ALGEBRA I

Algebra I MID-YEAR TEST

+ Study Guide!

Created by:

ALL THINGS ALGEBRA

_____ Given a set of data, write an equation for direct variation

_____ ~~Given a set of data, write an equation for inverse variation~~

_____ Given a situation that is ~~either~~ direct ~~or inverse variation~~, solve for a missing variable

_____ Recognize and graph direct ~~and inverse~~ variation situations

Systems of Equations & Inequalities - 2nd Semester

_____ Determine whether a system of equations has one solution, no solution, or infinite solutions.

_____ Solve systems of equations graphically

_____ Solve systems of equations by substitution or elimination

_____ Write a system of equations to model a real-life situation

_____ Solve systems of inequalities graphically

Monomials, Polynomials, & Factoring Unit 6

_____ Simplify monomial expressions using the product, power, quotient, and negative exponent rules

_____ Simplify monomial square roots

_____ Add, subtract, multiply, and divide polynomials

_____ Factor polynomials (GCF, Difference of Squares, Basic Trinomials, Slip & Slide Trinomials)

_____ Identify prime polynomials

Quadratic Equations: 2nd Semester

_____ Graph quadratic equations using the axis of symmetry and vertex

_____ Solve quadratic equations, either graphically by identifying the roots/zeros, or setting equation equal to 0 and solving for x-values

_____ Solve quadratic word problems

_____ Solve projectile motion problems

_____ Given a situation, determine whether a linear or quadratic relationship exists. Then, find the equation for the line or curve of best fit

_____ Using your equation or line or curve of best fit, make predictions on future outcomes

Statistics: 2nd Semester

_____ Determine the mean, median, mode, and range for a given set of data

_____ Construct a box-and-whisker plot using the lower extreme, lower quartile, median, upper quartile, and upper extreme of a data set.

_____ Compare and contrast several box-and-whisker plots

_____ Calculate the mean absolute deviation, standard deviation, and variance of a data set

_____ Interpret what the standard deviation means for a data set

_____ Calculate the z-score for a given data value in a set

TRANSITIVE:

- $a = b$ $b = c$ then $a = c$
-

Identify the following properties:

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

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

$8 - [12 \div (7 - 1)] + 1$

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

$8 - 2 + 1$

$6 + 1$

7

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

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

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

$+6x \quad +6x$

$6 = 6$

Infinite Solutions

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

$7x = 3(x-8)$

$7x = 3x - 24$

$4x = -24$

$x = -6$

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

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

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

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

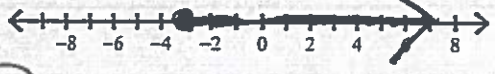
Inequalities

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

$-13 \quad -13$

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

$x \geq -3$



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

$-3x \quad -3x$

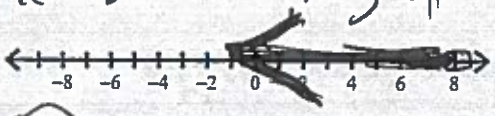
$-5x + 6 > -34$

$-6 \quad -6$

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

$x < 8$

← Divide by Negative Flip Ineq.



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

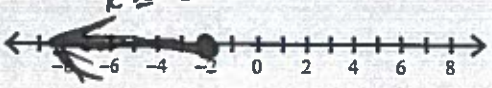
$3x - 7x - 21 \geq -13$

$-4x - 21 \geq -13$

$+21 \quad +21$

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

$x \leq -2$



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

$4 - 8x < 10 - 6x$

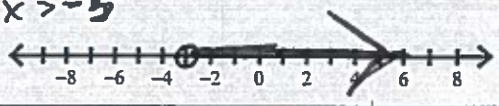
$+6x \quad +6x$

$4 - 2x < 10$

$-4 \quad -4$

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

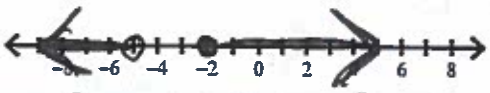
$x > -3$



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 $-5x - 8 \leq -13$

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

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

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

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

Relations & Functions

Domain: x-values Range: y-values

A relation is a function if it doesn't have any repeating x-values or passes the vertical line test!

1.

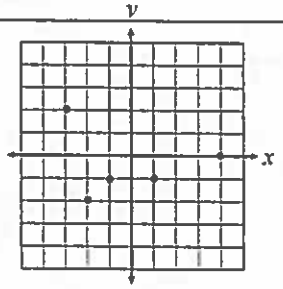
x	-1	2	5	-1
y	7	3	0	2

D = {-1, 2, 5}

R = {0, 2, 3, 7}

Function? No

2.

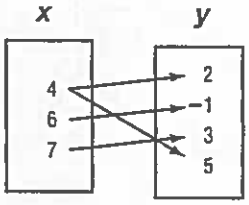


D = {-3, -2, -1, 1, 4}

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

Function? Yes

3.

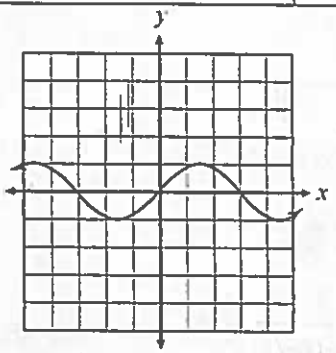


D = {4, 6, 7}

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

Function? No

4.

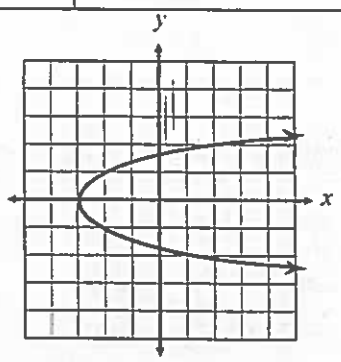


D = ℝ

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 $f(-2)$

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

$= 4 + 4 + 11$

$= 19$

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

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

$= 32 + 4$ $= 162 - 9$

$= 36$ $= 153$

153 − 36 = 117

36 − 153 = −117

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

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

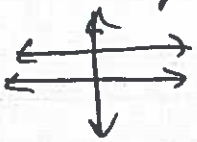
$= -4 + 1$ $f(-6) = -3$

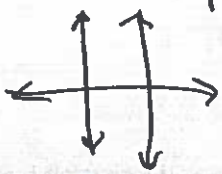
Slope

There are 4 types of slope. Sketch them below:

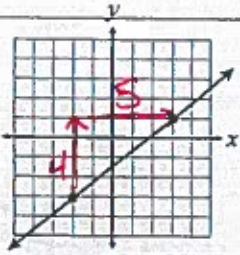
positive 

negative 

0 slope 

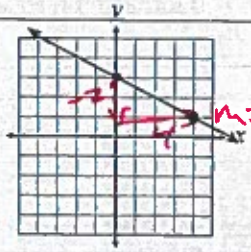
No Slope 

1. Find the slope:



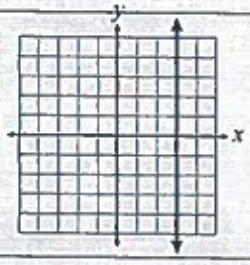
$m = \frac{4}{5}$

2. Find the slope:



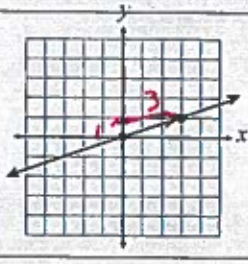
$m = -\frac{2}{4} = -\frac{1}{2}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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)

$m = \frac{-7 - 1}{-3 + (+1)} = \frac{-8}{-2} = 4$
$y - 1 = 4(x + 1)$
$y - 1 = 4x + 4$
$+1 \quad +1$
$y = 4x + 5$

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

$\frac{1 - 3}{5 - 0} = \frac{-2}{5}$
$y - 3 = -\frac{2}{5}(x - 0)$
$y - 3 = -\frac{2}{5}x$
$+3 \quad +3$
$y = -\frac{2}{5}x + 3$

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

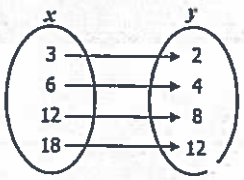
$\frac{2 + (+3)}{1 + (+2)} = \frac{5}{3}$
$y + 3 = \frac{5}{3}(x + 2)$
$y + 3 = \frac{5}{3}x + \frac{10}{3}$
$-3 \quad -3$
$y = \frac{5}{3}x + \frac{1}{3}$

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

$\frac{-4 - 1}{-6 - 4} = \frac{-5}{-10} = \frac{1}{2}$
$y - 1 = \frac{1}{2}(x - 4)$
$y - 1 = \frac{1}{2}x - 2$
$+1 \quad +1$
$y = \frac{1}{2}x - 1$

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

11.



12.

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

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

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

$y = kx$

$14 = k(5)$

$\frac{14}{5} = k$

$28 = \frac{14}{5}x \cdot \frac{5}{14}$

$x = 10$

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

$y = kx$

$-3 = k7$

$k = -\frac{3}{7}$

$y = -\frac{3}{7}(14)$

$y = -6$

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

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

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

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.

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.

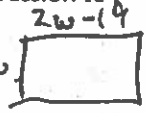
19. In scuba diving, the time it takes a diver to ascend safely to the surface varies directly with the depth of the dive. If it takes 0.75 minutes to reach the surface from a 45 foot dive, determine the time it will take to reach the surface from a 120 foot dive.

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.

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.

$y = (2w - 19)w$

$y = 2w^2 - 19w$

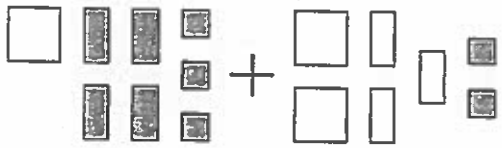


11. Consider the following models:

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

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

Write a polynomial to represent the following:



$x^2 + -4x + -3 \quad + 2x^2 + 3x + -2$

$3x^2 - x + -5$

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. $\sqrt{112}$
$\sqrt{4}\sqrt{6}$	$\sqrt{81}\sqrt{2}$	$\sqrt{16}\sqrt{5}$	$\sqrt{16}\sqrt{7}$
$2\sqrt{6}$	$9\sqrt{2}$	$4\sqrt{5}$	$4\sqrt{7}$

Simplifying Non-Perfect cube Roots

List the first 10 perfect cube numbers:

1, 8, 27, 64, 125, 216, 343, 512, 729, 1000

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