Piedmont Classical High School

Summer Math Packet

Summer math packets are designed to brush up your math skills and prepare you to start the year with a firm foundation of appropriate knowledge and understanding. Summer math packets are optional and designed to contain material that should be review. If you don't understand or have forgotten something in the math packet it is important that you get help and learn the concept so that you will be able to be successful in your new math class. If you choose to complete the packet, you will benefit from stronger skills, better understanding, and a 100% quiz grade.

Guidelines:

- You should complete the math packet for the class that you will be going into
- Math packets should reflect your own work
- You may get help with the material and concepts, but you must list people and resources who helped you on the accompanying form
- Completed Packets are due on August 19 at 4:00 pm and are to be turned into your math teacher
- If you need help, you may use the following recommended resources or find some on your own
    - Last year's textbook (you may check one out if you don't have one)
    - Khan academy
    - Tutoring hours at the school (confirm times and dates on website)
        - August 1, 3 from 10:00 -12:00
        - August 8, 10,15 3:00-5:00
        - August 17,18 during after school study hall

I will honor, through my words and actions, my school, my family, my country, and myself.

This packet reflects my own work and upholds the honor code.

Signed: _____

I received help from the following people: _____

_____

_____

GEOMETRY

SUMMER MATH REVIEW

Welcome to Geometry! Here is your optional summer review packet. Be sure to show all work on a separate sheet of paper, read directions carefully, and do NOT use a calculator. You will need graph paper. Get help if you need it!

I. Order of Operations: PEMDAS

    A. P (parentheses) - Simplify within parentheses or other grouping symbols first.

    B. E (exponents) - Simplify all exponential expressions, following rules for exponents.

    C. MD (multiply and divide) - Perform these operations as they occur, left to right.

    D. AS (add and subtract) - Perform these operations as they occur, left to right.

        Examples: $10 + 4 \div 2 - 3(2 \times 6 - 3)^2$

            P $10 + 4 \div 2 - 3 (12 - 3)^2$

            P $10 + 4 \div 2 - 3(9)^2$ = $10 + 4 \div 2 - 3 \times 81$

            MD $10 + 2 - 243$

            AS $12 - 243$ = -231

    E. Practice

        1. $2 + (2^2 + 6) \div 2 - 1$ 2. $[16 - 4(3 + 2)] \div (-2)$

        3. $(2 + 2^2 + 6) \div 2 - 1$ 4. $3 \times 4^2 - (5 \times 1 - 4)$

II. Solving Equations

    A. The goal is to get the variable (or the chosen variable) ALONE on one side of the equal marks.

B. Use mathematical operations to rearrange the terms - do NOT even think "move it over!" Add, subtract, multiply, or divide terms and coefficients as needed.

C. Whatever you do to one side of the equation (sides are separated by the =), you must do to the other.

Ex: $25 = 7 + x$ Subtract 7 from both sides

$\underline{-7 \quad -7}$

$18 = x$

Ex: $5(x + 3) = 1/2$ Multiply both sides by 2 to eliminate the fraction

$10(x + 3) = 1$ Distribute

$10x + 30 = 1$ Subtract 30

$10x = -29$ Divide by 10

$x = -2.9$ Also correct would be $\underline{-29}$
, 10

D. Practice

1. $m - 16 = 5$

2. $-g + 21 = 13$

3. $-5 + 3k = 10$

4. $(x + 5)/6 = 3$

III. Tackling word problems

A. Turn word problems into number problems as soon as possible.

B. Follow the question word by word, following instructions.

C. If the problem is a "story", write down what you know, *then* decide what to do.

D. Always write an equation. Simple problems that you can work in your head can give you safe practice writing the equations.

Ex: One half of what number is 6? $1/2\ X = 6$

What is 3 times the sum of 6 and 3? $X = 3\ (6 + 3)$

Hamburgers cost $4.50 each. You have $25. How many hamburgers can you buy?

$25 = 4.50\ X$ In this case, your calculated answer, 5.555... seems to make no sense; nobody sells 5/9 of a hamburger. You can only buy 5 hamburgers and get 2.50 in change. Your correct final answer is 5; math always makes sense.

E. Practice

1. Twelve divided by what number is 4?

2. What number added to 16 makes 25?

3. What is 5 less than 38?

4. Joe had 14 M&M's. He gave 6 to Sally. How many does he have left?

IV. Linear Equations (equations whose solutions form a straight line)

A. Forms of linear equations

1. Standard form: $Ax + By = C$

a. A, B, and C are integers (no fractions!)

b. A (or B if there is no A, i.e., if A is zero) must be positive

2. Slope - intercept form: $y = mx + b$

a. Any linear equation can be put in this form by solving for y.

b. m is the slope of the line; b is the y-intercept (line crosses y axis)

c. If m is 0, then $y = b$ and the line is horizontal ($\longleftrightarrow$)

d. If m is undefined (i.e., $y = 0$), the x = a constant and the line is ↕ .

e. Fractions are allowed.

3. Point-slope form: $(y - y_1) = m (x - x_1)$

a. y_1 and x_1 are points on the line, m is the slope.

b. This can be turned into slope-intercept form easily.

c. Fractions are allowed

4. Slope formula: $\dfrac{y_2 - y_1}{x_2 - x_1}$, which gives you "rise over run"

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B. Graphing

1. Plotting points

a. Choose a small number for x and plug it into equation, repeat.

b. Graph points, then connect dots.

2. Using point-slope form:

a. Find y-intercept, then

b. Move to other points according to slope.

c. Connect dots.

C. Practice (on graph paper)

1. Graph: $y = 3x + 2$

2. Graph: $3x + 3y = 12$

3. Graph: $y = 4$ and $x = 3$ on the same set of axes

4. Write an equation (in any form) for the line with slop -2 that passes through the point $(1, 3)$.

5. Write an equation for a vertical line passing through $(-4, 5)$

V. Literal Equations (solving for a variable instead of a number)

A. Follow general rules for solving any equation.

B. Remember, anything you can do with numbers you can do with variable.

  Ex. $D = RT$ solve for R

     Divide both sides by T

   $D/T = R$

  Ex: $A = \pi r^2$ solve for r

     Divide both sides by π

   $r^2 = A/\pi$

     Take the square root of both sides

   $r = \sqrt{A/\pi}$

C. Practice:

  1. $5x + 7y = 35$ solve for y

  2. $5x - 7y = w$ solve for x

VI. Exponents

  A. An exponent tells how many time a term is used as a factor.

   3^3 means 3 X 3 X 3 = 27

  B. Exponential expressions can be added, subtracted, multiplied, divided, squared, and "square rooted."

  C. Whatever you do to the exponential expression, do ONE STEP LOWER to the exponents.

   Ex: $(x^2)(x^3) = x^{2+3} = x^5$

   Ex: $(x^2)^3 = x^6$

   Ex: $x^2 + x^2 = 2x^2$ (The exponent did not change.)

Ex: $x^2 \div x^3 = x^{2-3} = x^{-1} = 1/x$

    D. Anything (and that means ANYTHING) raised to the 0 power = 1

    E. Practice - simplify

        1. $x^2 \cdot x^7$ 2. $b^5 + 2b^2 + 3b^5$

        3. $c^4 \times c^3$ 4. $g^2(g^3 + 2g^2 - 3g + 4)$

VII. Squares and square roots.

    A. Learn the perfect squares:

        1. They are, from 1^2 to 15^2,   1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225

        2. Learn means memorize.

    B. To find square roots,

        1. Factor any perfect squares out of the number under the radical

        2. Take those squares, then leave the rest under.

$$\text{Ex: } \sqrt{98x^3} = \sqrt{(49)(2)(x)(x)(x)} = 7x\sqrt{2x}$$

    C. Practice

        1. the square root of 32

        2. the square root of 450

        3. the square root of 48

VIII. Polynomials

    A. Multiplying: FOIL binomials

$$\text{Ex: } (x+3)(x-2) = x^2 - 2x + 3x - 6 = x^2 + x - 6$$

$$(a + b)(c + d) = ac + ad + bc + bd$$

B. Factoring: Breaking a polynomial into its factors

    1. Remove the GCF, if there is one

    2. Look for a pattern

        a. Difference of Two Squares (DOTS): $a^2 - b^2 = (a+b)(a-b)$

        b. Perfect Trinomial Square (PTS): $a^2 + 2ab + b^2 = (a+b)(a+b) = (a+b)^2$

            or $a^2 - 2ab + b^2 = (a-b)(a-b) = (a-b)^2$

    Ex: $x^2 - x - 6 = (x-3)(x+2)$

    Ex: $3x^3 - 3x^2 - 18x = 3x(x^2 - x - 6) = 3x\ (x-3)(x+2)$

    Ex: $x^2 - 81 = (x+9)(x-9)$ (DOTS)

    Ex: $x^2 + 6x + 9 = (x+3)(x+3) = (x+3)^2$

    3. Practice: Factor completely

        1. $4x^2 - 16$ 2. $x^2 - 8x + 16$

        3. $5x^2y - xy^2 + 3x^2y^2$ 4. $b^2 - 38b + 72$

IX. Solving quadratic equations (Equations like the ones in VIII)

    A. Factor, then set each factor equal to 0 and solve the equations you get.

    B. OR use the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

        The original equation would be $ax^2 + bx + c = 0$

        NOTE: a, b, and c are numbers, not variables.

    C. The solutions to a quadratic equation are the x values that would make the graph of the equation cross the x axis, so if $ax^2 + bx + c = y$, they the solutions would be where $y = 0$. Some solutions are imaginary, but that is for later.

    D. Practice   1. $x^2 - 2x - 8 = 0$ (Factor)
                        2. $2x^2 + 3x + 7 = 0$ (Use quadratic formula, leave in square-root form if you need to.