

# Westhill High School



Summer Math Packet

Geometry Readiness

Summer 2015

Student's Name: \_\_\_\_\_

## Operations with Signed Numbers

### Adding and Subtracting Signed Numbers

#### Adding Signed Numbers

Like Signs	Different Signs
Add the numbers & carry the sign	Subtract the numbers & carry the sign of the larger number
$(+) + (+) = +$ $(+3) + (+4) = +7$	$(+) + (-) = ?$ $(+3) + (-2) = +1$
$(-) + (-) = -$ $(-2) + (-3) = (-5)$	$(-) + (+) = ?$ $(-5) + (+3) = -2$

#### Subtracting Signed Numbers

**Don't subtract!** Change the problem to **addition** and change the sign of the **second** number. Then use the addition rules.

$(+9) - (+12) = (+9) + (-12)$	$(+4) - (-3) = (+4) + (+3)$
$(-5) - (+3) = (-5) + (-3)$	$(-1) - (-5) = (-1) + (+5)$

**Simplify. Do not use a calculator for this section!**

1. $9 + (-2) = \underline{\hspace{2cm}}$	5. $-1 + 15 = \underline{\hspace{2cm}}$	9. $-5 - (-1) = \underline{\hspace{2cm}}$
2. $-8 - 3 = \underline{\hspace{2cm}}$	6. $-2 - (-10) = \underline{\hspace{2cm}}$	10. $5 + (-17) = \underline{\hspace{2cm}}$
3. $-30 + 5 = \underline{\hspace{2cm}}$	7. $-10 + (-6) = \underline{\hspace{2cm}}$	11. $-4 - (-5) = \underline{\hspace{2cm}}$
4. $14 - 20 = \underline{\hspace{2cm}}$	8. $1 - 8 = \underline{\hspace{2cm}}$	12. $-6 + (-17) = \underline{\hspace{2cm}}$

### Multiplying and Dividing Signed Numbers

If the signs are the same,  
the answer is *positive*

If the signs are different,  
the answer is *negative*

Like Signs		Different Signs	
$(+)(+) = +$	$(+3)(+4) = +12$	$(+)(-) = -$	$(+2)(-3) = -6$
$(-)(-) = +$	$(-5)(-3) = +15$	$(-)(+) = -$	$(-7)(+1) = -7$
$(+) / (+) = +$	$(+3) / (+4) = +12$	$(+) / (-) = -$	$(+2) / (-3) = -6$
$(-) / (-) = +$	$(-3) / (-4) = +12$	$(-) / (+) = -$	$(-7) / (+1) = -7$

Simplify. Do not use a calculator for this section!

1. $15 \div (-5) = \underline{\hspace{2cm}}$	5. $\frac{-18}{-6} = \underline{\hspace{2cm}}$	9. $(3)(-4)(2) = \underline{\hspace{2cm}}$
2. $(-3)(4) = \underline{\hspace{2cm}}$	6. $-(-3) = \underline{\hspace{2cm}}$	10. $-16 \div (-4) = \underline{\hspace{2cm}}$
3. $-30 \div (-5) = \underline{\hspace{2cm}}$	7. $20 \div (-2) = \underline{\hspace{2cm}}$	11. $7 \cdot (-3) \cdot (-1) = \underline{\hspace{2cm}}$
4. $6 \cdot (-2) = \underline{\hspace{2cm}}$	8. $\frac{24}{-8} = \underline{\hspace{2cm}}$	12. $\frac{-50}{2} = \underline{\hspace{2cm}}$

## Order of Operations

To avoid having different results for the same problem, mathematicians have agreed on an order of operations when simplifying expressions that contain multiple operations.

1. Perform any operation(s) inside grouping symbols. (Parentheses, brackets above or below a fraction bar)
2. Simplify any term with exponents.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

One easy way to remember the order of operations process is to remember the acronym PEMDAS or the old saying, "Please Excuse My Dear Aunt Sally."

**P** - Perform operations in grouping symbols

**E** - Simplify exponents

**M** - Perform multiplication and division in order from left to right

**D**

**A** - Perform addition and subtraction in order from left to right

**S**

### Example 1

$$\begin{aligned}
 &2 - 3^2 + (6 + 3 \times 2) \\
 &2 - 3^2 + (6 + 6) \\
 &2 - 3^2 + 12 \\
 &2 - 9 + 12 \\
 &-7 + 12 \\
 &= 5
 \end{aligned}$$

### Example 2

$$\begin{aligned}
 &-7 + 4 + (2^3 - 8 \div -4) \\
 &-7 + 4 + (8 - 8 \div -4) \\
 &-7 + 4 + (8 - -2) \\
 &-7 + 4 + 10 \\
 &-3 + 10 \\
 &= 7
 \end{aligned}$$

Simplify each expression. Remember your order of operations process (PEMDAS). You must show all work!

1. $6 + 4 - 2 \cdot 3$	5. $50 - (17 + 8)$
2. $15 \div 3 \cdot 5 - 4$	6. $16 + 2 \cdot 5 \cdot 3 \div 6$
3. $20 - 7 \cdot 4$	7. $18 - 4^2 + 7$
4. $[10 + (2 \cdot 8)] \div 2$	8. $32 \div [16 \div (8 \div 2)]$

## Evaluating Expressions

<p><b>Evaluating Expressions</b></p> <ul style="list-style-type: none"> <li>• To evaluate an expression means to substitute a number for each variable, and simplify.</li> </ul> <p><b>Steps:</b></p> <ol style="list-style-type: none"> <li>1. substitute a number for each given variable</li> <li>2. simplify</li> </ol>	<p><b>Examples:</b></p> <ol style="list-style-type: none"> <li>1. <math>-2x + 5</math> when <math>x = 7</math>  <math display="block">-2(7) + 5</math> <math display="block">-14 + 5</math> <math display="block">-9</math> </li> <li>2. <math>\frac{4m}{3}</math> when <math>m = -3</math>  <math display="block">\frac{4(-3)}{3} = \frac{-12}{3} = -4</math> </li> </ol>
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Evaluate the expressions for the given values. Be sure to show all your work!

1. $-9 + p$ when $p = 5$	5. $-4p - 2s$ when $p = 3$ and $s = -5$	9. $\frac{2n}{4m}$ when $m = 5$ and $n = -$
2. $5k \div 3$ when $k = 6$	6. $-7y + 5x^2$ when $x = 4$ and $y = -1$	10. $-3d^3 + 4$ when $d = 4$
3. $-7x + 2y$ when $x = 2$ and $y = -5$	7. $-9a - 4b + 1$ when $a = 3$ and $b = -2$	11. $\frac{4mn}{-2}$ when $m = -3$ and $n = 8$
4. $3w^2$ when $w = 3$	8. $30 - 6x + y$ when $x = -4$ and $y = 2$	12. $-3(2x + 1)$ when $x = -4$

## Algebraic Translations - Translating from English to Mathematics

**Key Words for Translations:**

Add	Subtract	Multiply	Divide	Inequalities	Variable	=
Plus Sum Longer Than Greater Than Together Total Increased More Than In all And	Decreased Smaller * Less than Difference Reduced Differ * Fewer Shorter Than Minus Diminished	Per For Every For each Triple Multiplied Of Times Twice Double	One-third Quotient Divided by Each part Half as much Spilt equally	< is less than > is greater than ≤ is less than or equal to ≥ is greater than or equal to	a number some number quantity	Same as Equals Is Total Was Result Outcome Answer

Be careful! Words with \* are "turn-around" words!

Translate into a mathematical statement.

1. Seven added to five times a number is 5.	6. 2 less than a number is less than or equal to 3.
2. Eight times a number increased by 6 is 62.	7. The product of 5 and a number is 12.
3. One-half of a number is equal to 10.	8. Twice a number decreased by 1 is less than 5.
4. A number $p$ subtracted from 10 is 5.	9. The total of 4 and a number is 15.
5. The quotient of a number and 5 is greater than 8.	10. Three times a number added to 4 is 10.

**Matching – Put the letter of the algebraic expression that best matches the phrase.**

- |                                    |                  |
|------------------------------------|------------------|
| _____ 1. two more than a number    | a. $2x$          |
| _____ 2. two less than a number    | b. $x + 2$       |
| _____ 3. half of a number          | c. $2 - x$       |
| _____ 4. twice a number            | d. $x - 2$       |
| _____ 5. two decreased by a number | e. $\frac{x}{2}$ |

## Combining Like Terms

What is a *term*?

The parts of an algebraic expression that are separated by an addition or subtraction sign are called *terms*.  
The expression  $4x + 2y - 3$  has 3 terms.

What are *like terms*?

Terms with the same variable factors are called *like terms*.  
 $2n$  and  $3n$  are like terms, but  $4x$  and  $3y$  are not like terms because their variable factors  $x$  and  $y$  are different.

*To simplify an expression, you must combine the like terms.*

Examples:

Simplify

1.  $5x + 8x$

$$5x + 8x = (5 + 8)x = 13x$$

2.  $3y - 6y$

$$3y - 6y = (3 - 6)y = -3y$$

3.  $3x + 4 - 2x + 3$

$$3x - 2x + 4 + 3 = (3 - 2)x + 4 + 3 = x + 7$$

4.  $2b + 5c + 3b - 6c$

$$2b + 3b + 5c - 6c = (2+3)b + (5-6)c = 5b - c$$

Simplify each expression.

1. $6n + 5n =$ _____	6. $2a - 8b + a + 12b =$ _____
2. $2b + 6b =$ _____	7. $2m + 7n - 5m + m =$ _____
3. $x - 5x =$ _____	8. $-6 + p - 12 - 8p =$ _____
4. $3n + 1 - 2n + 8 =$ _____	9. $4d - 10 - 4d + 2 =$ _____
5. $7a + 9 - 4a + 3 =$ _____	10. $9h + 2k - h - 6k + 1 =$ _____

The Distributive Property is an algebra property which is used to multiply a single term and two or more terms inside a set of parentheses. Take a look at the problem below.

$$6(2 + 4x)$$

The Distributive Property tells us that we can remove the parentheses if the term that the polynomial is being multiplied by is distributed to, or multiplied with each term inside the parentheses.

This definition is tough to understand without a good example, so observe the example below carefully.

$$6(2 + 4x)$$

now by applying the Distributive Property

$$6 * 2 + 6 * 4x$$

The parentheses are removed and each term from inside is multiplied by the six.

Now we can simplify the multiplication of the individual terms:

$$12 + 24x$$

Simplify.

1. $3(5x + 6) =$ _____	6. $(8 - 3m)(-7) =$ _____
2. $-8(3a + 1) =$ _____	7. $-2(-6n - 3) =$ _____
3. $-(4p - 10) =$ _____	8. $(-5 - 6d)(-4) =$ _____
4. $(2x - 3y)4 =$ _____	9. $-5p + 10 =$ _____
5. $-9(2 - 5h) =$ _____	10. $-5(-3s - 6) =$ _____



## Solving Equations

To solve an equation means to *find the value* of the variable. We solve equations by isolating the variable using opposite operations.

**Example:**

Solve.

$$\begin{array}{r} 3x - 2 = -10 \\ + 2 \quad + 2 \end{array}$$

Isolate 3x by adding 2 to each side.

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

Simplify  
isolate x by dividing each side by 3.

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

Simplify

Check your answer.

$$\begin{array}{r} 3(-\frac{8}{3}) - 2 = -10 \\ -8 - 2 = -10 \\ -10 = -10 \end{array}$$

Substitute the value in for the variable.

Simplify

Is the equation true? If yes, you solved it correctly!

**Opposite Operations:**  
Addition (+) & Subtraction (-)  
Multiplication (x) & Division (÷)

**Please remember...**  
to do the same step on  
each side of the equation.

**Always check your  
work by substitution!**

Solve each equation. You must show all algebraic work!

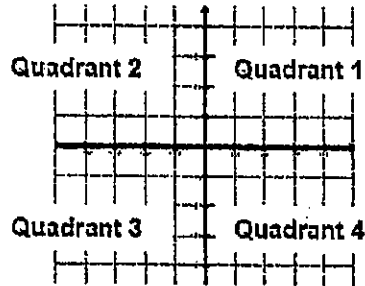
1. $y - 3 = 10$	6. $2x - 5 = 11$
2. $-7p = 21$	7. $-3x + 4 = -8$
3. $a + 8 = -2$	8. $\frac{x}{3} + 10 = 15$
4. $\frac{4}{5}d = 12$	9. $-6x + 3 = -9$
5. $-m = 9$	10. $\frac{e}{7} - 4 = 2$

11. $-5x - 2x = 14$	17. $-28 = -5b + 6(3 - 3b)$
12. $-6(n - 5) = 54$	18. $-9 + 4a = 1 + 6a + 4$
13. $-9 - 5x + 4x = -6 - 2x$	19. $-4(-4x + 5) = -20 + x$
14. $-3(2b + 1) = -15 - 4b$	20. $-m + 3 = 17$
15. $-2(7 + 3y) = 4 + 6(y - 1)$	21. $3 + \frac{x}{9} = 1$
16. $7x + 2 - 6x = 5$	22. $5b + 4 - 2b = -6 + b$

# Graphing

Points in a plane are named using 2 numbers, called a coordinate pair. The first number is called the x-coordinate. The x-coordinate is positive if the point is to the right of the origin and negative if the point is to the left of the origin. The second number is called the y-coordinate. The y-coordinate is positive if the point is above the origin and negative if the point is below the origin.

The x-y plane is divided into 4 quadrants (4 sections) as described below.

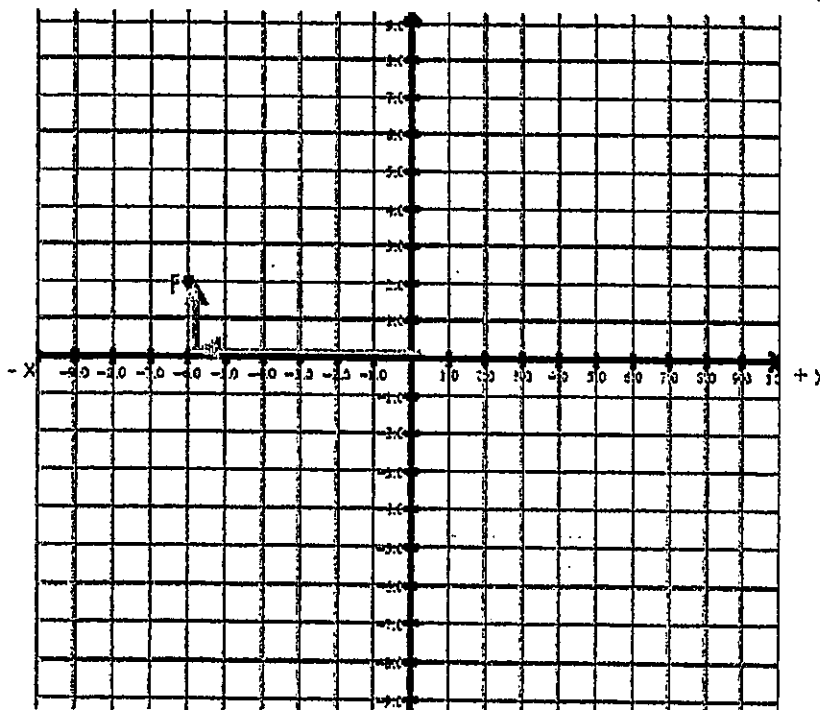


All points in Quadrant 1 has a **positive** x-coordinate and a **positive** y-coordinate (+ x, + y).  
All points in Quadrant 2 has a **negative** x-coordinate and a **positive** y-coordinate (- x, + y).  
All points in Quadrant 3 has a **negative** x-coordinate and a **negative** y-coordinate (- x, - y).  
All points in Quadrant 4 has a **positive** x-coordinate and a **negative** y-coordinate (+ x, - y).

Plot each point on the graph below. Remember, coordinate pairs are labeled (x, y). Label each point on the graph with the letter given.

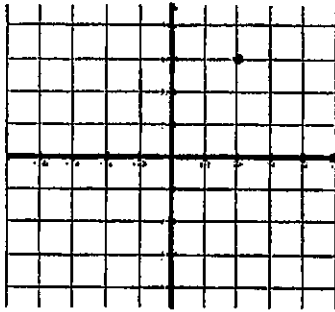
1. A(3, 4)
2. B(4, 0)
3. C(-4, 2)
4. D(-3, -1)
5. E(0, 7)

Example: F(-6, 2)

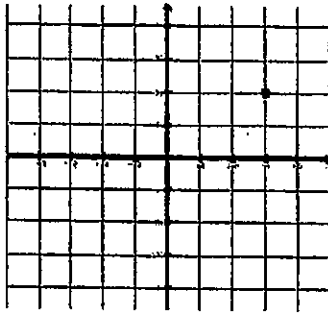


Determine the coordinates for each point below:

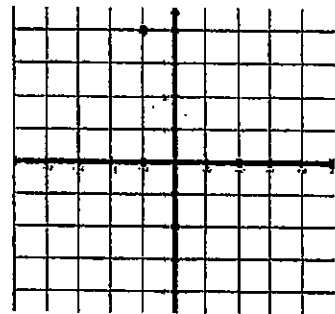
Example. (2, 3)



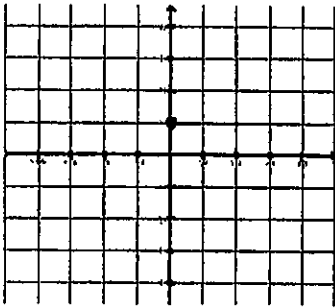
6. ( , )



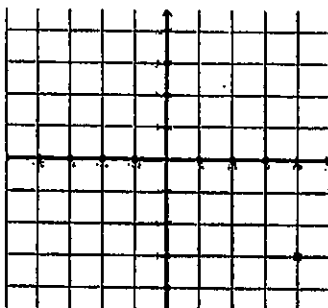
7. ( , )



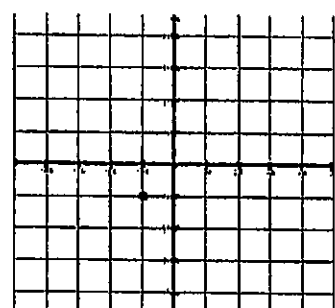
8. ( , )



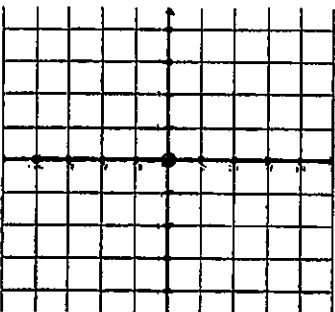
9. ( , )



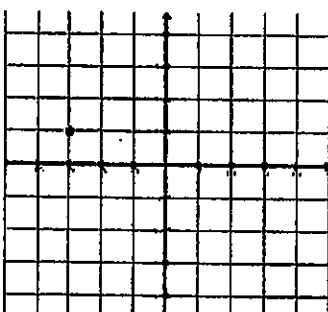
10. ( , )



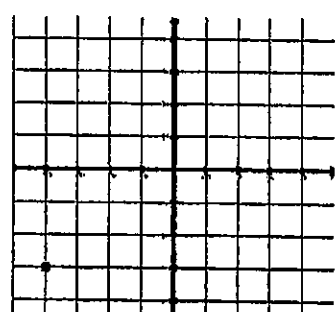
11. ( , )



12. ( , )



13. ( , )



## Finding the Slope of a Line

When you have two points it is very important that you label the numbers correctly. See what we did here:

$$\underbrace{(x_1, y_1)}_{\text{first point}} \text{ \& \ } \underbrace{(x_2, y_2)}_{\text{second point}}$$

- $x_1$  means "the first  $x$  value" and  $x_2$  means "the second  $x$  value"
- $y_1$  means "the first  $y$  value" and  $y_2$  means the "second  $y$  value"

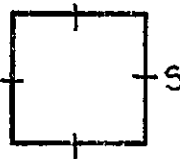
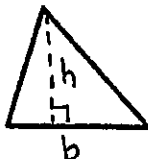
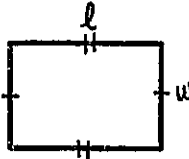
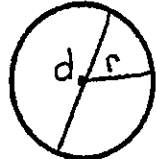
See an example of how to label the 2 points:  $\underbrace{(5, 6)}_{x_1 \ y_1} \text{ \& \ } \underbrace{(3, 1)}_{x_2 \ y_2}$

Once you have the points labeled, carefully substitute them into the formula.

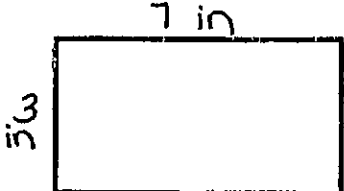
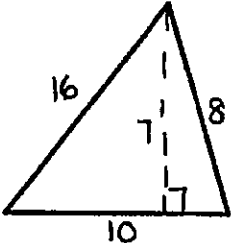
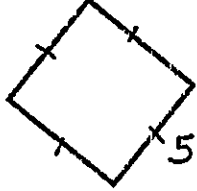
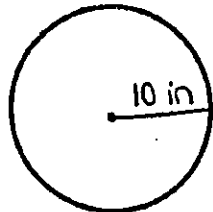
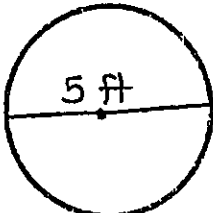
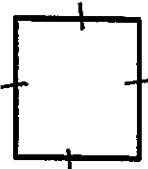
$$\text{Slope} = \frac{y_1 - y_2}{x_1 - x_2} \quad \text{Slope} = \frac{y_1 - y_2}{x_1 - x_2} = \frac{6 - 1}{5 - 3} = \frac{5}{2}$$

Find the slope of the line through the given points. Be sure to show all your work!

1. (10, 4) and (15, -16)	5. (-4, -8) and (8, 19)
2. (-6, -3) and (18, 15)	6. (-12, -6) and (12, 9)
3. (1, 1) and (-5, 2)	7. (-6, -5) and (-14, -1)
4. (5, 13) and (10, 13)	8. (11, -20) and (7, -19)

<p>Square:</p> <p><math>P = 4s</math> (<math>s</math> = side length)</p> <p><math>A = s^2</math></p> 	<p>Triangle:</p> <p><math>P = a + b + c</math> (<math>a</math>, <math>b</math> and <math>c</math> = side lengths)</p> <p><math>A = \frac{bh}{2}</math> or <math>\frac{1}{2}bh</math> (<math>b</math> = base and <math>h</math> = height)</p> 
<p>Rectangle:</p> <p><math>P = 2l + 2w</math> (<math>l</math> = length &amp; <math>w</math> = width)</p> <p><math>A = l \cdot w</math></p> 	<p>Circle:</p> <p><math>C = \pi d</math> (<math>d</math> = diameter)</p> <p><math>A = \pi r^2</math> (<math>r</math> = radius)</p> 

Find the area and perimeter of the given shapes. Be sure to show all work!

<p>1.</p>  <p>Perimeter: _____</p> <p>Area: _____</p>	<p>4.</p>  <p>Perimeter: _____</p> <p>Area: _____</p>
<p>2.</p>  <p>Perimeter: _____</p> <p>Area: _____</p>	<p>5.</p>  <p>Circumference: _____</p> <p>Area: _____</p>
<p>3.</p>  <p>Circumference: _____</p> <p>Area: _____</p>	<p>6.</p>  <p>Perimeter: _____</p> <p>Area: _____</p>