# Waring School Summer Math Packet

## *for students Completed Group 1 or Algebra*

Hello folks,

Here is a packet of problems for you to ponder and work on over the summer, in order to keep your math skills fresh. This means not just writing your answers, but showing your steps and your thinking! This is the work you will hand in during the first week of classes.

We've included some worked-out examples to help you and you can check out our Summer Resources page if you need help.

*"What kind of calculator do I need to do this work?"*

> You may not need a calculator, but if you want to use one, you may use a calculator.

*"How will I get all of these problems done this summer?"*

> We think if you spend one to two hours a week (or work through two pages each week) consistently this summer, you should be all set!

*"I don't know the answers to some of these!"*

> That's OK! You aren't supposed to be perfect and may not yet know how to do all of these problems. This is school, after all, and everybody's learning. Check out our FAQ and Resources for resources on what to do if you feel stuck.

If you have questions about specific problems, or anything else in this packet, you can look at our FAQ and Resources page, or E-mail our department chair Joan Sullivan at jsullivan@waringschool.org.

We hope you and your family have a good summer,
*The Waring Math Teaching Team*

**1. Evaluate each expression for the given values of the variables:**

Example:

$6x + 2y - z \quad for\ x = -1,\ y = 2,\ z = \frac{2}{3}$

Solution: substitute the values for the variables:

$$6 \cdot -1 + 2 \cdot 2 - \frac{2}{3} = -6 + 4 - \frac{2}{3} = -2 - \frac{2}{3} = -2\frac{2}{3}$$

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a) $5x - 4y \qquad for\ x = 9\ and\ y = 6$

b) $-6m - 2n \qquad for\ m = -\frac{1}{2}\ and\ n = \frac{1}{4}$

c) $3p - 5q - t \qquad for\ p = -11\ and\ q = 5\ and\ t = -2$

d) $4a^2b \qquad for\ a = -3\ and\ b = 2$

e) $2x^2 - 5x - 3 \quad for\ x = 4$

f) $\frac{x}{3-y} \quad for\ x = 10\ and\ y = 4$

g) $\frac{z^2}{4} \quad for\ z = 10$

h) $\frac{11f - 4g^4}{2} \quad for\ f = 8\ and\ g = 0$

i) $\frac{1}{3}(4 - x)^2 \quad for\ x = -5$

**2. Rewrite the expressions as sums in simplest form, by distributing and combining like terms.**

Example: $2(x + 5y) + 3(2y - 1 - 3x)$

Solution: First distribute:

$$2(x + 5y) + 3(2y - 1 - 3x) = 2x + 10y + 6y - 3 - 9x$$

Then combine like terms:

$$2x + 10y + 6y - 3 - 9x = -7x + 16y - 3$$

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a) $3n - 2 + 4n + 1$

b) $4(8y - 1) - 5y$

c) $2(a + 3b) + 9(3a + 2b)$

d) $t^2 - 59t + 54 - 82t^2 + 60t$

e) $(3x^5 + 8x^3) - (7x^2 - 6x^3)$

f) $(x^2 + 4x + 3) + 2(x^2 - x)$

g) $3n(n + 1) - 2(n^2 + 6) + n$

h) $\frac{4y^2+6y-8}{2} + y$

**3. Solve the equations.**

Example: $5n + 1 = 3n - 7$

Solution:

$5n + 1 = 3n - 7$ *subtract 3n from both sides*

$-3n \quad -3n$

$2n + 1 = -7$ *subtract 1 from both sides*

$-1 \quad -1$

$2n = -8$ *divide by 2 on both sides*

$n = -4$

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a) $4f + 9 = 57$

b) $-5x - 6 = 6x - 61$

c) $17 = 5 + 4(2x - 3)$

d) $15x - 3(x + 5) = 4x + 17$

e) $6(2 - 3x) + 4(1 - x) = -28$

f) $15 = \frac{x-5}{-2}$

g) $4(0.5n - 3) = n - 0.25(12 - 8n)$

h) $\frac{7}{9}x - \frac{4}{9}x = \frac{1}{4} + \frac{5}{12}$

*Each of these equations has two possible solutions:*

i) $3x^2 - 12 = 0$

j) $(x - 2)(x + 7) = 0$

**4. Solve the problem by writing a mathematical equation to model the situation and solve.**

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a) Ana made an initial deposit of $63 to a savings account.
Each week thereafter she deposited $15 to the account.
After ***t*** weeks she has $288. Find the value of ***t*.**
Write and solve an algebraic equation for this problem.

b) You have $60 and your sister has $120. You are saving $7 per week and your sister is saving $5 per week. How long will it be before you and your sister have the same amount of money?
Write and solve an algebraic equation for this problem.

c) 14 is 35% of what number?

d) You go out to dinner with your family and you pay 25% of the cost of the meal to cover tax and tips.
If you have to pay $175 in all, what was the cost of the meal before taxes and tips?
Write and solve an algebraic equation for this problem.

**5. Solve the equation.**
**You may want to use cross multiplication or what you know about equivalent ratios**

Example: $\frac{2}{9} = \frac{24}{x}$

Solution: A) Recognizing that these behave like equivalent fractions, we can see that the numerator has been multiplied by 12, so we can multiply the denominator by 12 as well.

$$\frac{2}{9} \cdot \frac{12}{12} = \frac{24}{108}$$

B) Recognizing that this is a proportion, we can cross multiply:

$$\frac{2}{9} = \frac{24}{x} \quad so \quad 2x = 9 \cdot 24$$

$$and \quad 2x = 216 \quad so \quad x = 108.$$

a) $\frac{n+9}{8} = 3$

b) $\frac{3}{5} = \frac{x}{x+4}$

c) $-1 = \frac{5+x}{6}$

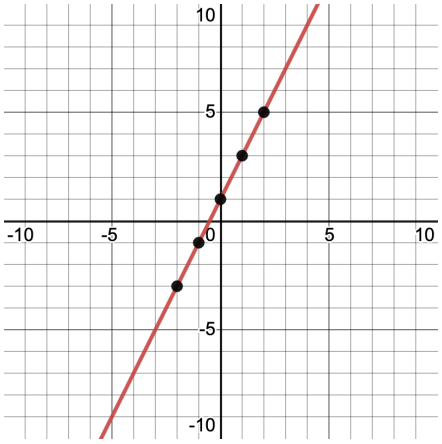
d) $\frac{2}{10} = \frac{f-1}{f+5}$

**6. Complete the table of values and sketch a graph of the equation.**

Example: $y = 2x + 1$

Solution: *First fill out the table by substituting values of x to find y-values.*
*Then plot the points on the coordinate grid.*

| x | y = 2x+1 |
|---|---|
| -2 | **-3** |
| -1 | **-1** |
| 0 | **1** |
| 1 | **3** |
| 2 | **4** |

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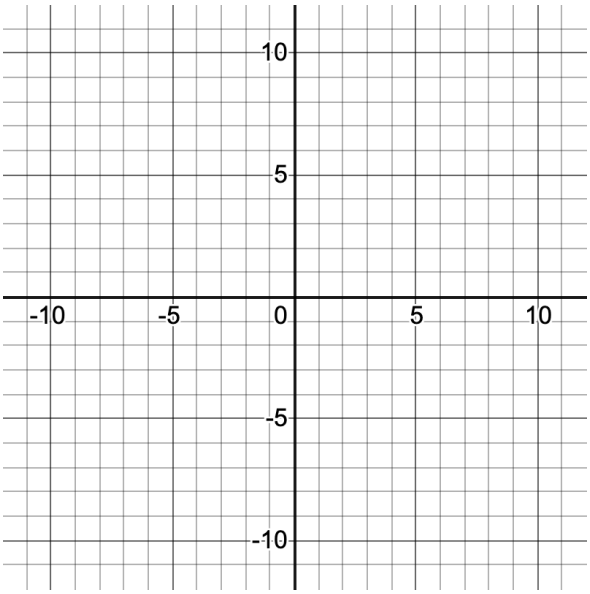
a) $y = 3x + 2$

| x | y = 3 x + 2 |
|---|---|
| -2 | |
| -1 | |
| 0 | |
| 1 | |
| 2 | |

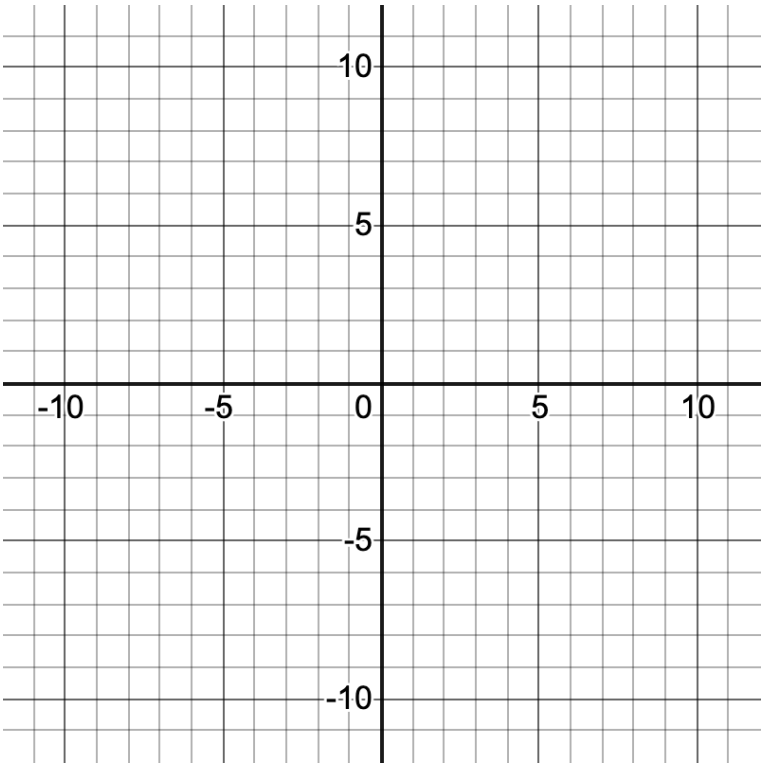



b) $y = -\frac{1}{2}x - 5$

(use the same coordinate grid for both a and b)

| x | $y = -\frac{1}{2}x - 5$ |
|---|---|
| -2 | |
| 0 | |
| 1 | |
| 2 | |

c) Graph the line that contains the point (-6, 0) and has a slope of $\frac{2}{3}$



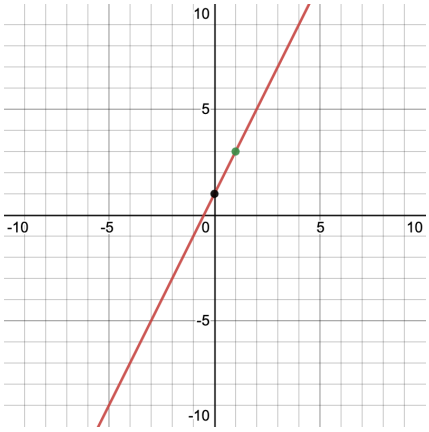

d) Graph the line that is parallel to the line in c) and includes the point (0,0).

*(Use the same coordinate grid above.)*

What is the equation for the parallel line you just sketched?

**7. Write an equation for each graph by identifying its slope and its y-intercept.**

Example:




Solution: $slope = \frac{rise}{run} = \frac{2}{1} = 2$

$y - intercept = 1$

$Equation: y = 2x + 1$

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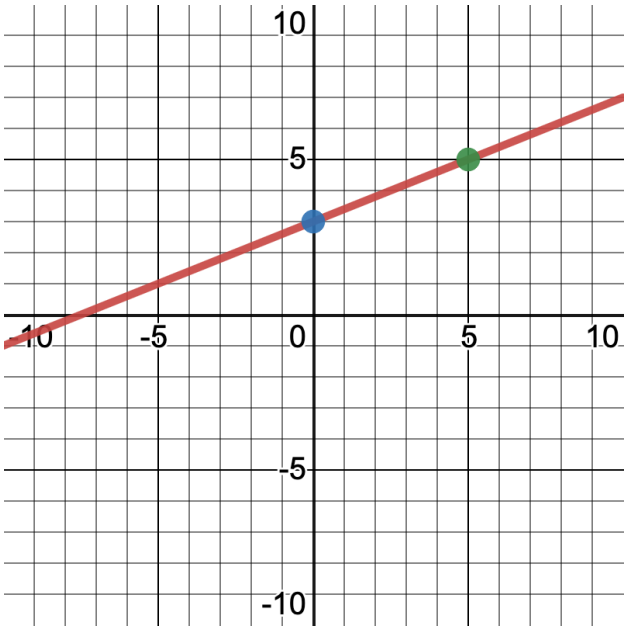
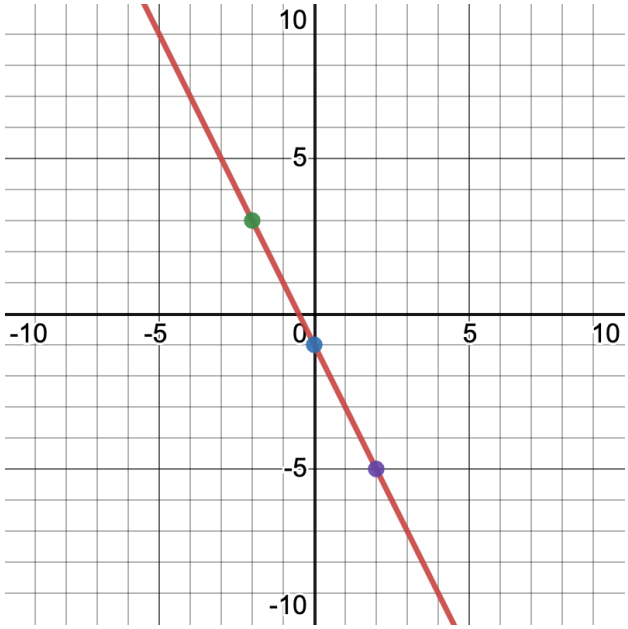



Slope:

y-intercept :

Equation :




Slope:

y-intercept :

Equation :

**8. Change the equation from standard form to slope-intercept form by solving for y.**

Example: $3x + 4y = 6$

Solution: $3x + 4y = 6$ *subtract 3x from both sides*

$4y = 6 - 3x$ *divide by 4 on both sides*

$y = \frac{6-3x}{4}$ *put into slope-intercept form*

$y = \frac{6-3x}{4} = \frac{6}{4} - \frac{3}{4}x = -\frac{3}{4}x + \frac{6}{4} = -\frac{3}{4}x + \frac{3}{2}$

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

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a) -x + 4y = 8

b) 5x + 3y = 24

c) -2x - 5y = 10

**9. Solve the system of equation by using substitution or elimination methods**

Example: $5x + 2y = 9$
$y = -x - 3$

Solution: Using substitution we can substitute for y in the first equation:

| | |
|---|---|
| $5x + 2(-x - 3) = 9$ | *Distribute* |
| $5x + -2x - 6 = 9$ | *Combine like terms* |
| $3x - 6 = 9$ | *Add 6 to both sides* |
| $3x = 15$ | *Divide by 3 on both sides* |
| $x = 5$ | |

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a) $6y - 9 = x$
$x = -3y$

b) $3x - 2y = 4$
$5x + 2y = 12$

c) $-2x + 3y = 4$
$x = y - 3$

d) $x + y = 2$
$2x + 7y = 9$

**10. Solve the problems by writing a system of equations and solving it.**

Example: There are a total of 142 laptops and desktop computers in a lab.
There are 6 more laptops than desktop computers.
What is the total number of laptops in the lab?

Solution: Let x= number of laptops and y= number of desktops
Equation 1: $x + y = 142$
Equation 2: $x = y + 6$

Using substitution:

$$(y + 6) + y = 142$$
$$2y + 6 = 142$$
$$2y = 136$$
$$y = 68$$

*There are 68 desktops and 74 laptops.*

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a) A company produced 300 items of clothing. Shirts were sold for $20 each, and pants were sold for $30 each. The company made total sales of $7,000 for the clothing. How many shirts did the company sell?

b) Dylan and Pascal were hungry and so they went on a food binge. Pascal bought 3 juice drinks and 2 subs for $19 and Dylan bought 2 juice drinks and 3 subs for $21. Find the price of a sub and the price of a juice drink.

c) The difference of two numbers is 9. Their sum is 47. Find the numbers.

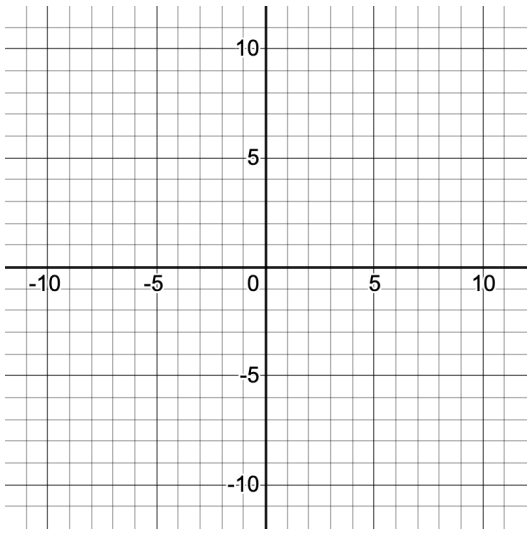
**11. Quadratics**

a) Fill in the table of values and sketch a graph of the equation.

*(hint: the graph will not be a straight line)*

$$y = x^2 - 2x - 3$$

| x | $y = x^2 - 2x - 3$ |
|---|---|
| -1 | |
| 0 | |
| 1 | |
| 2 | |
| 3 | |



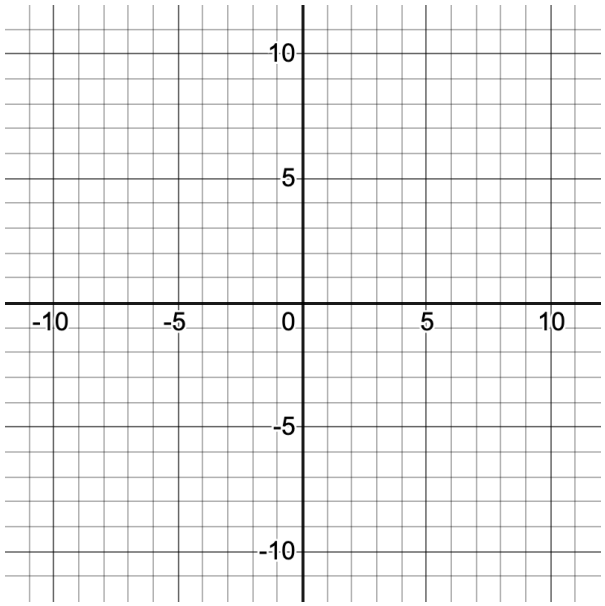

- What are the x-intercepts of the graph?
- What are the coordinates of the vertex?

b) Sketch a graph of the equation.

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

- Identify the zeros (x-intercepts).
- Identify the vertex.
- Use a table of values if that would help

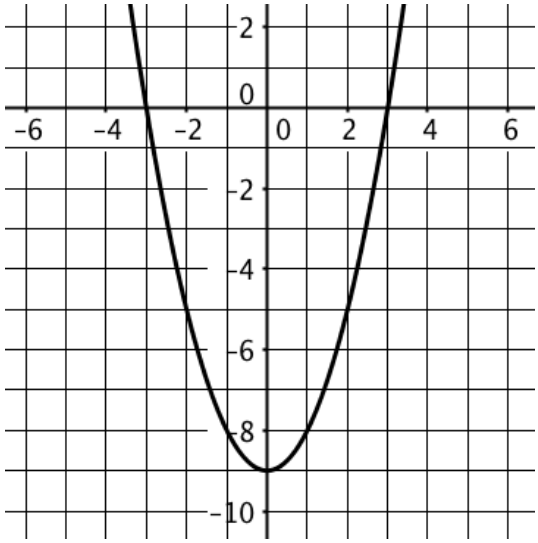
| x | $y = (x + 4)(x - 2)$ |
|---|---|
| 0 | |
| 2 | |
| | |
| | |
| | |



c) Here is a graph of a parabola:

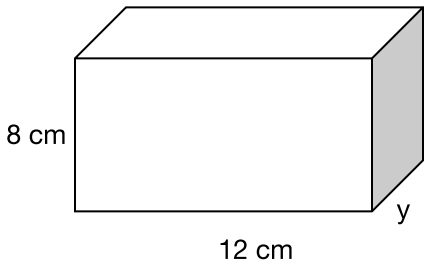
- Label the y-intercept, x-intercepts, and vertex on the parabola.

- Write an equation for this graph.

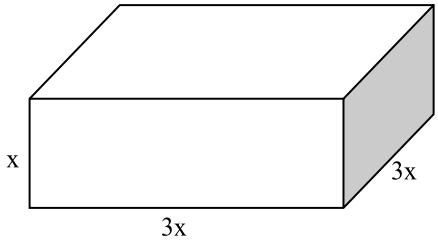



**12. Two more fun problems!**

a) If the <u>volume</u> is 480 $cm^3$, what is the length of the missing side labeled y?




b) The <u>surface area</u> = 1,080 sq. cm. Find x.




Woohoo!! Your math brains are happy!
This is the end… unless you are up for more challenge… see next page!!!

# OPTIONAL CHALLENGES: PROBLEMS TO PONDER !

1. Use any whole numbers 1 through 9 at most one time each to create an equation whose solution would be the **largest** possible value for x.

$$\square x + \square = \square$$

2. Use the whole numbers 1 through 9, at most one time each, to make the value of x = 2.75.

$$\square + \square(x - \square) = \square$$

3. Use the digits 1 to 9, at most TWO times each, to fill in the boxes to make an equation with no solutions.

$$\square x + \square = \square x + \square$$

4. Fill in the box with any number that will create an equation with a slope of $\frac{1}{2}$.

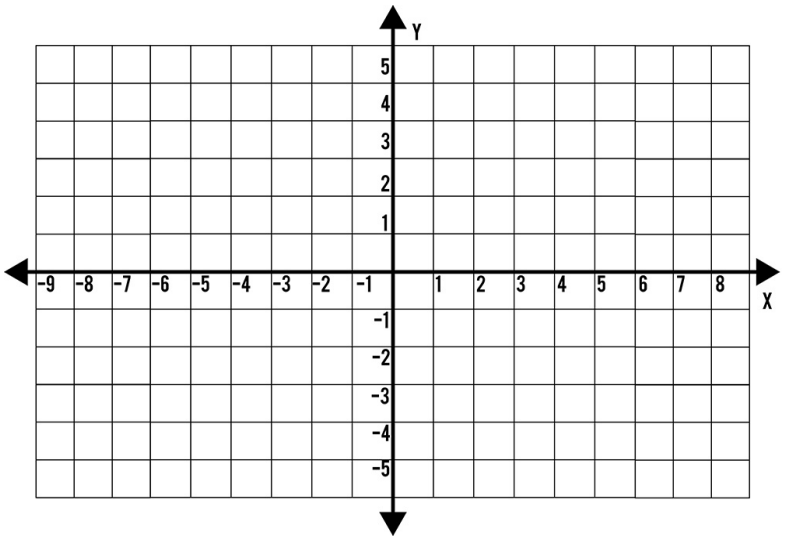
$$3x - \square y = 12$$

5. Using the integers from -9 to 9 only one time each, create 3 equations whose graphs all intersect at the point (1,1).

$$y = \frac{\square}{\square}x + \square$$

$$y = \frac{\square}{\square}x + \square$$

$$y = \frac{\square}{\square}x + \square$$




Woohoo! Your math brains are ecstatic!

***Remember to bring your work to your math teacher during the first week of classes.***