Welcome to Algebra 1!   Name: _____

This summer packet is for all students enrolled in Algebra 1 at Herndon High School for Fall 2023.

This summer assignment is not *required*, but it is *strongly recommended!*

The exercises will give you the opportunity to self-assess how prepared you are for Algebra this year. Success in our first unit will depend how well you understand the topics included, so put your best effort into it! Feel free to use old notes and online resources as needed to ensure that you understand the content.

Some tips for your summer review:

✓ Print this packet OR complete it on a separate piece of paper.

✓ Try to work on one page a day for about 20 minutes, and you'll be done in no time! Within each section, we've provided a link to a video that reviews the concept if you need it.

✓ You don't have to do the pages in order. Feel free to skip around. If you remember how to do some of the problems on the page, but not all of them – that's okay too! Just do your best!

✓ Do as many of the problems as you can without the use of a calculator. It is important to spend time keeping these skills and concepts fresh in your mind – especially your mental math! However, if needed, you may use Desmos to help you: https://www.desmos.com/testing/virginia/graphing

✓ As you work, think about which topics you feel confident in, which you're unsure of, and which you don't think you've ever learned! There is a Google Form at the end of this packet to provide us with your feedback. You are also welcome to reach out to us over the summer; our contact information is below.

✓ The answer key can be found online here. Use this responsibly to check your work.

FCPS may also provide additional resources for summer review. Check the HHS and FCPS websites for more information.

Have a great summer – we are looking forward to meeting you in August!

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Fill in the chart with the math symbol or operation that represents each term:

sum		difference		product	
of		twice		quotient	
more than		times		square	
less than		divided		square root	
is		equals		is less than	
is less than or equal to		is greater than		is greater than or equal to	

Exercises: Translate the following expressions into math symbols.

1. The quotient of a number and twelve.

2. Six less than five times a number.

3. The product of twenty-five and a number equals one hundred.

4. A number squared is sixteen.

5. The square root of thirty-six is less than or equal to a number.

6. One half of the sum of twenty and a number is greater than or equal to forty.

B. Operations with Real Numbers

Visit these links to review the sign rules for <u>addition/subtraction</u> and for <u>multiplication/division</u>.
Review sign rules for operations with positive and negative values:

Positive + Positive = _____   Positive • Positive = _____

Negative + Negative = _____   Negative • Negative = _____

Positive + Negative =   Hmmmmm?   Positive • Negative = _____

Describe why the sum of a positive and negative
value can be either positive or negative: _____

_____

Review rules for operations with fractions:
-   Adding and subtracting fractions: Find the common _____;
    add or subtract the _____ only.
-   Multiplying fractions: Multiply numerators, multiply denominators. Simplify by dividing common factors.
-   Dividing fractions: Multiply the dividend (first value) by the reciprocal (flip) of the divisor (second value).
    Simplify if possible.

Need more review? Check out this <u>video</u>!

Exercises: Simplify.

7. $-4+18$

8. $-5-5$

9. $7-3-11$

10. $-3+7-4+6$

11. $-\dfrac{1}{3}+\dfrac{1}{2}$

12. $3-\dfrac{1}{7}$

13. $\dfrac{13}{16}+\dfrac{5}{8}$

14. $7(-6)$

15. $-2\bullet(-9)$

16. $-30(7)$

17. $-2\bullet 4\bullet(-3)$

18. $-\dfrac{2}{3}\bullet-\dfrac{3}{4}$

19. $121\div(-11)$

20. $-56/8$

21. $\dfrac{-108}{-12}$

22. $14\div\dfrac{7}{8}$

Exercises: Simplify using your knowledge of exponents, radicals, and absolute value.

23. 5^2 24. 3^4 25. $\sqrt{49}$ 26. $\sqrt[3]{8}$ 27. $|-23|$

C. Order of Operations

Follow the Order of Operations (PEMDAS) when simplifying expressions:
1. Simplify all grouping symbols: parenthesis, brackets, braces, fraction bars, absolute value and radical signs.
2. Simplify all exponents and radicals.
3. Do multiplication and division in order from left to right.
4. Do addition and subtraction in order from left to right.

Need more review? Check out this <u>video</u>!

Exercises: Simplify.

28. $24 \div 4 \bullet 2$	29. $\dfrac{3\lvert 2-4 \rvert}{2(4+3)}$	30. $5+6(4-1) \div \dfrac{1}{3}$
31. $\dfrac{9(2+1)^2}{9} + \dfrac{5(4+2)}{5-4}$	32. $2\sqrt{25} + 10 \div 2(6) - \lvert -4 \rvert$	**Challenge:** Insert the fewest number of grouping symbols to make the following equation true: $$24 \div 3 + 9 \times 5 - 2 = 6$$

D. Evaluating Expressions

Replace each variable with its given value and simplify. Use parenthesis when substituting the value to preserve negative signs.

Need more review? Check out this <u>video</u>!

Exercises: Evaluate each of the following expressions for the given values of the variables:

$a = 5$ $\qquad\qquad$ $b = -2$ $\qquad\qquad$ $c = 0$

$d = -4$ $\qquad\qquad$ $e = 1$ $\qquad\qquad$ $f = 3$

33. $3a + 4e$	34. $2(d - 2)$	35. $b^2 - 2df$
36. $\lvert a - f \rvert + \lvert f - a \rvert$	37. $\dfrac{2b - 4d^2}{3}$	38. $5a + 6d - \dfrac{bf}{6}$

E. Distributive Property and Combining Like Terms

Use the Distributive Property when an expression with the addition or subtraction of terms is a factor.

Examples:

$8(x^2 + y - 3) \rightarrow 8x^2 + 8y - 24$

$-4(3a - 7b) \rightarrow -12a + 28b$

Non-example:

$2(5x)(3) \rightarrow 30x$

The two is not distributed since there is only multiplication and no addition or subtraction.

Combining Like Terms: Like terms have exactly the same variables raised to the same power. Combine by adding or subtracting the coefficients.

Need more review? Check out this <u>video</u>!

Exercises: Simplify.

39. $3x - 2 - 4x$	40. $2a - 7b - 8 + 4a - 3b - 10c + 1$	41. $14x^2 - 6x + 8 - 6x^2 + x - 11$
42. $-2(3x - 4y + 5z)$	43. $(3x^2 + 5x - 9)(6)$	44. $\dfrac{1}{2}(14 + 10a)$
45. $3x + 6(2x + 4)$		46. $7(3 - 2x) + 8 - 3(4x - 9)$

F. Solving Equations

Solve for the variable by isolating it on one side of the equation.

Steps:

1. Distribute.
2. Combine like terms on each side.
3. Move all the variables to one side by adding or subtracting.
4. Get rid of addition/subtraction.
5. Get rid of multiplication/division.
6. Check your answer by plugging in the solution.

Need more review? Check out this <u>video</u> or this <u>video</u>!

Example:

Exercises: Solve:
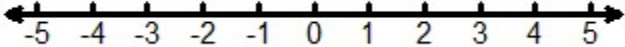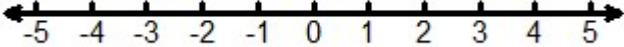
47. $x - 12 = -14$	48. $-2y = -20$	49. $-15 = -a - 7$
50. $\dfrac{3}{2}x - 18 = -42$	51. $3w - 6 + 5w = -2$	52. $21 = 3(2 - a)$
53. $8x + 3(2 - 3x) = 28$	54. $5x - 2(x + 1) = 10$	55. $\dfrac{1}{4}(8 - 10x) + \dfrac{1}{2}x = 5$
56. $3 - 5x = -8x - 9$	57. $3(x - 2) = 5(x + 8)$	58. $-2(d + 3) = 1 - d$

G. Solving Inequalities

Graph the inequalities on a number line. Remember to use the open circle for < and > and the closed circle for ≤ and ≥. Draw the arrow in the direction that represents the solution.
Need more review? Check out this <u>video</u>!

Exercises: Graph each inequality on a number line.

59. $x \geq -2$	60. $x < 3$

Solve. Remember solving an inequality is just like solving an equation! (See previous section for review if needed!) The only extra step is when you <u>multiply or divide each side of an inequality by a negative number,</u> you must **<u>FLIP</u>** the inequality symbol to maintain a true statement.
Need more review? Check out this <u>video</u>!

Exercises: Solve each inequality. You do <u>not</u> need to graph the solution on a number line.

61. $x + 7 < 10$	62. $-4y \leq 10$	63. $\dfrac{d}{2} \geq -6$
64. $-10 \leq -\dfrac{2}{5}c$	65. $-2 - 3x \geq 2$	66. $-1 < 26 - 3x$
67. $2m + 3m > 85$	68. $x + 10 \leq 3x - 8$	69. $5(2h - 3) - 6(h - 6) > 5$
70. $-2(7 - x) < -14 - 5x$	71. $\dfrac{2x - 3}{5} < 7$	72. $2 < 8y - (6y - 10)$

H. Solve for Y/Put in Slope-Intercept Form

Rewrite the equation so that <u>y is a function of x</u>.
This means <u>solve for y</u> or isolate the y to look like $y = mx + b$ **!!**

Need more review? Check out this <u>video</u>!

Exercises: Solve each equation for y.

73. $2x + y = 5$	74. $9 - y = 1.5x$	75. $2x = -3y + 10$

I. Identifying Functions, Domain, and Range

A relation is a **function** if and only if **each input *x* has exactly one output *y*.**
Domain = the x-values/input of the function.
Range = the y-values/output of the function.
Need more review? Check out this <u>video</u> or this <u>video</u>!

Exercises: Are the following relations functions? Why or why not? For those that are, identify the domain and range in set-builder notation.

76. $\{(2,5),(4,6),(6,5),(8,6)\}$	77.	78.
	<table><tr><th>Input</th><th>Output</th></tr><tr><td>4</td><td>3</td></tr><tr><td>13</td><td>7</td></tr><tr><td>9</td><td>4</td></tr><tr><td>4</td><td>0</td></tr></table>	
79.	80.	81.
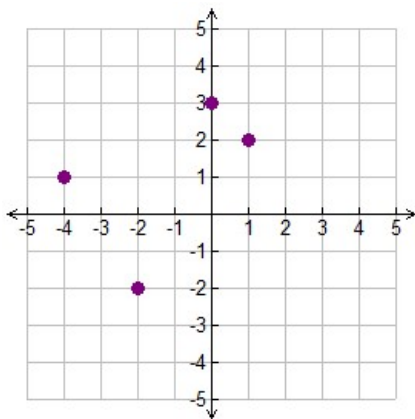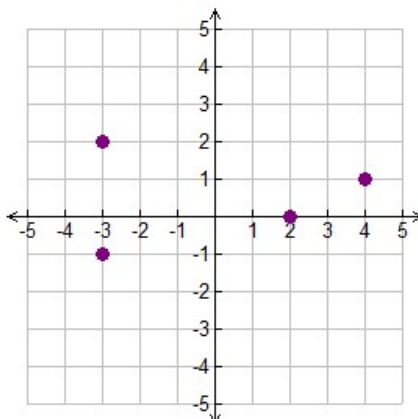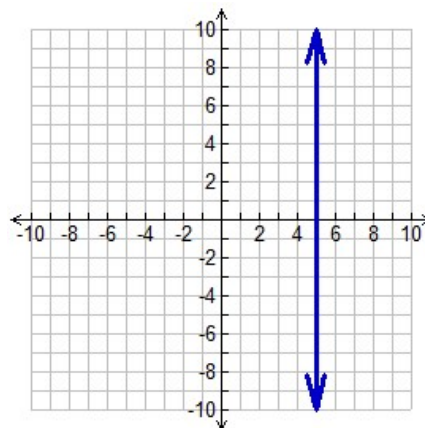
Are the following relations functions? Why or why not? You do <u>not</u> need to identify domain and range.
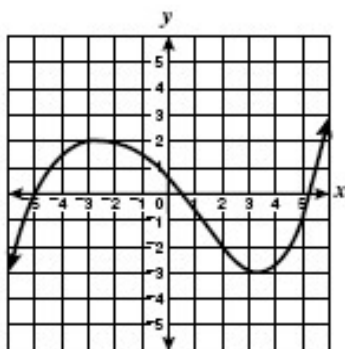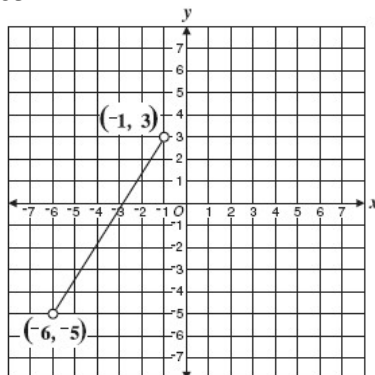
82.	83.	84.
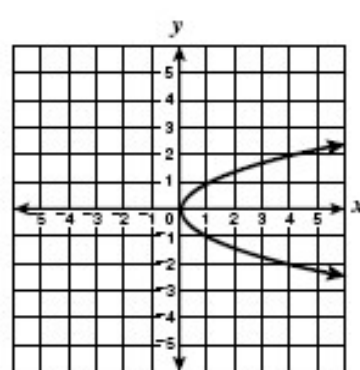
J. Graphing on the Coordinate Plane

The first value in an (x, y) ordered pair represents the distance horizontally from zero. If the x-value is positive, start at the origin (0, 0) and count to the right. If the x-value is negative, count to the left.

The second value in an (x, y) ordered pair represents the distance vertically from zero. If the y-value is positive, start at the origin (0, 0) and count up from zero. If the y-value is negative, count down.

Need more review? Check out this <u>video</u> or this <u>video</u>!

Exercises: If you do not have graph paper at home, you can print some from online, or you can do your best to draw clear graphs with a straight-edge or ruler.

85. Plot and label each of the (x, y) ordered pairs on the coordinate plane.

A (4, 2)   B (1, -3)   C (-5, -6)   D (1, 0)

E (-5, 0)   F (0, 4)   G (-2, 7)   H (0, -2)
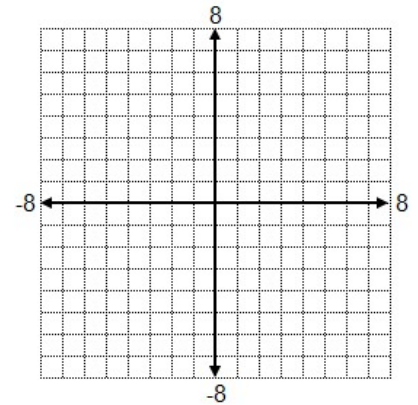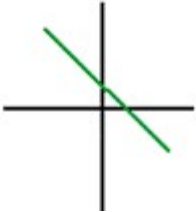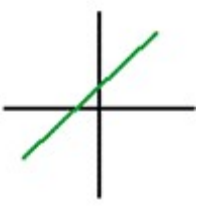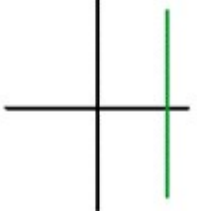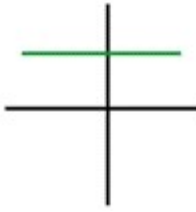
K. Slope

Slope describes how steep or flat a line is. It is the rate of change of the line. Slope is often represented by the variable *m*, such as in the slope-intercept form 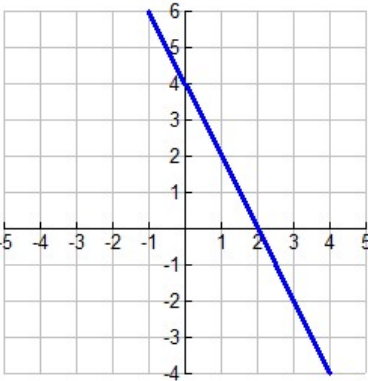of a line $y = mx + b$. We can use the slope formula to find the slope between two given points: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$.

Need more review? Check out this <u>video</u> or this <u>video</u>!

Exercises: Identify the <u>type</u> of slope shown in each graph.

86.	87.	88.	89.

Find the slope of the given line or between the given points.

90.

91. $y = -\dfrac{2}{3}x - 1$

92. $(2,1),\ (5,3)$

93. $(2,-9),(4,-3)$

94.

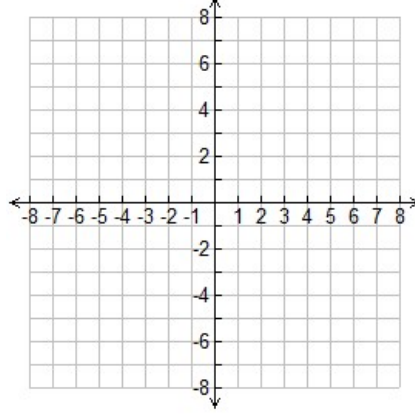| X	Y
9	-3
4	-6
-6	-12

L. Graphing Linear Functions

Exercises: Graph each line. If you do not have graph paper at home, you can print some from online, or you can do your best to draw clear graphs with a straight-edge or ruler.
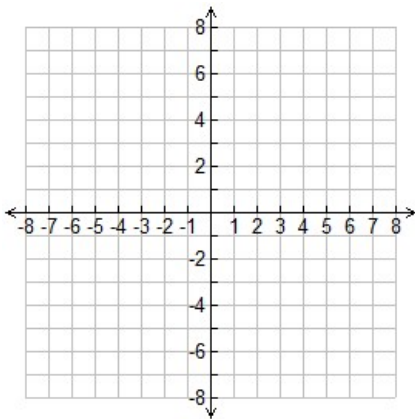
Need more review? Check out this video!
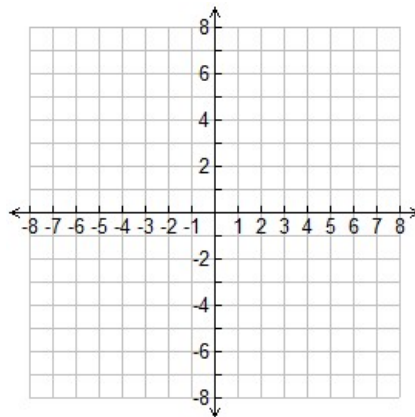
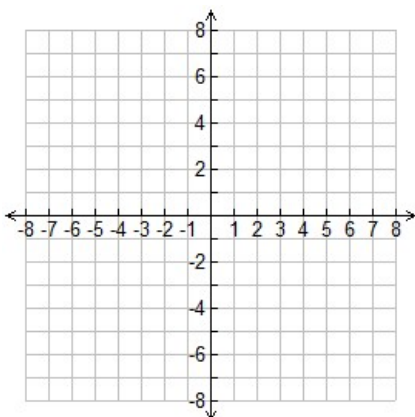95. $y = 3$
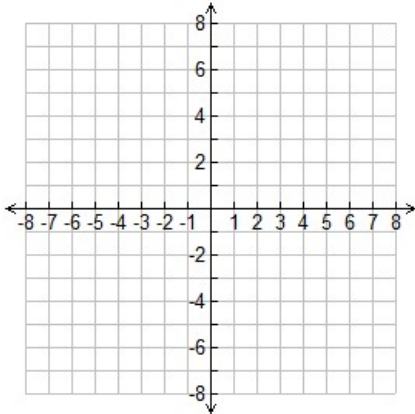
96. $x = -2$

97. $y = 2x + 3$

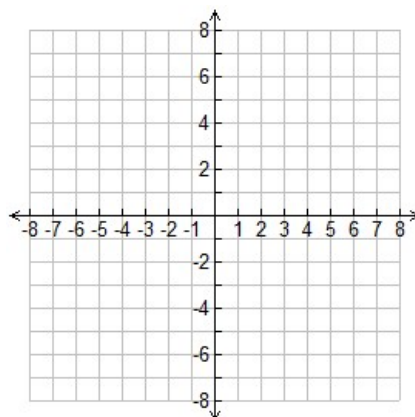| X	Y
-2	
-1	
0	
1	
2	

98. Graph the line that has a slope of $\dfrac{2}{3}$ and a y-intercept of -2.

99. $y = -\dfrac{1}{3}x - 1$

100. $2x - 2y = 8$

Whew! Feel ready for Algebra 1? Believe it or not, you will use all of these skills this year.

Please complete this quick Google Form to give us feedback on what concepts you understand and which ones you want more practice on.

We will check the answers to this packet in class – be ready with questions!

See you soon!