AP PRECALCULUS SUMMER PACKET

Welcome to AP Precalculus! I look forward to working with you this upcoming school year and preparing you to take the AP Precalculus Exam. While you are enjoying your summer, please take the time to complete the following assignment. This packet is designed to review concepts from many concepts from Algebra 1, Geometry, and Algebra 2 that will be needed for a smooth transition to AP Precalculus. It is expected that you are proficient on all of the material listed in this packet, as AP Precalculus is a rigorous and fast paced course.
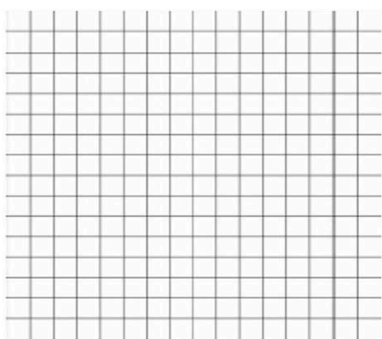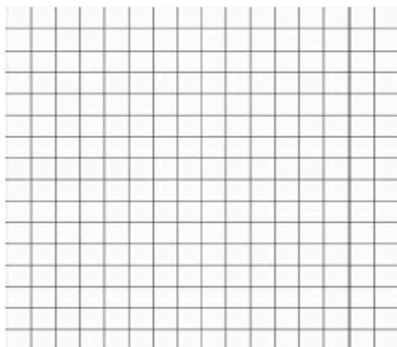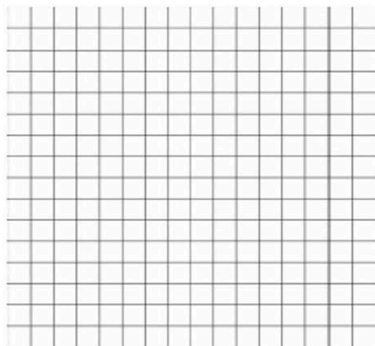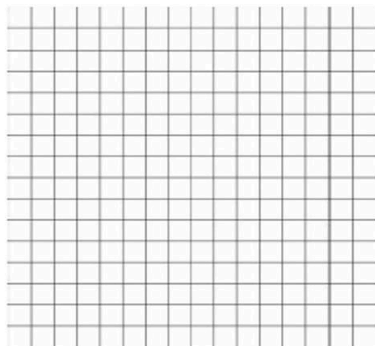
The prerequisite work assigned will help you review before the next academic school year 25-26 . There will be a very limited review of the following topics. The answers are at the beginning of each section, so that you can check your work.

This assignment is due the first day of class…no exceptions. Make a copy and save it under your name before completing. After we have looked at your work, we will spend a few days going over the problems.

We will have a test over the concepts in the summer work within the first two weeks of school starting. I look forward to a great year together!. If you have any questions, feel free to reach out via email: uchechuk.odionyenma@pgcps.org

Prerequisite #1: Linear Functions (Algebraic Manipulation):

1. A line passes through (7,4) and $(3, -4)$. Find the equation for the line in all three forms for linear equations		
Slope-intercepts Form $$y = mx + b$$	Point-slope Form $$y - y_1 = m(x - x_1)$$	Standard Form $$Ax + By = C$$

2. Sketch the graph of each line

a. $y = \frac{2}{3}x - 2$

b. $y = -3x + 1$

3. Sketch the graph of each line

a. $2x - 5y = 10$

b. $-4x + 3y = -24$

4. A recording studio charges a base fee for use for their facility plus a constant fee per hour of use. The table compares the number of hours the studio is used with the total cost c, for use of the studio. Use the table to answer each question below.

Hours of studio use (h)	2	4	6	8
Total cost to use the studio (C)	$450	$600	$750	$900

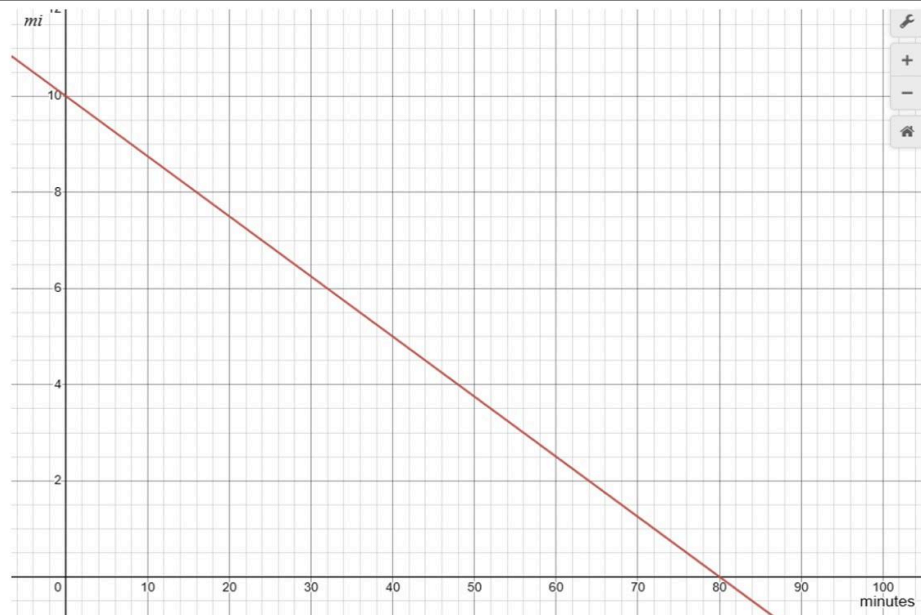|	
a. What is the fee charged per hour for the use of the studio?	b. What is the base fee for the rental of the studio?
c. Write a linear equation to model this situation.	d. Identify the domain and range for this function.

5. Jaden competes in a race, running at a constant pace from start to finish. The distance remaining in the race (in miles) as a function of time (in minutes) is shown in the graph. Use the graph to answer the following questions.

How long did it take Jaden to reach the finish line? Explain.	
How long (distance) was the race? Explain your reasoning.	

Prerequisite Review #2: Linear Functions: Solving Equations and Inequalities

1. Solve $4x - 9 < 7x + 15$	2. Solve $6(3x - 2) = -4(2x - 9)$
3. Solve $\frac{2}{3}x + 4 = \frac{4}{5}x - 3$	

Prerequisite Review #3: Polynomial Addition and Multiplication

Simplify the expression to a polynomial in standard form

1. $(4x^3 - 5x^2 - 3x + 7)(2x - 5)$	2. $3(2x - 5)(x^2 - 4x + 2)$
3. $(3x - 1)(-2x^2 + 4x - 7)$	

Prerequisite Review #4: Factoring Quadratic Trinomials

Factor each quadratic trinomial	
1. $x^2 + 10x + 9$	2. $x^2 - 6x + 9$
3. $x^2 - 11x + 24$	4. $3x^2 - 5x - 12$
5. $4x^2 + 28x + 49$	6. $15x^2 - 11x - 12$

Prerequisite Review #5: Solving Quadratic Equations and Inequalities (Scientific Calculator Allowed)

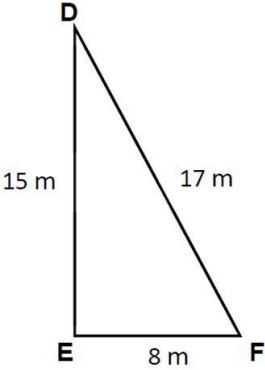|	
Solve each problem by factoring or using the quadratic formula. Round answers to the nearest hundredth as needed.	
1. $x^2 + 4x + 3 = 0$	2. $x^2 - 5x = 6$
3. $3x^2 - 5x - 9 = x^2 + 3$	4. $4x^2 - 12x + 1 < 0$
5. $2x^2 + 8x = -7$	6. A ball is catapulted upward from the top of a building at a speed of 30 feet per second. The ball's height above the ground can be modeled as $H(t) = -16t^2 + 30t + 40$. How long does it take for the ball to reach a height of 50 feet?

Prerequisite Review #6: Quadratic Functions: Algebraic Manipulations (Graphing Calculator is Allowed) Video Link   Solutions Link   Solutions Video Link

1. A ball is launched straight up with a velocity of 40 feet per second. The ball's height above the ground can be modeled by $H(t) = -16t^2 + 40t + 5$. Use this information to answer the following questions.

a. How high is the ball when it is released? Explain your answer.	b. How long does it take the ball to reach its maximum height? Explain your answer.
c. What is the maximum height the ball reaches? Explain your answer.	d. How long is the ball in the air? Explain your answer.
2. A child uses 36 legos to build the rectangular frame for the base of her lego castle. Write a quadratic function to the model this situation and determine the length of the side of the castle and the largest possible area covered by the castle's base.	3. Does the table of values below represent a quadratic equation? Justify your decision.

x	f(x)
-1	4
0	6
1	11
2	19
3	32

Prerequisite Review #7: Solving Right Triangle Problems Using Trigonometry (Calculator Allowed) Video Link Solutions Link Solutions Video Link

1. Use the diagram to identify each ratio. D 15 m 17 m E 8 m F	$sin\,F =$	$sin\,D =$
	$cos\,F =$	$cos\,D =$
	$tan\,F =$	$tan\,D =$

2. Using the diagram from #1 above, calculate the measure in degrees of ∠F.

3. When a ladder leans against a wall, it reaches a height of 15 feet. The angle of incline is 60°. How far away from the wall is the base of the ladder?

4. A kite is flying extended on 100 feet of string and is 30 feet high. What is the angle of elevation of the kite?

Prerequisite Review #8: Solving Systems of Equations in 2 or 3 Variables <u>Video Link</u>
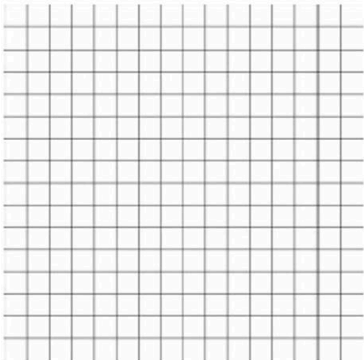<u>Solutions Link</u>   <u>Solutions Video Link</u>

1. Solve $\begin{cases} x + 2y = 10 \\ y = 2x - 5 \end{cases}$

2. $\begin{cases} 5x + 7y = 6 \\ 10x - 3y = 46 \end{cases}$

3. $\begin{cases} 3x + y - 2z = -12 \\ 2x + 2y - 3z = -12 \\ 5x + 3y + 2z = 4 \end{cases}$

4. $\begin{cases} y = x^2 + 4x - 2 \\ y = 3x + 5 \end{cases}$

Prerequisite Review #9: Piecewise Functions Video Link   Solutions Link   Solutions Video Link

1. An electrician charges $250 for the first hour of work and $75 for each additional hour.

a. Generate the piecewise function to define the cost of hiring this electrician.	b. Graph the piecewise function that would illustrate this situation.

2. Find each of the following values given that $f(x) = \begin{cases} x^3 - 4 & when & x < -6 \\ 2x + 7 & when & -6 \le x < 1 \\ \frac{x}{x^2+2} & when & x \ge 1 \end{cases}$

a. f(-6)	b. $f(1)$	c. $f(6)$	d. $f(0)$

3. Rewrite the function $g(x) = |3x| + 2$ as a piecewise function.

Prerequisite Review #10: Exponential Functions (Calculator Allowed) Video Link   Solutions Link   Solutions Video Link
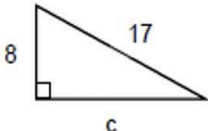
1. A certain bacteria population sample contains 500 bacteria and is known to grow by 20% every hour when left untreated.

a. Write an equation to model the untreated bacteria population (y) after x hours.

b. How many bacteria are in the sample after 5 hours?   7.5 hours?

Prerequisite Review #11: Rules for Exponents [Video Link](#) [Solutions Link](#) [Solutions Video Link](#)

Simplify the following expressions. Write your answers with positive exponents only.	
1. $(w^0 x^5)^{-1}$	2. $c^{-3}(c^7)^4$
3. $(u^3 v^5)^2 (u^{-7} v^{-10})$	4. $\dfrac{x^3 y^4}{w^7 z^{-2}} \cdot \dfrac{w^4 y^{-3}}{x^5 z^2}$

Prerequisite Review #12: Simplifying Radicals (square roots and cube roots) (Calculator Allowed) [Video Link](#) [Solutions Link](#) [Solutions Video Link](#)

1. Evaluate each of the following. Write your answer as a decimal rounded to the 3 decimal places as needed.				
a. $\sqrt{121}$	b. $\sqrt{175}$	c. $\sqrt[3]{125}$	d. $\sqrt[3]{8}$	e. $\sqrt[3]{36}$

2. Solve for c.

3. Simplify each of the following. Rationalize denominators as needed.		
a. $\sqrt{50}$	b. $\dfrac{3\sqrt{6}}{4\sqrt{5}}$	c. $\sqrt{72 a^5 b^6}$
d. $3\sqrt{5} + 6\sqrt{20}$	e. $\dfrac{\sqrt{200 x^{17} y^6}}{\sqrt{45 x^{15} y^9}}$	

Prerequisite Review #13: Complex Numbers

Simplify the following expressions and rationalize denominators as needed.	
1. $(3 + 7i) + (4 - 9i)$	2. $(3 + 7i) - (4 - 9i)$
3. $(3 + 7i)(4 - 9i)$	4. $\dfrac{10 - 2i}{3 + 4i}$