RAMAPO-INDIAN HILLS SCHOOL DISTRICT

Dear Ramapo-Indian Hills Student:

Please find attached the summer packet for your upcoming math course. The purpose of the summer packet is to provide you with an opportunity to review prerequisite skills and concepts in preparation for your next year's mathematics course. While you may find some problems in this packet to be easy, you may also find others to be more difficult; therefore, you are not necessarily expected to answer every question correctly. Rather, the expectation is for students to put forth their best effort, and work diligently through each problem.

To that end, you may wish to review notes from prior courses or on-line videos (www.KhanAcademy.com, www.glencoe.com, www.youtube.com) to refresh your memory on how to complete these problems. We recommend you circle any problems that cause you difficulty, and ask your teachers to review the respective questions when you return to school in September. Again, given that math builds on prior concepts, the purpose of this packet is to help prepare you for your upcoming math course by reviewing these prerequisite skills; therefore, the greater effort you put forth on this packet, the greater it will benefit you when you return to school.

Please bring your packet and completed work to the first day of class in September. Teachers will plan to review concepts from the summer packets in class and will also be available to answer questions during their extra help hours after school. Teachers may assess on the material in these summer packets after reviewing with the class.

If there are any questions, please do not hesitate to contact the Math Supervisors at the numbers noted below.

Enjoy your summer!

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Algebra 1 CPE-CP Summer Review Packet
Ramapo Indian Hills

This packet must be completed the summer before entering Algebra 1. These skills are necessary for a successful year in this course. Please review the notes for each section and complete all subsequent practice problems. Be sure to show all of your work. This packet must be completed in its entirety and be ready to be submitted at the beginning school.

I. Writing Algebraic Expressions

In **algebraic expressions,** letters such as *x* and *w* are called variables. A variable is used to represent an unspecified number or value.

Practice: Write an algebraic expression for each verbal expression.

1. Four times a number decreased by twelve ____________________
2. Three more than the product of five and a number ________________
3. The quotient of two more than a number and eight ________________
4. Seven less than twice a number __________________________

II. Order of Operations

To evaluate numerical expressions containing more than one operation, use the rules for order of operations. The rules are often summarized using the expression **PEMDAS**

Examples:

Parentheses (Grouping Symbols)	$[(7-4)^2+3]+15$	$\frac{(9-7)^2+6}{11-6}$
Exponents	$=[3^2+3]+15$	$=\frac{2^2+6}{5}$
Multiply or Divide, from left to right	$=[9+3]+15$	$=\frac{4+6}{5}$
Add or Subtract, from left to right	$=12+15$	$=\frac{10}{2}$
		$=5$

Practice: Evaluate each expression.

1. $250 \div [5(3 \bullet 7 + 4)]$

2. $\dfrac{5^2 \cdot 4 - 5 \cdot 4^2}{5(4)}$

3. $\dfrac{1}{2} \cdot 26 - 3^2$

4. $8^2 \div (2 \bullet 8) + 2$

5. $5 + \left[30 - (6 - 1)^2\right]$

6. $\dfrac{2 \cdot 4^2 - 8 \div 2}{(5 + 2) \cdot 2}$

III. 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.

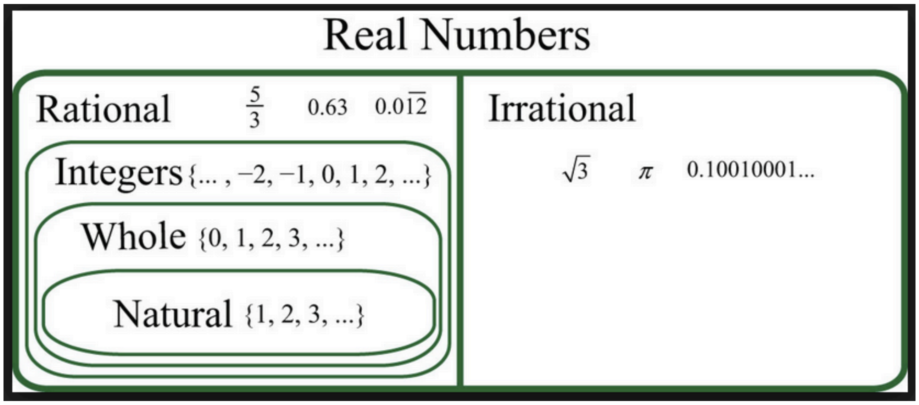
1. $5x^2 - y$ when $x = 4$ and $y = 24$

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

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

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

IV. The Real Number System



The **Real** number system is made up of two main sub-groups **Rational numbers** and **Irrational numbers.**

The set of rational numbers includes several subsets: **natural numbers, whole numbers, and integers.**

- **Real Numbers-** any number that can be represented on a number-line.
  - **Rational Numbers-** a number that can be written as the ratio of two integers (this includes decimals that have a definite end or repeating pattern)
    Examples: $2, -5, \frac{-3}{2}, \frac{1}{3}, 0.253, 0.\overline{3}$
    - **Integers-** positive and negative whole numbers and 0
      Examples: $-5, -3, 0, 8 \ldots$
    - **Whole Numbers** – the counting numbers from 0 to infinity
      Examples: { 0, 1, 2, 3, 4, ….}
    - **Natural Numbers-** the counting numbers from 1 to infinity
      Examples: { 1, 2, 3, 4… }
  - **Irrational Numbers-** Non-terminating, non-repeating decimals (including π, and the square root of any number that is not a perfect square.)
    Examples: $2\pi,\ \sqrt{3},\ \sqrt{23},\ 3.21211211121111\ldots.$

Practice: Name all the sets to which each number belongs.

1. -4.2 ______________________________
2. $3\sqrt{5}$ ______________________________
3. $\frac{5}{3}$ ______________________________
4. 9 ______________________________
5. $\sqrt{16}$ ______________________________
6. $-\frac{8}{2}$ ______________________________

V. Fractions

Add, subtract, multiply or divide. Simplify fully. Write your answer as an improper fraction in simplest form, not a decimal.

1. $6 - \frac{1}{6}$

2. $\frac{1}{2} - \frac{1}{2}$

3. $\frac{1}{5} - \frac{1}{5}$

4. $\frac{3}{8} - \frac{1}{3}$

5. $-\frac{10}{7} + \frac{1}{6}$

6. $2 - \frac{13}{8}$

7. $-\frac{4}{3} - \left(-\frac{3}{2}\right)$

8. $\left(-3\frac{3}{5}\right) - \left(4\frac{2}{5}\right)$

9. $\frac{8}{7} \cdot \frac{7}{10}$

10. $-2 \cdot \frac{3}{7}$

11. $-\frac{2}{3} \cdot \left(1\frac{1}{4}\right)$

12. $\left(-2\frac{2}{3}\right) \cdot \left(4\frac{1}{10}\right)$

13. $-\frac{1}{2} \div \frac{5}{4}$

14. $-\frac{9}{5} \div 2$

15. $2 \div \left(-3\frac{4}{5}\right)$

16. $\left(-3\frac{7}{10}\right) \div \left(2\frac{1}{4}\right)$

VI. 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. $0.3(40a+10b-5)$

VII. 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

$$8x^2 + 9x - 12x + 7x^2 = (8+7)x^2 + (9-12)x$$
$$= 15x^2 + -3x$$
$$= 15x^2 - 3x$$

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

VIII. Solving Equations with Variables on One-Side

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

Example:
Solve.

$3x - 2 = 10$	
$+2 \quad +2$	Isolate 3x by adding 2 to each side.
$\frac{3x}{3} = \frac{12}{3}$	Simplify Isolate x by dividing each side by 3.
$x = 4$	Simplify

Check your answer.

$3(4) - 2 = 10$	Substitute the value in for the variable.
$12 - 2 = 10$	Simplify
$10 = 10$	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!

Practice: Solve each equation.

1. $98 = b + 34$

2. $-14 + y = -2$

3. $8k = -64$

4. $\frac{2}{5}x = 6$

5. $14n - 8 = 34$

6. $8 + \frac{n}{12} = 13$

7. $\frac{3k - 7}{5} = 16$

8. $-\frac{d}{6} + 12 = -7$

IX. Solving Equations with Variables on Each-Side:

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

X. Solving For a Specific 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.**

$$2x - 4y = 8$$
$$2x - 4y - 2x = 8 - 2x$$
$$-4y = 8 - 2x$$
$$\frac{-4y}{-4} = \frac{8 - 2x}{-4}$$
$$y = \frac{8 - 2x}{-4} \text{ or } \frac{2x - 8}{4}$$

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

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

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

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

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

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

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?