Summer Packet

for Students Entering

8th Grade Algebra 1

Fall 2018

Pomfret Community School

Ms. Slingo

Name:_____

Directions:

To retain your mathematical awesomeness, work on this packet **throughout** the summer! Do not rush to complete it in June or wait until the third week of August. **Spread it out throughout the summer!**

Completion of this packet counts as your first Algebra 1 assignment.

As a bonus, you will get a homework pass for turning in a complete packet.

Packets are due on the 2nd day of school.

As always, show your work!

This packet will review the following important concepts:

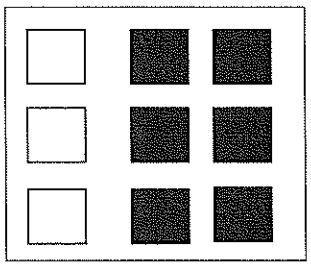
1) Integer rules
2) Order of Operations
3) Simplifying expressions
4) Solving equations with integers
5) Solving equations with fractions/decimals
6) Solve and graph inequalities

Algebra Tiles and Integers

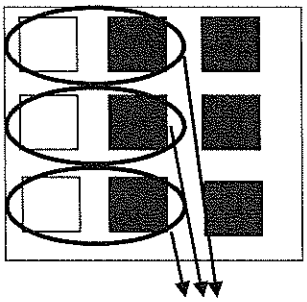
Key	Rules to Remember
■ = 1 □ = -1	The sum and difference of two numbers can be positive, negative, or zero. The sum of an integer and its opposite is zero. Subtracting an integer is the same as adding the opposite of the number.

You can use algebra tiles to help you **add integers**.

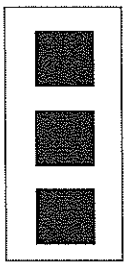
Here is how to model the solution to the problem -3 + 6



- 3 + 6



Remove pairs that equal zero



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1. Use algebra tiles to model and find each sum.

(A) 4 + (-2) (B) 1 + (-4) (C) -2 + 2

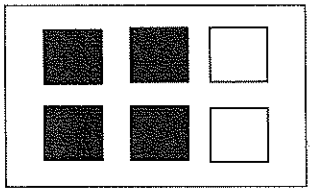
(D) -1 + 4 (E) -5 + (-5) (F) -3 + -2

You can use algebra tiles to **subtract integers**.

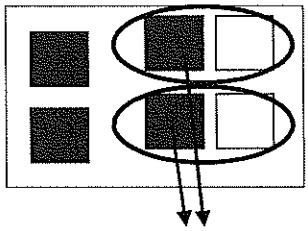
Here is how to model a solution to the problem 2 – 4.

First change the subtraction problem to an addition problem by keeping the sign of the first integer, switching the operation to addition then changing the sign of the second integer.

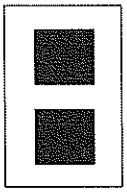
$$4 - 2 = 4 + (\text{-}2)$$



4 + (-2)



Remove pairs that equal zero



2

2. Use algebra tiles to model and find each difference. First change the subtraction to an addition. Remember the rule: $-(-n) = n$. This means that the opposite of the opposite of a number is the original number,

(A) 2 – (-4) (B) -2 – 1 (C) -1 – 4

(D) -4 – 2 (E) -3 – (-5) (F) -3 – 2

Operations with Integers Practice

Complete the problems below. Look for any patterns in each column.

5 + 5 = _____	-4 + 5 = _____
5 + 4 = _____	-4 + 4 = _____
5 + 3 = _____	-4 + 3 = _____
5 + 2 = _____	-4 + 2 = _____
5 + 1 = _____	-4 + 1 = _____
5 + 0 = _____	-4 + 0 = _____
5 + -1 = _____	-4 + -1 = _____
5 + -2 = _____	-4 + -2 = _____
5 + -3 = _____	-4 + -3 = _____
5 + -4 = _____	-4 + -4 = _____
5 + -5 = _____	-4 + -5 = _____

Look for patterns above and write a general rule for each of the following:

If both numbers are positive, _____

_____

If both numbers are negative, _____

_____

If one number is positive and the other is negative, _____

_____

(1) Complete this subtraction pattern

(2) Complete this addition pattern

$9 - 2 =$ _____ $9 + -2 =$ _____

$9 - 1 =$ _____ $9 + -1 =$ _____

$9 - 0 =$ _____ $9 + 0 =$ _____

$9 - -1 =$ _____ $9 + 1 =$ _____

$9 - -2 =$ _____ $9 + 2 =$ _____

Compare answers in pattern 1 and in pattern 2. _____

(3) Complete this subtraction pattern

$-2 - 2 =$ _____ (think "2 less than -2)

$-2 - 1 =$ _____

$-2 - 0 =$ _____

$-2 - -1 =$ _____

$-2 - -2 =$ _____

(4) Complete this addition pattern

$-2 + -2 =$ _____

$-2 + -1 =$ _____

$-2 + 0 =$ _____

$-2 + 1 =$ _____

$-2 + 2 =$ _____

Compare answers in pattern 3 and in pattern 4. _____

How are subtraction and addition related? _____

Generalize a rule for subtracting signed numbers: _____

Complete these multiplication problems.

10 * 4 = _____

10 * 3 = _____

10 * 2 = _____

10 * 1 = _____

10 * 0 = _____

10 * -1 = _____

10 * -2 = _____

10 * -3 = _____

-10 * 4= _____

-10 * 3 = _____

-10 * 2 = _____

-10 * 1 = _____

-10 * 0 = _____

-10 * -1 = _____

-10 * -2 = _____

-10 * -3 = _____

Complete these division problems.

20 ÷ 5 = _____

15 ÷ 5= _____

10 ÷ 5 = _____

5 ÷ 5 = _____

0 ÷ 5 = _____

-5 ÷ 5 = _____

-10 ÷ 5 = _____

20 ÷ -5 = _____

15 ÷ -5 = _____

10 ÷ -5 = _____

5 ÷ -5 = _____

0 ÷ -5 = _____

-5 ÷ -5 = _____

-10 ÷ -5 = _____

Now state the rules for multiplying and /or dividing two signed numbers:

If both numbers are positive, _____

If both numbers are negative, _____

If one number is positive and the other is negative, _____

Evaluate the following expressions according using the order of operations. Show each step of your work.

ORDER OF OPERATIONS
Grouping – Simplify inside the parenthesis or other grouping symbol (fraction bar or radical)
Exponents – Evaluate the exponent
Multiplication and **D**ivision –left to right
Addition and **S**ubtraction left to right

(a) $5+12\div 3$

(b) $16\div(7-3)+7$

(c) $14-200\div 5^2$

(d) $20-5(4-2)^2$

(e) $3^4-(4^2-20)$

(f) $(18-11)^2-(2-5)^3$

(g) $6-\left[17-2(8\div 4+3)+2^3\right]$

(h) $\dfrac{3(7+1)+6}{5^2-5\cdot 3}$

Simplifying Expressions with addition and/or subtraction

Rule: Only combine like terms, which are terms with the same base and exponent.

Example: $4x^2 + 6x^2 + 8x + 3 + 9 - x$
Combine like terms: $4x^2 + 6x^2 = 10x^2$ $8x - x = 7x$ $3 + 9 = 12$

So $4x^2 + 6x^2 + 8x + 3 + 9 - x = 10x^2 + 7x + 12$

Complete these practice problems:

1) $5n + 9n$

2) $4b + 6 - 4$

3) $35n - 1 + 46 + 8n$

4) $-33v - 49v$

5) $30n + 8n$

6) $7x + 31x$

Sometimes, we need to distribute before we can simplify. Remember that distributing means everything inside the grouping symbol is being multiplied by the number or variable in front of the grouping symbol.

Example 1:

$4(3x + 9) - 8x - 6$
$4 \cdot 3x + 4 \cdot 9 - 8x - 6$ *(distribute)*
$12x + 36 - 8x - 6$ *(multiply each term)*
$4x + 30$ *(combine like terms)*

Example 2:

$-8(2x - 7) - 3x - 9$
$-8 \cdot 2x - (-8) \cdot 7 - 3x - 9$
$-16x + 56 - 3x - 9$
$-19x + 47$

Complete these practice problems:

1) $10(x + 3) - 38x - 47$

2) $2(7 - n) + 4$

3) $-8(-5b + 7) + 5b$

4) $-4p - 2(1 - 6p)$

Solving Equations

Remember: Simplify each side
Get all like terms together
Keep both sides balanced
"Undo" what is happening to the variable to isolate it.

Example:

$3x + 12 - x + 8 = 8x + 2 + -3x - 12$

1) Simplify each side: $2x + 20 = 5x - 10$
2) Subtract 2x from each side: $-2x \quad -2x$
$20 = 3x - 10$
3) "Undo" the subtraction: $+10 \quad +10$
$\underline{30} = \underline{3x}$
4) "undo" the multiplication: $3 \quad 3$
$10 = x$

Solve for the variable in the following problems. Show all steps.

1) $-20 = -4x - 6x$

2) $6 = 1 - 2n + 5$

3) $8x - 2 = -9 + 7x$

4) $5p - 14 = 8p + 4$

5) $p - 4 = -9 + p$

6) $-8 = -(x + 4)$

7) $12 = -4(-6x - 3)$

8) $14 = -(p - 8)$

9) $-(7 - 4x) = 9$

10) $2(4x - 3) - 8 = 4 + 2x$

11) $3n - 5 = -8(6 + 5n)$

Solving Equations with Fractions and/or Decimals

You can "clear out" fractions and decimals with a multiplier and then solve

Example 1: $\frac{2}{3}x + \frac{1}{2} = 6$ **Step 1**: multiply all terms by the LCM of the denominators (6)

$6(\frac{2}{3}x) + 6(\frac{1}{2}) = 6(6)$

$\frac{12}{3}x + \frac{6}{2} = 36$ **Step 2:** Simplify the fractions

$4x + 3 = 36$ **All of our variable terms are together, so we can move on to isolating**

$-3 \quad -3$ **the variable by undoing the addition by subtracting 3 from each side.**

$\frac{4x}{4} = \frac{33}{4}$ **Now we can unto the multiplication by dividing each side by 4.**

$x = \frac{33}{4}$ or 8¼ or 8.25

Example 2: 0.35y + 1.4 = 0.5y + 0.95

Step 1: Multiply all terms by the appropriate power of ten, resulting in integers. (In this case, it is 100)

100(0.35y) + 100(1.4) = 100(0.5y) + 100(0.96)

35y + 140 = 50y + 95

Step 2: Combine like terms by subtracting 35y from each side. Then subtract 95 from each side.

35y + 140 = 50y + 95
-35y -35y
140 = 15y + 95
-95 -95
45 = 15y

Step 3: Divide both sides by 15.

15 15
3 = y

Solve the following problems. Show all steps.

1) $\frac{19}{20} = p - 1\frac{1}{4}$

2) $b + 1 = -2\frac{1}{3}$

3) $-2 = \frac{3}{2}a$

4) $-\frac{3}{4} = \frac{3a}{7}$

5) $-2\frac{14}{15} = -2\frac{1}{5}n$

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

$0.4x + 3.9 = 5.78$

$9.2r + 5.514 = 158.234$

$-5.4 - 7.8x = -78.408$

$-8.38v + 10.71 = 131.382$

Solving and Graphing Inequalities

Solving inequalities is a lot like solving equations. See the example below:

$8x + 12 < -20$
$-12 \quad -12$ (subtract 12 from each side)
$\frac{8x}{8} < \frac{-32}{8}$ (divide each side by 8)
$x < -4$

Be careful when dividing or multiplying by a negative number! Doing so makes everything the opposite, including the inequality sign! See the example below:

$-4x + 16 > 40$
$-16 \quad -16$ (Subtract 16 from each side)
$\frac{-4x}{-4} > \frac{24}{-4}$ (Divide each side by -4)
$x < -6$ (Remember that when dividing by a negative ALL parts become the opposite)

You can avoid this by using balancing to solve the inequality instead:

$-4x + 16 > 40$
$4x \quad +4x$ (Add 4x to each side)
$16 > 4x + 40$
$-40 \quad -40$ (Subtract 40 from each side)
$\frac{-24}{4} > \frac{4x}{4}$ (Divide both sides by 4)
$-6 > x$

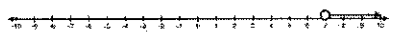
As you can see, both strategies for solving $-4x + 16 > 40$ result in the same answer.

To graph an inequality on a number line, remember the following:

Symbol	Meaning	Closed or Open Circle
<	Less Than	Open ○
>	Greater Than	Open ○
≤	Less Than or Equal to	Closed ●
≥	Greater Than or Equal to	Closed ●

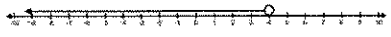
Locate the value on the number line and mark it with the appropriate type of circle.
If the variable is greater than that value, draw a ray extending right from the point.
If the variable is less than that value, draw a ray extending left from the point.

$x > 7$



x is greater than 7. This means that the solution set contains all numbers greater than 7, but since the solution is greater than 7 and not equal to 7, we must use an open circle to indicate that 7 is not included.

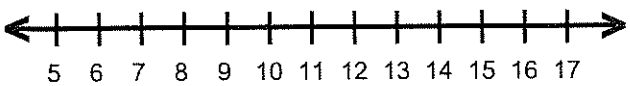
$x < 4$



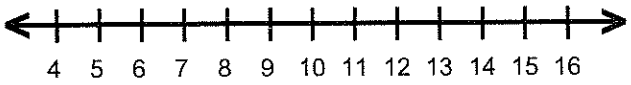
x is less than 4. This means that the solution set contains all numbers less than 4, but since the solution is less than 4 and not equal to 4, we must use an open circle to indicate that 4 is not included.

Solve and Graph the Inequalities

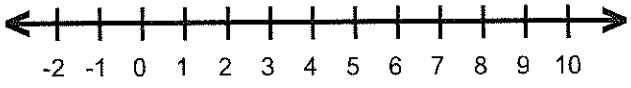
1) $69 > 6h - 11 + 2h$



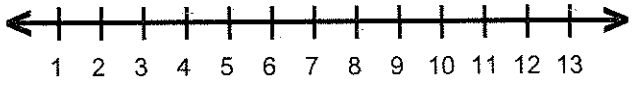
2) $4(5 - 3z) - 2z \geq 11z - 180$



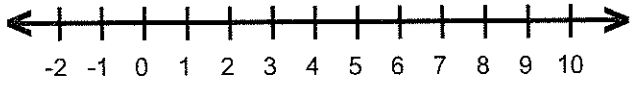
3) $6(3 - 2s) \geq 5s - 101$



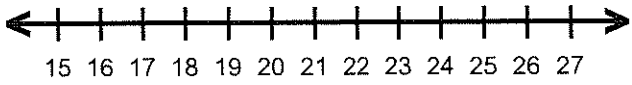
4) $11y - 149 > 5(3 - 6y)$



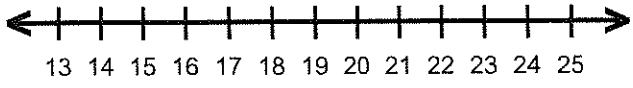
5) $10p - 254 \leq 6(3 - 4p)$



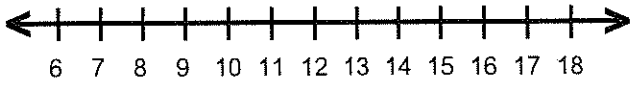
6) $-5x + 6x < 25$



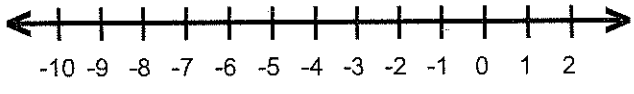
7) $114 \geq 2v + 4v$



8) $6r + 2r \leq 72$



9) $-61 \leq 3d - 5 + 5d$



10) $3(6 - 2g) - 4g < 5g - 147$