Name:_____

Due Date: 1st day of School

Algebra 2

2019 Summer Assignment

Directions: **Complete the following problems to the best of your ability. Show your work in the space provided next to each question, in order to earn full credit. This will count as your first grade for the upcoming school year. Start it off right!**

I. Evaluating Algebraic Expressions

To evaluate algebraic expressions, first replace the variables with their values. Then, use order of operations to calculate the value of the resulting numerical expression.

Example: Evaluate $x^2 - 5(x - y)$ if $x = 6$ and $y = 2$

$$\begin{aligned} x^2 - 5(x - y) &= (6)^2 - 5(6 - 2) \\ &= (6)^2 - 5(4) \\ &= 36 - 5(4) \\ &= 36 - 20 \\ &= 16 \end{aligned}$$

Practice: Evaluate each expression.

1. $5x^2 - y$ when $x = 4$ and $y = 24$

2. $\dfrac{3xy - 4}{7x}$ when $x = 2$ and $y = 3$

3. $(z + x)^2 + \dfrac{4}{5}x$ when $x = 2$ and $z = 4$

4. $\dfrac{y^2 - 2z^2}{x + y - z}$ when $x = 12, y = 9$, and $z = 4$

II. The Distributive Property

The Distributive Property states for any number *a, b,* and *c*:

1. $a(b+c)=ab+ac$ or $(b+c)a=ba+ca$
2. $a(b-c)=ab-ac$ or $(b-c)a=ba-ca$

Practice: Rewrite each expression using the distributive property.

1. $7(h-3)$
2. $-3(2x+5)$
3. $(5x-9)4$
4. $\frac{1}{2}(14-6y)$
5. $3(7x^2-3x+2)$
6. $\frac{1}{4}(16x-12y+4z)$
7. $(9-2x+3xy)\cdot -4$
8. $0.3(40a+10b-5)$

III. Combining Like Terms

Terms in algebra are numbers, variables or the product of numbers and variables. In algebraic expressions terms are separated by addition (+) or subtraction (-) symbols. Terms can be combined using addition and subtraction if they are **like-terms**.

Like-terms have the same variables to the same power.

Example of like-terms: $5x^2$ and $-6x^2$

Example of terms that are **NOT** like-terms: $9x^2$ and $15x$
*Although both terms have the variable **x**, they are not being raised to the same power*

To combine like-terms using addition and subtraction, add or subtract the numerical factor

Example: Simplify the expression by combining like-terms

$$\begin{aligned} 8x^2+9x-12x+7x^2 &= (8+7)x^2+(9-12)x \\ &= 15x^2+-3x \\ &= 15x^2-3x \end{aligned}$$

Practice: Simplify each expression

1. $5x-9x+2$

2. $3q^2+q-q^2$

3. $c^2+4d^2-7d^2$

4. $5x^2+6x-12x^2-9x+2$

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

6. $10xy-4(xy+2x^2y)$

IV. Solving Equations

To solve an equation with the same variable on each side, write an equivalent equation that has the variable on just one side of the equation. Then solve.

Example **Solve $4(2a - 1) = -10(a - 5)$.**

$4(2a - 1) = -10(a - 5)$	Original equation
$8a - 4 = -10a + 50$	Distributive Property
$8a - 4 + 10a = -10a + 50 + 10a$	Add $10a$ to each side.
$18a - 4 = 50$	Simplify.
$18a - 4 + 4 = 50 + 4$	Add 4 to each side.
$18a = 54$	Simplify.
$\frac{18a}{18} = \frac{54}{18}$	Divide each side by 18.
$a = 3$	Simplify.

The solution is 3.

Practice: Solve each equation.

1. $5+3r=5r-19$

2. $8x+12=4(3+2x)$

3. $-5x-10=2-(x+4)$

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

5. $3(d-8)-5=9(d+2)+1$

V. Solving for a Variable

Solve for Variables Sometimes you may want to solve an equation such as $V = \ell wh$ for one of its variables. For example, if you know the values of V, w, and h, then the equation $\ell = \frac{V}{wh}$ is more useful for finding the value of ℓ. If an equation that contains more than one variable is to be solved for a specific variable, use the properties of equality to isolate the specified variable on one side of the equation.

Example 1 **Solve $2x - 4y = 8$ for y.**

$$\begin{aligned} 2x - 4y &= 8 \\ 2x - 4y - 2x &= 8 - 2x \\ -4y &= 8 - 2x \\ \frac{-4y}{-4} &= \frac{8 - 2x}{-4} \\ y &= \frac{8 - 2x}{-4} \text{ or } \frac{2x - 8}{4} \end{aligned}$$

The value of y is $\frac{2x - 8}{4}$.

Example 2 **Solve $3m - n = km - 8$ for m.**

$$\begin{aligned} 3m - n &= km - 8 \\ 3m - n - km &= km - 8 - km \\ 3m - n - km &= -8 \\ 3m - n - km + n &= -8 + n \\ 3m - km &= -8 + n \\ m(3 - k) &= -8 + n \\ \frac{m(3 - k)}{3 - k} &= \frac{-8 + n}{3 - k} \\ m &= \frac{-8 + n}{3 - k}, \text{ or } \frac{n - 8}{3 - k} \end{aligned}$$

The value of m is $\frac{n - 8}{3 - k}$. Since division by 0 is undefined, $3 - k \neq 0$, or $k \neq 3$.

Practice: Solve each equation or formula for the variable specified.

1. $15x + 1 = y$ for x

2. $x(4 - k) = p$ for k

3. $7x + 3y = m$ for y

4. $P = 2l + 2w$ for w

VI. Slope/ Rate of Change

Find Slope

Slope of a Line	$m = \frac{\text{rise}}{\text{run}}$ or $m = \frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are the coordinates of any two points on a nonvertical line

Example 1 **Find the slope of the line that passes through $(-3, 5)$ and $(4, -2)$.**

Let $(-3, 5) = (x_1, y_1)$ and $(4, -2) = (x_2, y_2)$.

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

$$= \frac{-2 - 5}{4 - (-3)}$$ $y_2 = -2, y_1 = 5, x_2 = 4, x_1 = -3$

$$= \frac{-7}{7}$$ Simplify.

$$= -1$$

Example 2 **Find the value of r so that the line through $(10, r)$ and $(3, 4)$ has a slope of $-\frac{2}{7}$.**

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

$$-\frac{2}{7} = \frac{4 - r}{3 - 10}$$ $m = -\frac{2}{7}, y_2 = 4, y_1 = r, x_2 = 3, x_1 = 10$

$$-\frac{2}{7} = \frac{4 - r}{-7}$$ Simplify.

$$-2(-7) = 7(4 - r)$$ Cross multiply.

$$14 = 28 - 7r$$ Distributive Property

$$-14 = -7r$$ Subtract 28 from each side.

$$2 = r$$ Divide each side by -7.

Practice:

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

1. $(4,9), (1 - ,6)$
2. $(2,5), (6,2)$
3. $(4, 3.5), (-4,3.5)$
4. $(1, -2), (-2, -5)$

Determine the value of r so the line that passes through ach pair of points has the given slope.

5. $(6,8), (r, -2), m = 1$
6. $(10, r), (3,4), m = -\frac{2}{7}$

VII. Linear Equations in Slope-Intercept Form

Slope-Intercept Form

Slope-Intercept Form	$y = mx + b$, where m is the given slope and b is the y-intercept

Example 1 **Write an equation of the line whose slope is −4 and whose y-intercept is 3.**

$y = mx + b$ Slope-intercept form

$y = -4x + 3$ Replace m with -4 and b with 3.

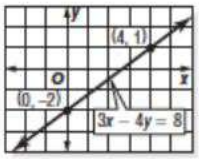
Example 2 **Graph $3x - 4y = 8$.**

$3x - 4y = 8$ Original equation

$-4y = -3x + 8$ Subtract $3x$ from each side.

$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$ Divide each side by -4.

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



The y-intercept of $y = \frac{3}{4}x - 2$ is -2 and the slope is $\frac{3}{4}$. So graph the point $(0, -2)$. From this point, move up 3 units and right 4 units. Draw a line passing through both points.

Practice:

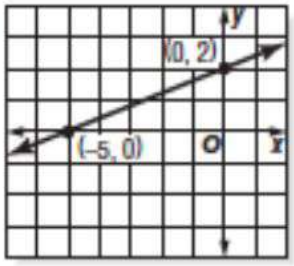
Write an equation of the line with the given slop and y-intercept.

1. slope: $\frac{1}{4}$, y-intercept: 3

2. slope: -2.5, y-intercept: 3.5

Write an equation of the line shown in each graph.

3.



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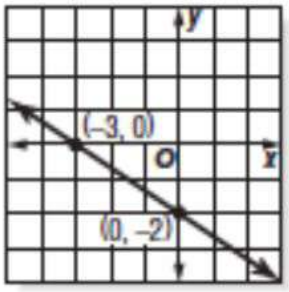
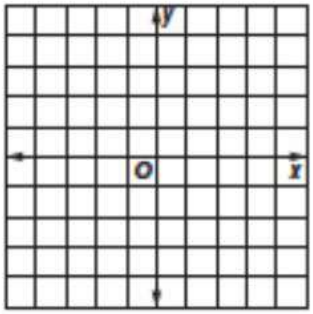
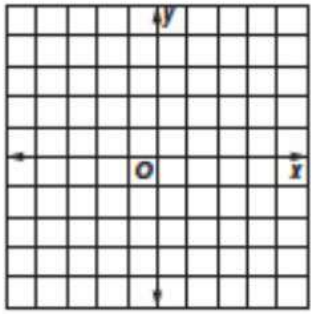


Graph each equation.

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



6. $6x + 3y = 6$



VIII. Solving Word Problems

Translate each word problem into an algebraic equation, using x for the unknown, and solve. Write a **"let x ="** for each unknown; write an equation; solve the equation; substitute the value for x into the let statements(s) to answer the question.

For Example:

Kara is going to Maui on vacation. She paid $325 for her plane ticket and is spending $125 each night for the hotel. How many nights can she stay in Maui if she has $1200?

Step 1: What are you asked to fine? Let variables represent what you are asked to find.

How many nights can Kara stay in Maui?

Let x = The number of nights Kara can stay in Maui

Step 2: Write an equation to represent the relationship in the problem.

$325 + 125x = 1200$

Step 3: Solve the equation for the unknown

$$\begin{aligned} 325 + 125x &= 1200 \\ -325 \quad & \quad -325 \\ 125x &= 875 \\ x &= 7 \end{aligned}$$

Kara can spend 7 nights in Maui

Practice: Write an algebraic equation to model each situation. Then solve the equation and answer the question.

1. A video store charges a one-time membership fee of $11.75 plus $1.50 per video rental. How many videos did Stewart rent if he spends $72.00?

2. Darel went to the mall and spent $41. He bought several t-shirts that ach cost $12 and he bought 1 pair of socks for $5. How many t-shirts did Darel buy?

3. Nick is 30 years less than 3 times Ray's age. If the sum of their ages is 74, how old are each of the men?

4. Three-fourths of the student body attended the pep-rally. If there were 1230 students at the pep rally, how many students are there in all?

5. Sarah drove 3 hours more than Michael on their trip to Texas. If the trip took 37 hours, how long did Sarah and Michael each drive?

6. Bicycle city makes custom bicycles. They charge $160 plus $80 for each day that it takes to build the bicycle. If you have $480 to spend on your new bicycle, how many days can it take Bicycle City to build the bike?