Name:_____

Parent Signature:_____ **Date:**_____

This packet must be signed and dated by a parent/guardian upon its completion by the student whose name appears above. It will not be graded without a parent's signature.

Ridgefield Park Public Schools

Summer Algebra I Packet
For
Students
Entering Grade 9

- **Complete the following mathematics review packet and hand it in to your 9th grade Algebra I teacher on the first day of school in September.**
- **The beginning pages provide you with guidance on the steps needed to complete the questions at the end of the packet.**
- **It will be graded and counted as a 1st Marking Period quiz grade...based on 100 points! Record your answers to the questions on the Answer Sheet provided**
- **Unanswered questions and answers without work shown will be marked incorrect. <u>All work must be shown on separate sheets of paper that you attach.</u>**
  - Each correct answer will receive 1 point for a total of 50 points.
  - The attached work will be worth 50 points.
- **Beginning on the 2nd day of school the packet will be marked lower by 5 points per day it is late until such time as you would have 0 points.**

Please attach this cover page to the front of the materials you will be handing in to your Algebra I teacher on the first day of school.

Name:_____ **School:**_____

Algebra I Summer Packet Answer Sheet

Record your answer for each question on the lines provided below. (1 point each)
All work must be shown on separate sheets of paper that you attach. (50 points)

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____
11._____
12._____
13._____
14._____
15._____
16._____
17._____
18._____
19. mean = _____
19. median = _____
19. mode = _____
19. range = _____
20. mean = _____
20. median = _____
20. mode = _____
20. range = _____
21. mean = _____
21. median = _____
21. mode = _____
21. range = _____
22._____
23._____
24._____
25._____
26._____
27._____
28._____
29._____
30._____
31._____
32._____
33._____
34._____
35._____
36._____
37._____
38._____
39._____
40._____
41._____

Unanswered questions and answers without work shown will be marked incorrect.

Using Variables

You often hear word phrases such as *half as much* or *three times as deep.* These phrases describe mathematical relationships. You can translate word phrases like these into mathematical relationships called *expressions.*

Example

Translate the following word expressions into algebraic expressions.

the sum of x and 15	seven times x
$x + 15$	$7x$
Remember that "sum" means to add.	Remember that "times" mean to multiply.

Example

Translate the following word sentence into an algebraic equation.

The weight of the truck is two times the weight of the car.

=	← Write an equal sign under the word *is*. Whatever is written to the left of *is* belongs on the left side of the =. Whatever is written to the right of *is* belongs on the right side of the =.
The weight of the truck is two times the weight of the car.	
t = 2 • c	← Represent the unknown amounts with variables.
$t = 2c$	← The translation is complete. Check to make sure you have translated all parts of the equation.

Exponents and Order of Operations

Order of Operations

1. Perform any operations inside grouping symbols.
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.

Example

Write + on the first index card, − on the second card, and × on the third card. Shuffle the cards and place them face down on your desk. Randomly pick cards to fill in the blanks with operation signs. Once you have filled in the operation signs, simplify the expression.

6 ___ (9 ___ 7) ___ 8	← Pick cards to fill in the blanks with operation signs.
6 × (9 − 7) + 8	← Subtract 7 from 9 inside the grouping symbols.
6 × 2 + 8	← Do multiplication and division first. Multiply 6 by 2.
12 + 8	← Do addition and subtraction last. Add 12 and 8 to get the answer.
20	← The answer is 20.

Mean, Median, Mode, and Range

In working with statistical data, it is often useful to determine a single quantity that best describes the set of data. The best quantity to choose is usually one of the most popular measures of central tendency: the mean, the median, or the mode.

	Definitions
Mean	The **mean** is the sum of the data items in a set divided by the number of data items in the set.
Median	The **median** is the middle value in a set of data when the numbers are arranged in numerical order. If the set has an even number of data items, the median is the mean of the two middle data values.
Mode	The **mode** of the data is the data item that occurs most often in a data set.
Range	The **range** of a set of data is the difference between the greatest and least data values.

Example

Find the mean, median, and mode of the set of data: 34 46 31 40 33 40.

Mean: $\frac{34 + 46 + 31 + 40 + 33 + 40}{6} = \frac{224}{6} = 37.\overline{3}$ ← **Add the data items and divide by the number of data items in the set.**

Median: 31 33 34 40 40 46 ← **Arrange the data items in increasing order.**

$\frac{34 + 40}{2} = 37$ ← **Since there is an even number of data values, find the mean of the two middle data values.**

Mode: The mode is 40 since it occurs most often.

Range: $46 - 31 = 15$

The Distributive Property

You can compare the Distributive Property to distributing paper to the class. Just as you distribute a piece of paper to each person in the class, you distribute the number immediately outside the parentheses to each term inside the parentheses by multiplying.

Example

Simplify $3(2x + 3)$ by using the Distributive Property.

$3(2x + 3)$ ← **Draw arrows to show that 3 is distributed to the 2x and to the 3.**

$3(2x) + 3(3)$ ← **Use the Distributive Property.**

$6x + 9$ ← **Simplify.**

Example

Simplify $-(4x + 7)$ by using the Distributive Property.

$-1(4x + 7)$ ← **Rewrite using the Multiplication Property of −1.**

$-1(4x + 7)$ ← **Draw arrows to show that −1 is distributed to the 4x and to the 7.**

$-1(4x) + (-1)(7)$ ← **Use the Distributive Property.**

$-4x - 7$ ← **Simplify.**

Properties of Numbers

The properties of real numbers allow you to write equivalent expressions.

Properties of Real Numbers

For every real number a, b, and c,

Commutative Property of Addition

$a + b = b + a$ **Example** $3 + 7 = 7 + 3$

Commutative Property of Multiplication

$a \cdot b = b \cdot a$ **Example** $3 \cdot 7 = 7 \cdot 3$

Associative Property of Addition

$(a + b) + c = a + (b + c)$ **Example** $(6 + 4) + 5 = 6 + (4 + 5)$

Associative Property of Multiplication

$(a \cdot b) \cdot c = a \cdot (b \cdot c)$ **Example** $(6 \cdot 4) \cdot 5 = 6 \cdot (4 \cdot 5)$

Identity Property of Addition

$a + 0 = a$ **Example** $9 + 0 = 9$

Identity Property of Multiplication

$a \cdot 1 = a$ **Example** $6 \cdot 1 = 6$

Inverse Property of Addition

For every a, there is an additive inverse $-a$ such that $a + (-a) = 0$. **Example** $5 + (-5) = 0$

Inverse Property of Multiplication

For every a $(a \neq 0)$, there is a multiplicative inverse $\frac{1}{a}$ such that $a\left(\frac{1}{a}\right) = 1$. **Example** $5 \cdot \frac{1}{5} = 1$

Symmetric Property

If $a = b$, then $b = a$ **Example** $2 \cdot 3 = 6$, so $6 = 2 \cdot 3$

Distributive Property	**Examples**
$a(b + c) = ab + ac$	$5(4 + 2) = 5 \cdot 4 + 5 \cdot 2$
$a(b - c) = ab - ac$	$5(4 - 2) = 5 \cdot 4 - 5 \cdot 2$

Multiplication Property of Zero

For every real number n, $n \cdot 0 = 0$. $-35 \cdot 0 = 0$

Multiplication Property of -1

For every real number n, $-1 \cdot n = -n$. $-1 \cdot (-5) = 5$

Solving One-Step Equations by Adding or Subtracting

Follow these steps to solve equations.

	Solve: $n + (-2) = 11$	Solve: $n - 6 = -36$
① Use the inverse operation on both sides of the equation.	$n + (-2) - (-2) = 11 - (-2)$	$n - 6 + 6 = -36 + 6$
② Simplify.	$n = 13$	$n = -30$
③ Check.	$n + (-2) = 11$ $13 + (-2) \stackrel{?}{=} 11$ $11 = 11$ ✔	$n - 6 = -36$ $-30 - 6 \stackrel{?}{=} -36$ $-36 = -36$ ✔

Solving One-Step Equations by Multiplying or Dividing

Follow these steps to solve equations.

	Solve: $\frac{t}{5} = -7$	Solve: $-2x = 8$
① Use the inverse operation on both sides of the equation.	$(5)\frac{t}{5} = (5)(-7)$	$\frac{-2x}{-2} = \frac{8}{-2}$
② Simplify.	$t = -35$	$x = -4$
③ Check.	$\frac{t}{5} = -7$ $\frac{-35}{5} \stackrel{?}{=} -7$ $-7 = -7$ ✔	$-2x = 8$ $-2(-4) \stackrel{?}{=} 8$ $8 = 8$ ✔

Solving Two-Step Equations

The order of operations tells you to do multiplication and division before you do addition and subtraction. However, when solving two-step equations, you must first do any addition and subtraction necessary to isolate the variable on one side of the equation. Start by asking yourself, "Has any adding or subtracting been done to the variable?" If the answer is yes, perform the inverse operation. Then repeat this step for multiplication and division.

Example

Write the steps and solve the equation.

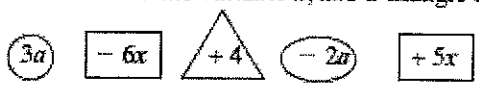
$3x + 4 = 10$ ←	**Think: Is any adding or subtracting being done to the variable? 4 is being added. What is the inverse of adding 4?**
$3x + 4 - 4 = 10 - 4$ ←	**Subtract 4 from each side.**
$3x = 6$ ←	**Simplify.**
$3x = 6$ ←	**Think: Is any multiplying or dividing being done to the variable? It is being multiplied by 3. What is the inverse of multiplying by 3?**
$\frac{3x}{3} = \frac{6}{3}$ ←	**Divide each side by 3.**
$x = 2$ ←	**Simplify.**

Solving Multi-Step Equations

Example

Simplify $3a - 6x + 4 - 2a + 5x$ by combining like terms.

Ring each term that has the variable a. Draw a rectangle around each term that has the variable x, and a triangle around each constant term.



Group the like terms by reordering the terms so that all matching shapes are together.

Combine like terms by adding coefficients.

$a - x + 4$

Steps for Solving a Multi-Step Equations

Step 1:	Use the Distributive Property to remove parentheses on each side.
Step 2:	Combine like terms on each side.
Step 3:	Undo addition or subtraction.
Step 4:	Undo multiplication or division.

Example

Solve: $2(x-3) = 8$

$$2(x-3) = 8$$

$2(x) - 2(3) = 8$		← Use the Distributive Property.
$2x - 6 = 8$		← Simplify.
$2x - 6 + 6 = 8 + 6$		← Add 6 to each side.
$2x = 14$		← Simplify.
$\frac{2x}{2} = \frac{14}{2}$		← Divide each side by 2.
$x = 7$		← Simplify.

Example

Solve: $3a + 6 + a = 90$

$3a + 6 + a = 90$		
$4a + 6 = 90$		← Combine like terms.
$4a + 6 - 6 = 90 - 6$		← Subtract 6 from each side.
$4a = 84$		← Simplify.
$\frac{4a}{4} = \frac{84}{4}$		← Divide each side by 4.
$a = 21$		← Simplify.

Complete the following questions, showing all work on separate sheets of paper that you attach. Record each answer on the provided answer sheet located in the beginning of this packet.

Using Variables

Write an algebraic expression for each phrase.

1. 7 increased by x

2. p multiplied by 3

3. n less than 7

4. the product of 2 and q

Write a phrase for each algebraic expression.

5. $\frac{8}{y}$

6. $s - 10$

Define a variable and write an algebraic expression for each phrase.

7. the difference of 8 and a number

8. 3 increased by a number

Define a variable and write an algebraic equation to model each situation.

9. What is the amount of money in a bank containing only dimes?

10. How many marbles remain in a 48-marble bag after some marbles have been given away?

Exponents and Order of Operations

Evaluate each expression.

11. $14 + 6x^3 - 8 \div x^2$ for $x = 2$

12. $14 \div [3(a-2) - b]$ for $a = 8$ and $b = 11$

13. $7a - 4(b + 2)$ for $a = 5$ and $b = 2$

14. $\frac{a + 2b}{5}$ for $a = 1$ and $b = 2$

15. $5 + u^2 \times 8 - v^3 \div v^2$ for $u = 4$ and $v = 2$

16. $\frac{5m + n}{5}$ for $m = 6$ and $n = 15$

17. $x + 3y^2$ for $x = 3.4$ and $y = 3$

18. $|d + 2| + |-7|$ for $d = 1$

Mean, Median, Mode, and Range

Find the mean, median, mode, and range of the data.

(1 point for the correct answer for each part = 4 points for each question)

19. 1, 5, 3, 2, 1, 0, 4, 2, 6, 1

20. 31.25, 27.50, 28.00, 36.95, 32.10

21. 90, 120, 140, 135, 112, 126

The Distributive Property

Write an expression for each phrase.

22. 5 times the quantity x plus 6

23. twice the quantity 3 times c plus 9

Properties of Numbers

Name the property that each equation illustrates.

24. $83 + 6 = 6 + 83$

25. $1 \cdot 4y = 4y$

26. $15x + 15y = 15(x + y)$

27. $(8 \cdot 7) \cdot 6 = 8 \cdot (7 \cdot 6)$

28. $x + (-x) = 0$

29. $-12 + 0 = -12$

Solving Equations

Solve each equation.

30. $\frac{9}{8}x = -\frac{1}{4}$

31. $x - \frac{3}{8} = -\frac{1}{2}$

32. $3x - 7 = 35$

33. $\frac{m}{9} + 7 = 3$

34. $2n + 3n + 7 = -41$

35. $2(3a + 2) = -8$

36. $13 + 2(5c - 2) = 29$

37. $26.54 - p = 0.5(50 - p)$

Write and solve an equation for each situation.

38. You want to buy a bouquet of yellow roses and baby's breath for \$16. The baby's breath costs \$3.50 per bunch, and the roses cost \$2.50 each. You want one bunch of baby's breath and some roses for your bouquet. How many roses can you buy?

39. Suppose you want to buy one pair of pants and several pairs of socks. The pants cost \$24.95, and the socks are \$5.95 per pair. How many pairs of socks can you buy if you have \$50.00 to spend?

40. The width of a rectangle is 6 cm less than the length. The perimeter is 72 cm. Write and solve an equation to find the dimensions of the rectangle.

41. John and two friends rent a canoe at a park. Each person must rent a life jacket. If the bill for the rental of the canoe and life jackets is \$41, for how many hours did they rent the canoe?