IV

10. {(-10, 5), (-8, 4), (-6, 3), (-2, 1)}

Neither

11.



DV

12.

x	-2	-1	3	4
y	-9	-18	6	4.5

IV

The following ordered pairs represent DIRECT VARIATION. Find the missing value.

13. (5, 14), (x, 28)

$\frac{5}{14} = \frac{x}{28}$ $X=10$

14. (14, y), (7, -3)

$\frac{14}{y} = \frac{7}{-3}$ $y=-6$

The following ordered pairs represent INVERSE VARIATION. Find the missing value.

15. (4, 12), (3, y)

$y=16$

16. (x, 6), (3, -8)

$x=-4$

Solve the following word problems using direct or inverse variation.

17. The height of a wave in California varies directly with the seconds that pass by. At 4 seconds, the wave is 6 feet height. Identify the constant of variation.

$k=\frac{6}{4}$ $k=\frac{3}{2}$

18. The cost per person to rent a mountain cabin is inversely proportional to the number of people who share the rent. If 5 people share the cabin and it costs $36 per person, identify the constant of variation.

$5=\frac{k}{36}$ $k=180$

19. In scuba diving, the time it takes a diver to ascend safely to the surface varies directly with the depth of the dive. If it takes 0.75 minutes to reach the surface from a 45 foot dive, determine the time it will take to reach the surface from a 120 foot dive.

$\frac{0.75}{45} = \frac{X}{120}$ $X=2$ min.

20. The pitch of a music note varies inversely as its wavelength. If the tone has a pitch of 440 vibrations per second and a wavelength of 2.4 feet, find the pitch of a note that has a wavelength of 1.6 feet.

$2.4=\frac{k}{440}$ $k=1056$ $\frac{1056}{1.6}$ 660 vib/sec

Name: _____ Algebra Review: **PACKET #4**

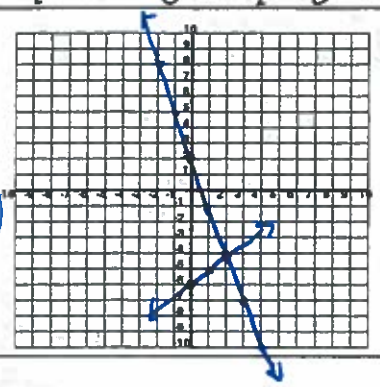
Systems of Equations

1. What is a system of equations? 2 or more equations that have may have a solution

2. The possible solutions are one solution, no solutions, or infinite solutions

Solving Systems of Equations By Graphing

1. $y = -3x + 2$
   $y = x - 6$



(2, -4)

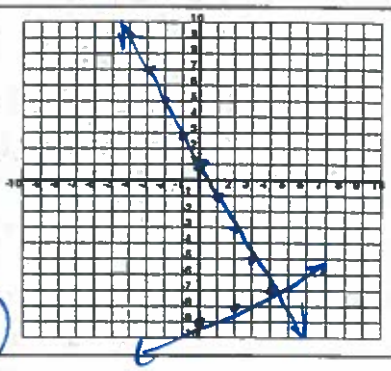
2. $2x + y = 1$
   $x - 2y = 18$

$y = -2x + 1$

$-2y = -x + 18$

$y = \frac{1}{2}x - 9$

(4, -7)



Solving Systems of Equations Algebraically

WHEN SOLVING BY ELIMINATION, EQUATIONS MUST BE "LINED-UP".

1. $x + y = -4$
   $x - y = 2$

$2x = -2$

$x = -1$

$-1 + y = -4$

$y = -3$

(-1, -3)

2. $(x + y = 4)\ -2$
   $2x - 5y = 15$

$-2x - 2y = -8$

$-7y = 7$

$y = -1$

$x + (-1) = 4$

$x = 5$

(5, -1)

3. $(4x + 3y = -1)\ 5$
   $(5x + 4y = 1)\ -4$

$20x + 15y = -5$

$-20x - 16y = -4$

$-1y = -9$

$y = 9$

$4x + 3(9) = -1$

$4x + 27 = -1$

$4x = -28$

$x = -7$

(-7, 9)

4. $y = 4x + 2$
   $(y = x - 1)\ -1$

$-y = -x + 1$

$0 = 3x + 3$

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

$x = -1$

$y = 4(-1) + 2$

$y = -4 + 2$

$y = -2$

(-1, -2)

5. $x = 2y - 3$
$2x - 3y = -5$
$(x - 2y = -3)-2$
$-2x + 4y = 6$
$y = 1$

$x = 2(1) - 3$
$x = 2 - 3$
$x = -1$

$(-1, 1)$

6. $2x + 3y = 4$
$y = 5x - 27$
$(-5x + y = -27)-3$
$15x - 3y = 81$
$17x = 85$
$\frac{17}{17} \quad \frac{17}{17}$
$x = 5$

$y = 5(5) - 27$
$y = 25 - 27$
$y = -2$
$(5, -2)$

Word Problems

1. Erin bought 4 jars of jelly and 6 jars of peanut butter for $19.32. Adam bought 3 jars of jelly and 5 jars of peanut butter for $15.67. Find the cost of each.

$(4j + 6p = 19.32)3$
$(3j + 5p = 15.67)-4$
$12j + 18p = 57.96$
$-12j - 20p = -62.68$
$-2p = -4.72$
$p = \$2.36$

$4j + 6(2.36) = 19.32$
$4j + 14.16 = 19.32$
$4j = 5.16$
$j = \$1.29$

2. Reserved seats for the football game cost $4.00 each and general admission tickets for $3.00 each. After the game was over, it was found that 1787 total tickets were sold and $5792 was made. Find the number of each sold.

$4r + 3g = 5792$
$(r + g = 1787)-4$
$-4r - 4g = -7148$
$\frac{-g}{-1} = \frac{-1356}{-1}$
$g = 1356$ general

$r + 1356 = 1787$
$-1356 \quad -1356$
$r = 431$ reserved

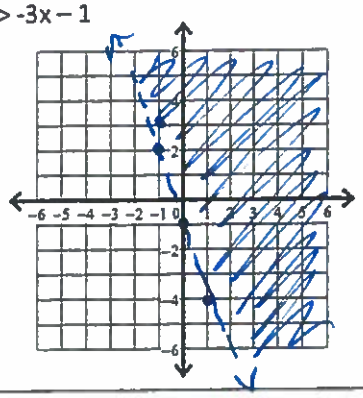
3. Nicole has a collection of 29 nickels and dimes worth $2.30. How many of each does she have?

$(n + d = 29)-0.05$
$0.05n + 0.10d = 2.30$
$-0.05n - 0.05d = -1.45$
$0.05d = 0.85$

$d = 17$ dimes
$n = 12$ nickels

Graphing Linear Inequalities

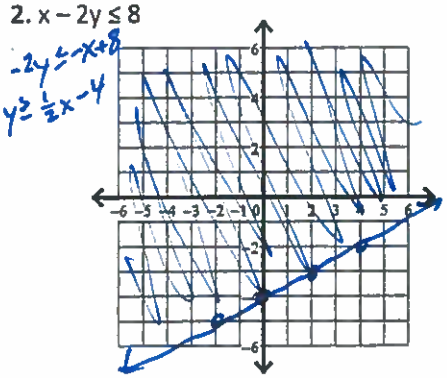
1. $y > -3x - 1$



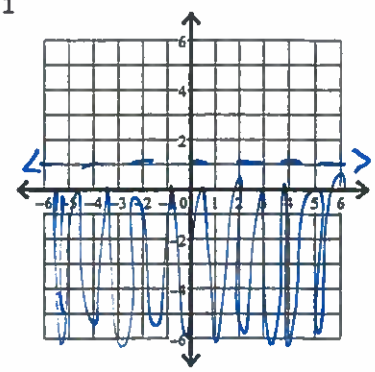
2. $x - 2y \leq 8$

$-2y \leq -x + 8$

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



3. $y < 1$



Systems of Linear Inequalities

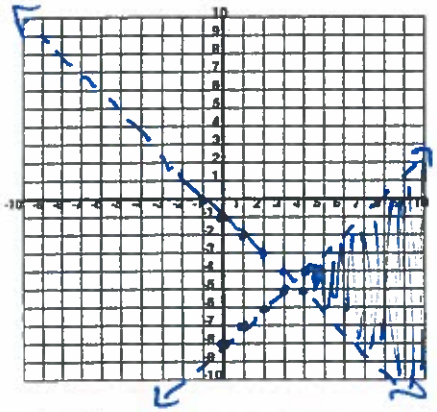
1. $x + y > -1$

$x - y > 8$

$y > -x - 1$

$-y > -x + 9$

$y < x - 8$

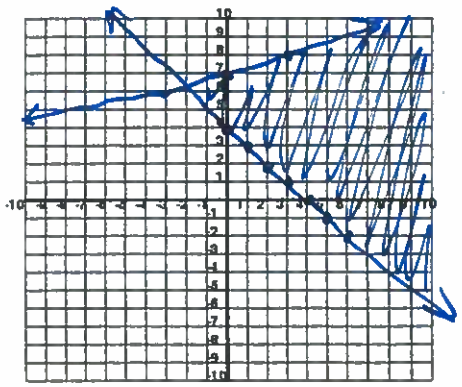


2. $-x + 3y \leq 21$

$y \geq -x + 4$

$3y \leq x + 21$

$y \leq \frac{1}{3}x + 7$



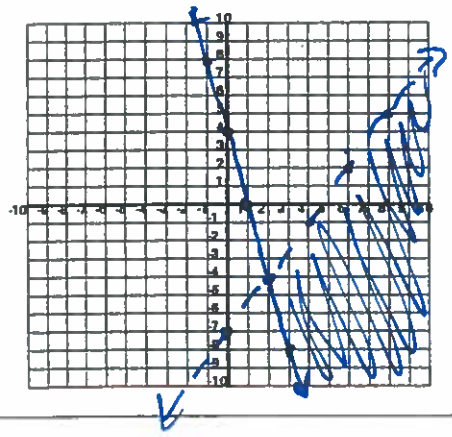
3. $4x + y \geq 4$

$3x - 2y > 14$

$y \geq -4x + 4$

$-2y > -3x + 14$

$y < \frac{3}{2}x - 7$

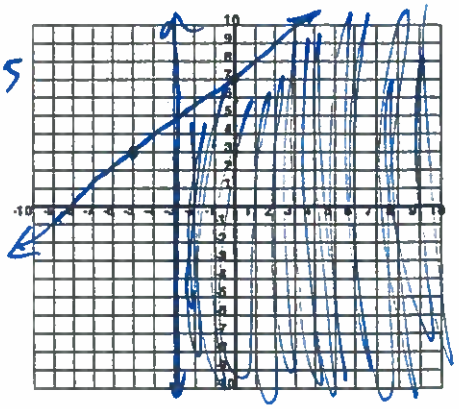


4. $4x - 5y \geq -35$

$x \geq -3$

$-5y \geq -4x - 35$

$y \leq \frac{4}{5}x + 7$



Name: _____ Algebra Review: **PACKET #5**

Exponent Rules

PRODUCT RULE	POWER RULE	QUOTIENT RULE	NEGATIVE EXPONENT RULE
$x^a \cdot x^b = x^{a+b}$	$(x^a)^b = x^{a \cdot b}$	$\frac{x^a}{x^b} = x^{a-b}$	$x^{-a} = \frac{1}{x^a}$

1. $v^4 \cdot 7v^3 \cdot 5v^1$

$35v^8$

2. $(3x^2y^2)^3$

$3^3x^6y^6 = 27x^6y^6$

3. $(-2a^6bc^3)^2 \cdot -5ab^2$

$(-2)^2a^{12}b^2c^6 \cdot -5ab^2$

$4a^{12}b^2c^6 \cdot -5ab^2 = -20a^{13}b^4c^6$

4. $(-2y^4) \cdot (xy^3)^2 - 13x^2y^{10}$

$-2y^4 \cdot x^2y^6 - 13x^2y^{10}$

$-2x^2y^{10} - 13x^2y^{10}$

$-15x^2y^{10}$

5. $\frac{a^6b^7c^2}{a^5b^4c^2} = ab^3$

6. $\frac{(-3x^6)^2}{5x^3 \cdot 3x^3} = \frac{(-3)^2x^{12}}{15x^6} = \frac{9x^{12}}{15x^6}$

$\frac{3x^6}{5}$

7. $\left(\frac{4x^4y^2}{6xy}\right)^2$

$\frac{y^2x^8y^4}{6^2x^2y^2}$

$\frac{16x^6y^2}{36} = \frac{4x^6y^2}{9}$

8. $\frac{-9n^8}{27n^{10}}$

$\frac{-1}{3n^2}$

9. $\frac{a^{12}b^{-3}}{(ab)^{-4}}$

$\frac{a^{12}b^{-3}}{a^{-4}b^{-4}} = a^{16}b^1$

Simplifying Polynomials

1. $(5 + 2x^3 + x - 3x^2) + (4x^3 + 11 - 6x + 7x^2)$

$6x^3 + 4x^2 - 5x + 16$

2. $(2x^2 + 3x + 2) - (x^2 - 4x - 1)$

$x^2 + 7x + 3$

3. $3a^2b^3(2a^2 - 7ab + b^2)$

$6a^4b^3 - 21a^3b^4 + 3a^2b^5$

4. $(x + 4)(x + 9)$

$x^2 + 9x + 4x + 36$

$x^2 + 13x + 36$

5. $(2a + 5b)(a - 3b)$

$2a^2 - 6ab + 5ab - 15b^2$

$2a^2 - ab - 15b^2$

6. $(x + 8)(x - 8)$

$x^2 + 8x - 8x - 64$

$x^2 - 64$

7. $(2y - 1)^2$

$(2y-1)(2y-1)$

$4y^2 - 2y - 2y + 1$

$4y^2 - 4y + 1$

8. $\frac{18a^3b + 12a^2b^2 - 6ab}{6ab}$

$3a^2 + 2ab - 1$

9. $\frac{-24x^4 + 48x^3 - 8x^2}{8x^3}$

$-3x + 6 - \frac{1}{x}$

10. The length of a rectangular classroom floor is 19 feet less than twice the width. Write an expression to represent the area of the floor.

$w(2w-19) = A$

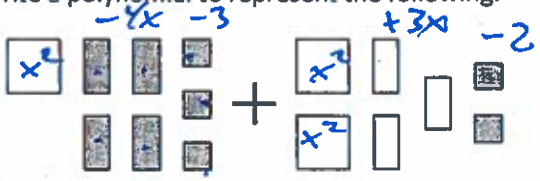
$2w^2 - 19w = A$

11. Consider the following models:

$\square = x^2$ $\quad \square = x$ $\quad \square = 1$

$\blacksquare = -x^2$ $\quad \blacksquare = -x$ $\quad \blacksquare = -1$

Write a polynomial to represent the following:



$3x^2 - x - 5$

Simplifying Non-Perfect square Roots

List the first 10 perfect square numbers:

1, 4, 9, 16, 25, 36, 49, 64, 81, 100

1. $\sqrt{24}$	2. $\sqrt{162}$	3. $\sqrt{80}$	4. $\sqrt{112}$
$\sqrt{4}\sqrt{6}$ $2\sqrt{6}$	$\sqrt{81}\sqrt{2}$ $9\sqrt{2}$	$\sqrt{4}\sqrt{20}$ $2\sqrt{4}\sqrt{5}$ $2 \cdot 2\sqrt{5}$ $4\sqrt{5}$	$\sqrt{16}\sqrt{7}$ $4\sqrt{7}$

Simplifying Non-Perfect cube Roots

List the first 10 perfect cube numbers:

1, 8, 27, 64, 125, 216, 343, 512, 729, 1080

1. $\sqrt[3]{40}$	2. $\sqrt[3]{54}$	3. $\sqrt[3]{297}$	4. $\sqrt[3]{192}$
$\sqrt[3]{8}\sqrt[3]{5}$ $2\sqrt[3]{5}$	$\sqrt[3]{27}\sqrt[3]{2}$ $3\sqrt[3]{2}$	$\sqrt[3]{27}\sqrt[3]{11}$ $3\sqrt[3]{11}$	$\sqrt[3]{64}\sqrt[3]{3}$ $4\sqrt[3]{3}$

Monomial Square Roots

1. $\sqrt{x^2}$ x	2. $\sqrt{9k^4}$ $3k^2$	3. $\sqrt{y^5}$ $y^2\sqrt{y}$
4. $\sqrt{18m^3}$ $\sqrt{9}\sqrt{2}\sqrt{m^2}\sqrt{m}$ $3m\sqrt{2m}$	5. $\sqrt{36x}$ $6\sqrt{x}$	6. $\sqrt{28ab^2}$ $\sqrt{4}\sqrt{7}\sqrt{a}\sqrt{b^2}$ $2b\sqrt{7a}$
7. $\sqrt{81x^2y^2z}$ $9xy\sqrt{z}$	8. $\sqrt{108a^2b^3c^6}$ $\sqrt{36}\sqrt{3}\sqrt{a^2}\sqrt{b^2}\sqrt{b}\sqrt{c^6}$ $6abc^3\sqrt{3b}$	9. $\sqrt{72mn^8p^5}$ $\sqrt{36}\sqrt{2}\sqrt{m}\sqrt{n^8}\sqrt{p^4}\sqrt{p}$ $6n^4p^2\sqrt{2mp}$

Name: _____ Algebra Review: **PACKET #6**

Factoring

GCF	DIFFERENCE OF SQUARES	BASIC TRINOMIAL	SLIP & SLIDE TRINOMIAL
largest # that can be pulled out	$(a+b)(a-b)$	x^2+3x+2 $(x+2)(x+1)$	

Polynomials that can't be factored at all are called prime!

1. $21c-12$ $3(7c-4)$	2. x^2y+8x $x(xy+8)$	3. $75a^2b^3c-30ab^2$ $15ab^2(5abc-2)$
4. $4m^2-81n^2$ $(2m+9n)(2m-9n)$	5. $12x^2-12$ $12(x^2-1)$ $12(x+1)(x-1)$	6. $27b-75b^3$ $3b(9-25b^2)$ $3b(3+5b)(3-5b)$
7. $p^2-13p+30$ $(p-10)(p-3)$	8. n^3-4n^2-60n $n(n^2-4n-60)$ $n(n-10)(n+6)$	9. $5w^2-15w-20$ $5(w^2-3w-4)$ $5(w-4)(w+1)$
10. $3x^2+10x+3$ 9 $3x^2+9x+1x+3$ $3x(x+3)+1(x+3)$ $(x+3)(3x+1)$	11. $12c^2+5c-2$ -24 $12c^2+8c-3c-2$ $4c(3c+2)-1(3c+2)$ $(3c+2)(4c-1)$	12. $2x^2-5x+4$ 8 ~~$2x^2-8x+3x+4$~~ Prime

Dividing Polynomials by a Binomial

1. $\frac{x^2-12x+20}{x-10}$ $\frac{(x-10)(x-2)}{x-10}$ $x-2$	2. $\frac{y^2-y-56}{y+7}$ $\frac{(y-8)(y+7)}{y+7}$ $y-8$	3. $(x^2-1)\div(x+1)$ $\frac{(x+1)(x-1)}{x+1}$ $x-1$

Graphing Quadratic Equations

STANDARD FORM OF A QUADRATIC EQUATION: $y = ax^2 + bx + c$

FORMULA FOR THE AXIS OF SYMMETRY: $x = \frac{-b}{2a}$

WHEN GRAPHED, A QUADRATIC EQUATION CREATES A parabola.

1. $y = -x^2 + 6x - 13$

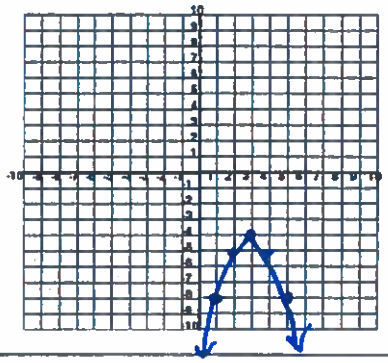
$\frac{-6}{2(-1)} = 3$

x	y
1	-8
2	-5
3	-4
4	-5
5	-8

$-9+18-13$

$-1+6-13$

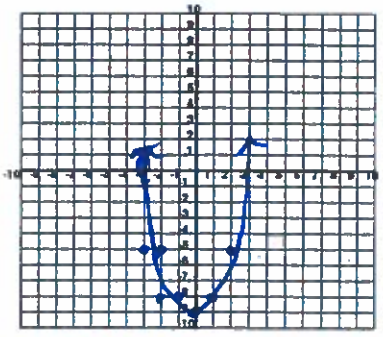
$4+12-13$



2. $y = x^2 - 9$

-1

x	y
-2	-5
-1	-8
0	-9
1	-8
2	-5



3. $y = (x-5)(x+1)$

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

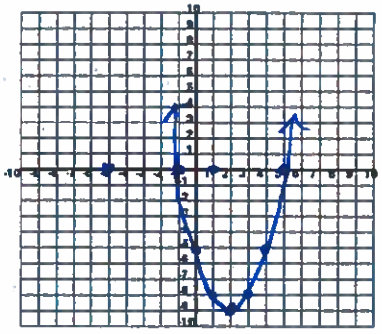
$x^2 - 4x - 5$

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

x	y
0	-5
1	-8
2	-9
3	-8
4	-5

$4-8-5$

$-4-5$

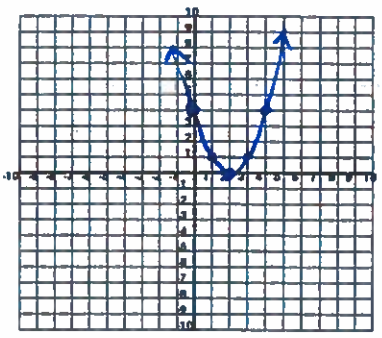


4. $y = (x-2)^2$ $x^2 - 4x + 4$

x	y
0	4
1	1
2	0
3	1
4	4

$4-8+4$

$1-4+4$



Solving Quadratic Equations

The solutions to a quadratic equation are the point(s) at which the parabola intersects the x-axis.

To solve a quadratic equation, use one of the following methods:

- **Factoring**
- **Quadratic Formula**

1. $x^2 + 8x = 0$

$x(x+8) = 0$

$x = 0 \quad x + 8 = 0$

$x = \{-8, 0\}$

2. $4x^2 = 10x$

$4x^2 - 10x = 0$

$2x(2x-5) = 0$

$2x = 0 \quad 2x - 5 = 0$

$+5 \quad +5$

$2x = 5$

$x = 5/2$

$x = 0$

$x = \{0, \frac{5}{2}\}$

3. $x^2 + 5x = 6$

$x^2+5x-6=0$

$(x+6)(x-1)=0$

$x+6=0 \quad x-1=0$

$x=\{-6, 1\}$

4. $x^2 = 18x - 81$

$x^2-18x+81=0$

$(x-9)(x-9)=0$

$x=\{9\}$

11. $2x^2 + 5 = 77$

$2x^2=72$

$\sqrt{x^2=36}$

$x=\{\pm 6\}$

6. $\frac{3x^2 + 9x - 30}{3} = \frac{0}{3}$

$x^2+3x-10=0$

$(x+5)(x-2)=0$

$x=\{-5, 2\}$

7. $6x^2 - x = 2$ $\quad -12$

$6x^2-x-2=0$

$6x^2-4x+3x-2=0$

$2x(3x-2)+1(3x-2)=0$

$(3x-2)(2x+1)=0$

$x=\{-\frac{1}{2}, \frac{2}{3}\}$

8. $4x^2 + 1 = 50$

$4x^2=49$

$\sqrt{x^2=\frac{49}{4}}$

$x=\{\pm\frac{7}{2}\}$

9. $(x + 1)(x - 4) = 6$

$x^2-4x+1x-4-6=0$

$x^2-3x-10=0$

$(x-5)(x+2)=0$

$x=\{-2, 5\}$

10. $\frac{2}{3}x^2 - 14 = 136$

$\frac{3}{2}\cdot\frac{2}{3}x^2=150\cdot\frac{3}{2}$

$\sqrt{x^2=225}$

$x=\{\pm 15\}$

Quadratic Equation Word Problems

1. The length of a rectangle is 4 inches less than twice its width. If the area of the rectangle is 70 square inches, what are its dimensions?

$l=2w-4$

$A=lw$

$70=(2w-4)w$

$70=2w^2-4w$

$0=2w^2-4w-70$

$0=w^2-2w-35$

$0=(w-7)(w+5)$

$w=7$

$l=7(7)-4$

$l=14-4$

$l=10$ in $\quad w=7$ in

2. The stress distribution on a structure is given by $s = 2x^2 + 4x - 30$ where s is stress in pounds per square inch and x is the distance in feet from a reference point. At what distance is the stress equal to 0?

$0=\frac{2x^2+4x-30}{2}$

$0=x^2+2x-15$

$0=(x+5)(x-3)$

$x=3$ inches

3. The number of seconds to complete a chemical reaction was determined to be given by the equation $s = 250 - 5t - t^2$ where s is the number of seconds and t is the temperature in degrees Celsius at which the reaction occurred. If a chemical reaction was complete in 200 seconds, what was the temperature at which the reaction occurred?

$200 = 250 - 5t - t^2$

$0 = 50 - 5t - t^2$

$0 = t^2 + 5t - 50$

$0 = (t+10)(t-5)$

$t = 5°C$

4. A toy rocket is launched from a platform that is 48 feet high. The rocket's height above the ground is modeled by the equation $h = -16t^2 + 32t + 48$.

a) What is the maximum height of the rocket?

$t = \frac{-32}{-32} = 1$

$h = -16 + 32 + 48$

$h = 64$ ft

b) What is the rocket's height at 2 seconds?

$h = -16(4) + 32(2) + 48$

$h = -64 + 64 + 48$

$h = 48$ ft

c) How long will it take the rocket to reach the ground?

$0 = -16t^2 + 32t + 48$

$0 = t^2 - 2t - 3$

$0 = (t-3)(t+1)$

$t = 3$ seconds

Curve of Best Fit (Quadratic Regression)

1. Given the data in the table below, find an equation to model the curve of best fit.

x	y
0	0
1	66
2	100
3	102
4	72

$y = -16x^2 + 82x$

2. Given the data in the table below, find an equation to model the curve of best fit.

x	0	1	2	3	4
y	305	367	397	395	361

$y = -16x^2 + 78x + 305$