Name: ______________________________

(5/11/17)

Hebron HS 9th Grade Center

Summer Packet

Pre-AP Algebra 1- 2019-20

To receive credit all work must be shown. There will be a test over this material. Any work done on additional paper must be turned in with the assignment.

A. Order of Operations

PEMDAS = **P**arentheses, **E**xponents, **M**ultiplication/**D**ivision, **A**dd/**S**ubtract from left to right.

Simplify each expression using appropriate Order of Operations.

1. $1 \bullet 5 - 6 \div 2 + 3^2$
2. $125 \div \left[5\left(2+3\right)\right]$
3. $4 + 2(10 - 4 \bullet 6)$
4. $3(2+7)^2 \div 5$
5. $12(20-17) - 3 \bullet 6$
6. $3^2 \div 3 + 2^2 \bullet 7 - 20 \div 5$

B. Fractions Review

The fraction bar represents division:

$\frac{1}{2} = 1 \div 2 = 0.5$ $\quad\quad$ $1 \div 4 = \frac{1}{4} = 0.25$

Fractions should always be written in simplest form:

$\frac{5}{20} = \frac{1 \cdot 5}{4 \cdot 5} = \frac{1}{4}$ $\quad\quad$ $\frac{3}{30} = \frac{3 \cdot 1}{3 \cdot 10} = \frac{1}{10}$

Any integer can be written as fraction with a denominator of 1:

$5 = \frac{5}{1}$ $\quad\quad$ $-8 = -\frac{8}{1}$ $\quad\quad$ $-32 = -\frac{32}{1}$

An improper fraction can be written as a mixed number (but improper fractions are more useful so don't convert):

$\frac{17}{5} = \frac{15+2}{5} = \frac{15}{5} + \frac{2}{5} = 3 + \frac{2}{5} = 3\frac{2}{5}$ $\quad\quad$ $\frac{25}{3} = \frac{24+1}{3} = 8\frac{1}{3}$

There are several equivalent ways to write a negative fraction:

$-\frac{3}{5} = \frac{-3}{5} = \frac{3}{-5}$ $\quad\quad$ $-\frac{7}{13} = \frac{-7}{13} = \frac{7}{-13}$ $\quad\quad$ $\frac{-3}{-5} = \frac{3}{5}$

To add or subtract fractions, you must have a common denominator:

$\frac{1}{5} + \frac{2}{15} = \frac{3}{15} + \frac{2}{15} = \frac{5}{15} = \frac{1}{3}$ $\quad\quad$ $\frac{3}{10} + \frac{1}{6} = \frac{9}{30} + \frac{5}{30} = \frac{14}{30} = \frac{7}{15}$

To multiply fractions, multiply the numerators and the denominators:

$\frac{1}{3} \cdot \frac{2}{15} = \frac{2}{45}$ $\quad\quad$ $\frac{3}{7} \cdot \frac{4}{9} = \frac{12}{63} = \frac{4}{21}$

To divide fractions, multiply by the reciprocal:

$\frac{2}{7} \div \frac{10}{21} = \frac{2}{7} \cdot \frac{21}{10} = \frac{1}{1} \cdot \frac{3}{5} = \frac{3}{5}$ $\quad\quad$ $\frac{6}{5} \div \frac{9}{8} = \frac{6}{5} \cdot \frac{8}{9} = \frac{48}{45} = \frac{16}{15}$

Evaluate the following expressions and record each answer as a fraction in simplest form:

1. $\frac{1}{6} + \frac{5}{18} =$

2. $\frac{1}{5} - \frac{2}{15} =$

3. $\frac{7}{10} + \frac{5}{8}$

4. $\frac{3}{7} \div \frac{5}{8} =$

5. $\frac{-4}{3} \div \frac{3}{5} =$

6. $\frac{14}{26} - \frac{6}{13} =$

7. $\frac{9}{2} \cdot \frac{-4}{3} =$

9. $4\frac{1}{5} \div \frac{3}{5} =$

8. $\frac{3}{-4} \cdot \frac{-2}{9} =$

10. $\left(4\frac{1}{5}\right)\left(\frac{3}{5}\right) =$

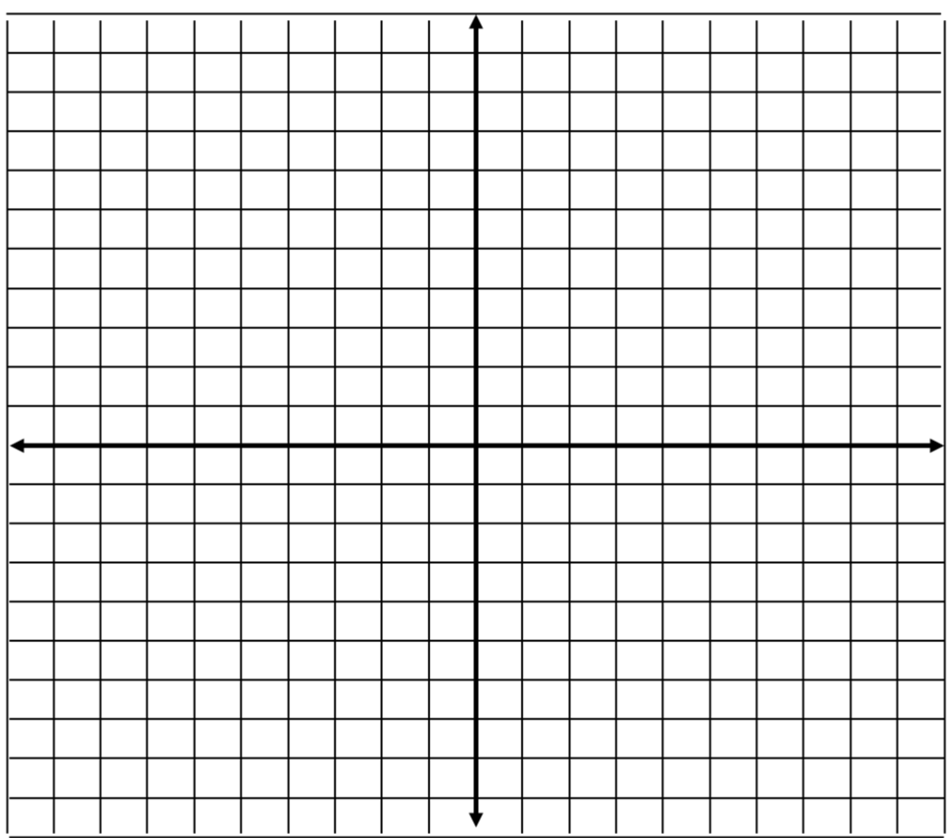
C. Coordinate Plane

Label : the origin, the 4 quadrants, the x-axis, and the y-axis

Plot and label the ordered pairs:

A: (3,-4) B: (-2,1) C: (6.5, 0) D: $(2, 9\frac{1}{2})$

E: (0, 3) F: $(-4, -\frac{9}{2})$ G: (8, -2) H: $(-\frac{16}{2}, 2)$



D. Integer Operations

1. -23 + 17 =

2. 15 – (-6) =

3. -5 – 8 =

4. 12 * -3 =

5. -4 * -7 =

6. $\frac{18}{-6}$

7. $\frac{-15}{-3}$

8. -24 + 30 + -9 =

9. 15 + 12 – 8 + 5 =

E. Algebraic Properties

Write an example of each property:

1. Commutative Property of Addition
2. Commutative Property of Multiplication
3. Associative Property of Addition
4. Associative Property of Multiplication
5. Additive Inverse
6. Additive Identity
7. Multiplicative Inverse
8. Multiplicative Identity
9. Multiplicative Property of Zero
10. Distributive Property

F. Combining Like Terms

- Like terms: terms that have the same variables with the same exponents
- CLT: add the coefficients of the like terms.

$2x + 5x = 7x$ $3x^2 - 7x + 8x^2 + 8 = 11x^2 - 7x + 8$ $6xy + 7x^2 - 8xy - 9x + 10x^2 = 17x^2 - 9x - 2xy$

Simplify by combining like terms:

1. $6n + 11n$
2. $6x^2 - 7x + 9 - 8x^2 + 7x - 8$
3. $8xy - 2x + 9xy + 3x$
4. $25x^2 - 9x + 7y - 13x^2 + 8y$
5. $8x^2y + 9xy - 2x^2y + 3xy - 9xy^2$
6. $6a^4b - 7ab + 3b - 6a^4b + 7ab$

G. Distributive Property

Simplify using the Distributive Property:

1. $-2(3y - 7)$
2. $6(1 - 4x)$
3. $4(2x + 5)$
4. $-3(5x - 10 + 7y)$
5. $-(4x - 5y)$
6. $2x(-3x - 1)$
7. $-x(5x + 2 - 7y)$

H. Evaluating With Integers

EVALUATE (simplify) the expression using your order of operations and integer rules. Show the substitution step and all work. Reduce all fractions. Use the following given values to evaluate the following expressions.

a = -2 b = 2 c = -3 d = 4 e = -5 f = -1

1. $5a + b - 2c$

2. $\frac{2e}{a} - ab + f$

3. $\frac{(3b - c)}{(6c + c)}$

4. $-2a - 4d - f$

5. $\frac{2(b - e)}{c + d}$

6. $-2f(a + 2c)$

7. $-3d + af - 15$

8. $(3f - c)(2a - b)(-d)$

I. Solving Equations

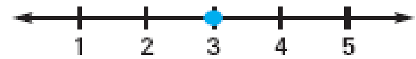
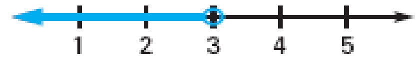
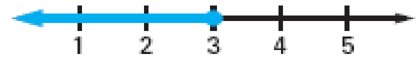
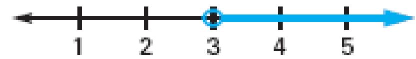
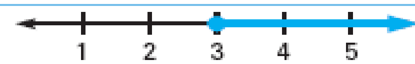
Find the numeric value of the variable by isolating the variable.

- ✓ Inverse Operations cancel each other:
  addition ↔ subtraction or multiplication ↔ division or square ↔ square root
- ✓ Apply the inverse operation to both sides of the equation to isolate the variable
- ✓ Always balance across the equal sign.

Solve for the variable in each problem.

1. $x - 4 = 16$
2. $25 + x = 17$
3. $a - 4 = 15$
4. $-8m = 64$
5. $7x = 42$
6. $4x + 7 = 31$

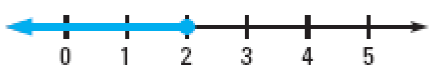
J. Solving Inequalities

Symbol	Meaning	Equation or Inequality	Graph
$=$	equals	$x = 3$	
$<$	is less than	$x < 3$	
$\leq$	is less than or equal to	$x \leq 3$	
$>$	is greater than	$x > 3$	
$\geq$	is greater than or equal to	$x \geq 3$	

Examples:

$2x \leq 4$

$x \leq 2$ Divide each side by 2



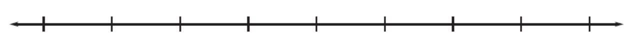
$-4y < 18$

$\dfrac{-4y}{-4} > \dfrac{18}{-4}$ Divide by -4 and change < to >

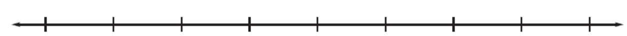
$y > -4.5$ Simplify

Solve and graph the following inequalities.

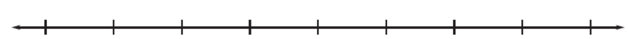
1. 3f < 15



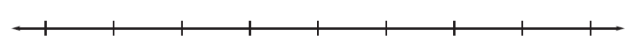
2. m + 6 $\geq$ 7



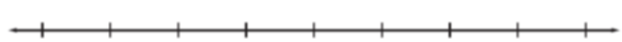
3. -7h < 56



4. 2g – 8 > 20



5. 3x + 5 < -22

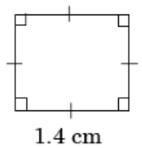


K. Perimeter

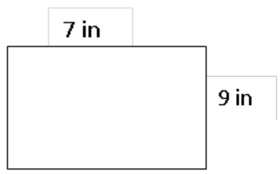
To find the perimeter (distance around) any shape, add all of the sides.

Find the perimeter of the following figures. Round to the nearest hundredth if necessary.

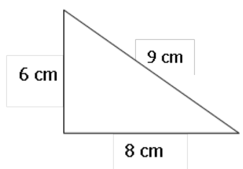
1.

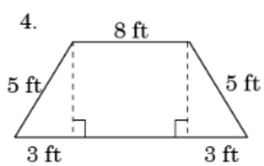


2.



3.





4.

L. Area

Triangle: $A = \frac{1}{2}bh$ where b is the length of the base and h is the height of the triangle.

Square: $A = s^2$

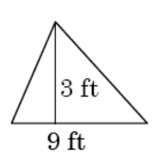
Parallelogram/Rectangle: $A = bh$ where b is the length of the base and h is the height

Trapezoid: $A = \frac{1}{2}h\left(b_1 + b_2\right)$ where h is the height, and b_1 and b_2 are the bases

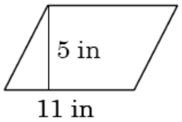
Circle: $A = \pi r^2$ where r is the radius of the circle

Find the area of the following figures. Round to the nearest hundredth if necessary.

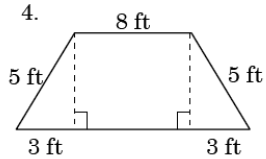
1.

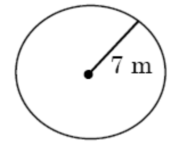


2.



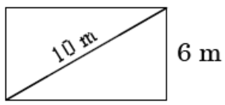
4.





3.

5.



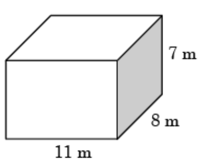
4.

M. Surface Area

Prism:	$Surface\ Area = Ph + 2B; Volume = Bh$ where P = Perimeter of base, h = height of prism B = Area of base
Cylinder:	$Surface\ Area = 2\pi rh + 2\pi r^2; Volume = \pi r^2 h$ where r = radius of cylinder h = height of cylinder
Pyramid:	$Surface\ Area = \frac{1}{2}P\ell + B; Volume = \frac{1}{3}Bh$ where P = Perimeter of base, ℓ =slant height, h = height of pyramid B = Area of base
Cone:	$Surface\ Area = \pi r\ell + \pi r^2; Volume = \frac{1}{3}\pi r^2 h$ where r = radius of cone, h = height of cone, ℓ =slant height

Find the **surface area** of the following figures. Round to the nearest hundredth if necessary.

1.



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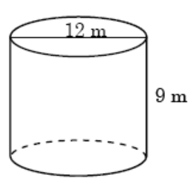
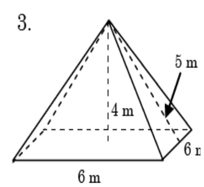


3.



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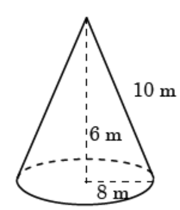


N. Volume

Prism: *V = Bh* where P = Perimeter of base, h = height of prism B = Area of base

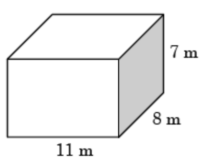
Cylinder: *V =* $\pi r^2 h$ where r = radius of cylinder h = height of cylinder

Pyramid: *V = (1/3)Bh* where P = Perimeter of base, ℓ =slant height, h = height of pyramid B = Area of base

Cone: *V = (1/3)*$\pi r^2 h$ where r = radius of cone, h = height of cone, ℓ =slant height

Find the **volume** of the following figures. Round to the nearest hundredth if necessary.

5.



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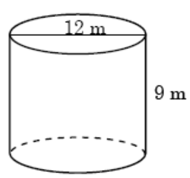

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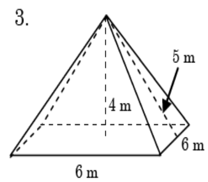

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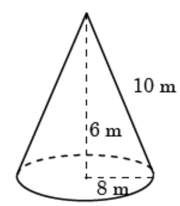
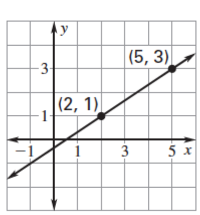


M. Slope

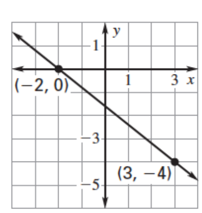
Slope – m, rate of change, $\frac{rise}{run}$, $m = \frac{y_2 - y_1}{x_2 - x_1}$

Find the slope of the line that passes through the points.

1.



2.



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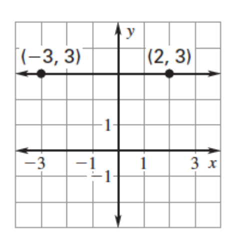
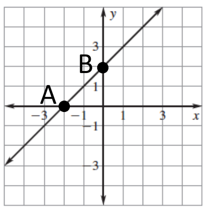


N. X- and Y-Intercepts

X-Intercept: the point where the line intersects the x (horizontal)-axis. The y value of the point will be 0.

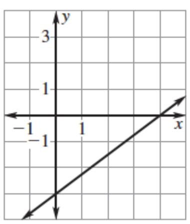
Y-Intercept: the point where the line intersects the y (vertical)-axis. The x value of the point will be 0.



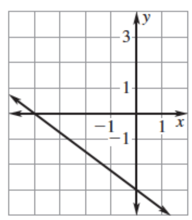
For the graph pictured to the left, the x-intercept would be located at A(-2, 0) and the y-intercept would be located at B(2, 0).

Find the x- and y-intercepts for the graphs below.

1.



2.



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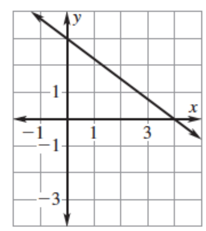


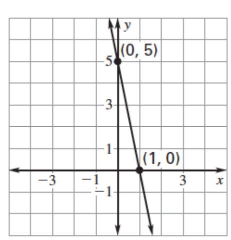
O. Slope-Intercept Form

Slope-Intercept Form: y = mx + b, where m is the slope of the line, and b is the y-intercept.

Write and equation of a line with the given slope and y-intercept.

1. Slope: 7; y-intercept: 4
2. Slope: -3, y-intercept: 5
3. Slope: 1, y-intercept: -6

4.



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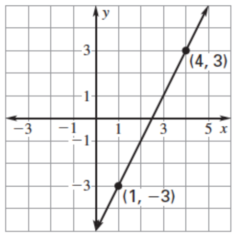
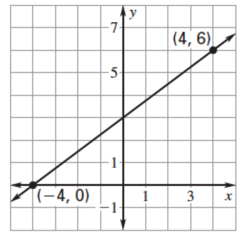




6.

P. Linear vs. Nonlinear Functions

You can determine if a function is linear or nonlinear by looking at the rate of change.

+2 +2 +2

x	3	5	7	9
y	7	10	13	16

+3 +3 +3

As x increases by 2, y increases by 3. The rate of change is constant, so this function is linear.

+1 +1 +1

x	1	2	3	4
y	−3	−6	−10	−15

−3 −4 −5

As x increases by 1, y decreases by a different amount each time. The rate of change is not constant, so this function is nonlinear.

Determine whether each table represents a linear or nonlinear function.

1.

x	3	5	7	9
y	7	9	11	13

2.

x	1	5	9	13
y	0	6	8	9

3.

x	3	6	9	12
y	2	3	4	5

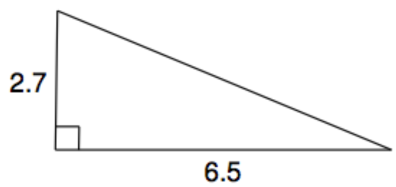
4.

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

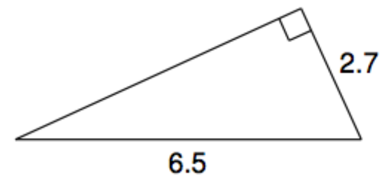
Q. Pythagorean Theorem

Using Pythagorean Theorem $a^2 + b^2 = c^2$ (where a and b are the legs, and c is the hypotenuse), find the missing lengths.

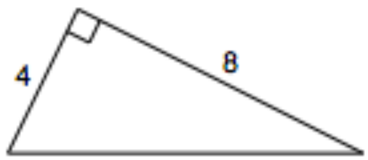
1.



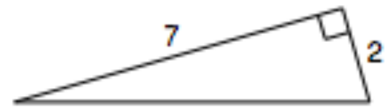
2.



3.

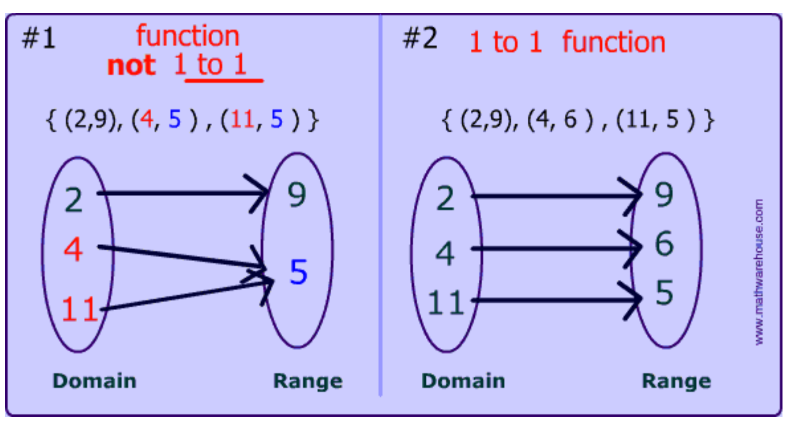


4.



R. Functions

A function relates each element of a set with exactly one element of another set. Summary → For every input, there is one and only one output.



Determine if the following are functions or not.

1. {(0, 0), (1, 1), (1, -1), (2, 2), (2, -2)}

2. {(-2, 2), (-1, 1), (0, 0), (1, 1), (2, 2)}

3.

x	4	2	5	7
y	6	4	5	8

4.

x	1	2	3	2
y	4	5	6	7