ORANGE PUBLIC SCHOOLS
OFFICE OF CURRICULUM AND INSTRUCTION
OFFICE OF MATHEMATICS

ALGEBRA II
Pre - Assessment

School Year 2013-2014

Directions for Algebra II Pre-Assessment

The Algebra II Pre-Assessment is made up of two sections. Section 1 is made up of 14 short response, 10 multiple choice, and 3 extended response questions. Section 2 is made up of one long task that is split up into multiple parts.

Read each question carefully, including diagrams and graphs.
Work as rapidly as you can without sacrificing accuracy. Do not spend too much time puzzling over a question that seems too difficult for you. Answer the easier questions first; then return to the harder ones. <u>Try to answer every question, even if you have to guess</u>.

Where necessary, you may use scratch paper for your work. Do not use the margins of the test booklet to do scratch work.

Record all answers on the answer sheet. Anything written on the test booklet will not be graded. When necessary, be sure to provide all work and explanations in a clear and neat manner.

You may use a calculator for this test.

Algebra II Pre-Assessment
Section 1
Short Responded Questions

1. Concrete will be poured into a form in the shape of a rectangular prism to make a patio. The measurements of the dimensions of the form are shown in the table below. How many cubic yards of concrete are needed to fill the form?

Dimension	Measurement
Length	10 feet
Width	8 feet
Height	6 inches

2. In a triathlon, Jenny swam for 1 hour, biked for 1.75 hours, and ran for 1 hour. Her average biking speed was 2 times her average running speed, and her average running speed was 8 times her average swimming speed. The total distance of the triathlon was 55.5 kilometers. Write an equation and solve it to find Jenny's average swimming speed in kilometers per hour.

3. Solve the system of equations below by graphing on the coordinate plane provided.

$$3x + 2y = 8$$
$$x + 2y = 4$$
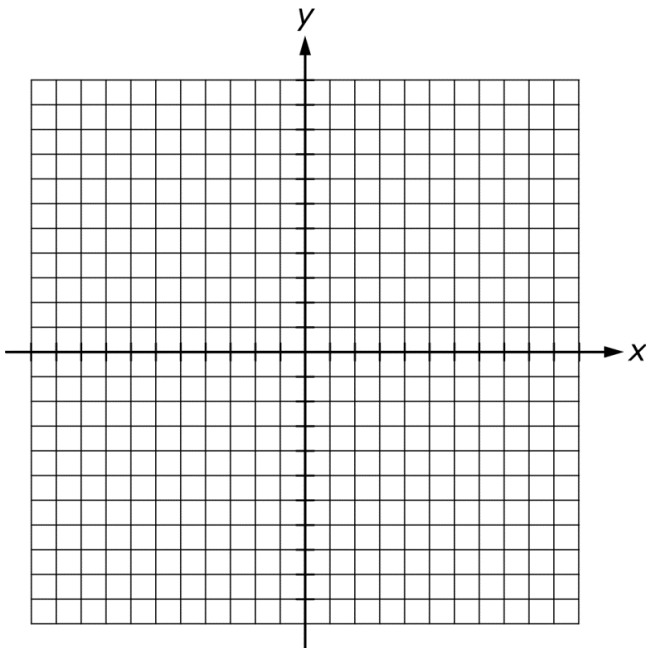
4. The function **F(v)** represents the amount, in dollars, raised at a fundraiser for a charity by v volunteers. Use function notation to write a representation of each of the following.

    Part A   The amount, in dollars, raised by 12 volunteer

    Part B   The amount, in dollars, raised by m volunteers is $2,500.

5. Use the function $f(x) = -2.5x + 50$ to answer the following questions.

    Part A: What is the y-intercept of the function as an ordered pair?

    Part B: What is the x-intercept as an ordered pair?

6. Solve the equation $2x - 3 = x^2/3$ for x. Show your work and give your answer in simplest form.

7. Write an expression for the area of a square with sides of length **a + b**. Use the distributive property to fully expand the expression. Show your work.

8. Simplify the expression below. (show your work)

$$\left(12s^4 - 6s^2 + 4s\right) + \left(6s^4 - 4s + 27\right) - \left(4s^4 + s^2 + 12\right)$$

9. The table below identifies the values for the first 5 terms in an arithmetic sequence.

Term Number, n	1	2	3	4	5
Term Value, a_n	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$

    Part A: Write an equation that can be used to find the value of a_n, the nth term in the sequence.

    Part B: By how much does the term value change with each term number increase of 1?

10. In a classroom, there are 3 more girls than boys and the ratio of girls to boys is 6 to 5.

    Part A: Write an equation in one variable that represents the situation described above, where g represents the number of girls in the classroom.

    Part B: What is the total number of students in the classroom?

11.

Year	United States Population, in Millions
1910	92.40
1920	106.46
1930	123.07
1940	132.12
1950	152.27
1960	180.67
1970	205.05
1980	227.22
1990	249.43
2000	282.16
2010	309.33

The table above shows the population, in millions, of the United States in ten-year intervals from 1910 to 2010. Calculate the average rate of change, in millions of people per year, of the population of the United States for the following time interval.

    Part A: 1910–1960: _____

    Part B: Interpret what these numbers mean in the context of the problem.

12. Write the function $f(x) = x^2 - 4x - 7$ in vertex form. Show your work.

13. Describe how the graph in the coordinate plane of each of the following functions differs from the graph of **f(x).** Indicate whether the graph represents a horizontal or vertical shift, a vertical stretch or shrink, or a horizontal stretch or shrink. Be sure to give the direction and number of units of the shift or the scale factor of the stretch or shrink.

$f(x) + 5$ _____

$f(x - 5)$ _____

$f(5x)$ _____

$5f(x)$ _____

14. Solve the equation below for h.

$$A = \frac{(b_1 + b_2) \times h}{2}$$

Multiple Choice Questions

15. A company wants to purchase two types of light bulbs, CFL (compact fluorescent) and LED (light emitting diode). The cost of each CFL bulb is $2, and the cost of each LED bulb is $20. The company must purchase a total of 800 light bulbs, must spend at most $5,000 on the Light bulbs, and wants to purchase as many LED bulbs as possible. Let L represent the number of LED light bulbs purchased, and C represent the number of CFL light bulbs purchased.

Which of the following systems models the situation described?

A.
$$2C + 20L = 800$$
$$C + L \leq 5,000$$

B
$$20C + 2L = 800$$
$$C + L \leq 5,000$$

C.
$$2C + 20L \leq 5,000$$
$$C + L = 800$$

D.
$$20C + 2L \leq 5,000$$
$$C + L = 800$$

16. Two linear functions have been evaluated for integer x-values from -3 to 3. The results are shown in the table below. Based on the table, which of the following could be the coordinates of the point where the graphs of the equations intersect?

x	Function 1	Function 2
−3	4	−5
−2	3	−4
−1	2	−3
0	1	−2
1	0	−1
2	−1	0
3	−2	1

A. (0, 1)

B. (0.5, 0.5)

C. (1.5, 0)

D. (1.5, -0.5)

17. . Consider the system given below.

$$y = \frac{2}{3}x + 3$$
$$y = \frac{5}{2}x + \frac{7}{2}$$

Which of the following is true about the solution set of the system?

A. The solution is a point in the coordinate plane.
B. The solution is all the points on the line **y = 2/3 x + 3**
C. The solution is a point on the x-axis.
D. The solution is the region in the coordinate plane above **y = 5/2 x + 7/2**

18. The first term in a sequence is -18 and each term after the first is 4 times the preceding term. Which of the following recursive functions defines the sequence described above?

A.
$$f(1) = -18$$
$$f(n) = 4f(n-1), \ n > 1$$

B.
$$f(1) = -18$$
$$f(n) = 4 + f(n-1), \ n > 1$$

C.
$$f(1) = -18$$
$$f(n) = 4f(n+1), \ n > 1$$

D.
$$f(1) = -18$$
$$f(n) = 4 + f(n+1), \ n > 1$$

19. A ball is thrown in the air from a platform that is 48 feet above the ground with an initial vertical velocity of 32 feet per second. The height of the ball, in feet, can be represented by the function **h(t) = 16 t² + 32 t + 48** where t is the time, in seconds, since the ball was thrown. Which of the following shows the function rewritten in the form that would be best to use to identify the maximum height of the ball?

A. $h(t) = -16(t-2)^2 + 112$

B. $h(t) = -16(t-2)^2 + 96$

C. $h(t) = -16(t-1)^2 + 80$

D. $h(t) = -16(t-1)^2 + 64$

20.

x	y
-2	9
-1	3
0	1
1	3
2	9

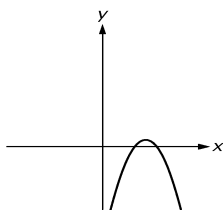Which of the following equations could represent the relationship between x and y shown in the table above?

A. y = - (5x + 1)

B. y = - 4x + 1

C. y = 2x² + 1

D. y (2x + 1) ²

21. If the equation **2x² + bx + 5 = 0** has no real solutions, which of the following <u>must</u> be true?
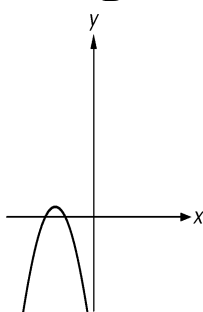
A. $b^2 < 10$

B. $b^2 > 10$

C. $b^2 < 40$

D. $b^2 > 40$

22. The quadratic function f can be written as $f(x) = -(x + a)(x - b)$ where a and b are positive numbers and $a < b.$ Which of the following could be the graph of $f(x)$ in the coordinate plane?
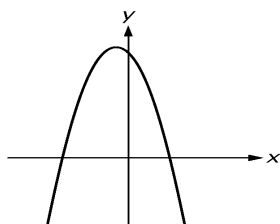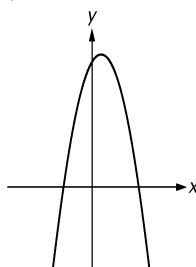
A

B

C.

D.

23. . Which of the following is equivalent to $a^{\frac{1}{3}} b^{\frac{5}{6}}$?

A. $\sqrt{a^3 b^6}$

B. $\sqrt{ab^5}$

C. $\sqrt[6]{a^2 b^5}$

D. $\sqrt[6]{ab^5}$

24. $y = 3x + 5$

Which of the following scenarios could be described by the equation above?

A. The distance of a tortoise from the starting line in a race, if the tortoise started 5 miles ahead of the starting line and moved at a pace of 3 miles per hour.

B. The amount of money Miranda has, if for every $5 Miranda earns, she gives $3 to her mother.

C. The number of cards Larry has, if he had 3 collector cards and he adds 5 more cards to his collection every 3 days.

D. The number of points earned on a test, if each question is worth 5 points and Mr. Felder subtracted 3 points for every incorrect answer
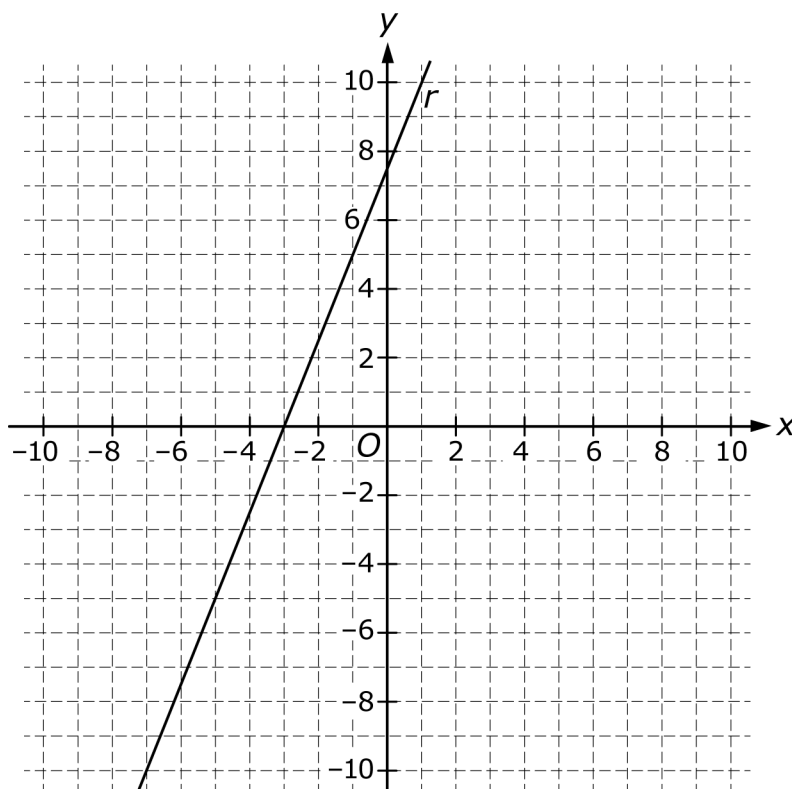
Extended Constructed Response Questions

25.

x	0	1	2	3	4	5	6	7	8	9	10
$f(x)$	80	103	122	137	148	155	158	157	152	143	130

A table of values for the quadratic function f is shown above. The function g is defined by $g(x) = -4x^2 + 48x + 10.$ Which function has the greater maximum value? Show your work.

26. The graph of the function r is shown in the coordinate plane below.

The function s is defined by $s(x) = -2/5\ x - 6/5$ for all real numbers x.

**Part A:** Describe how the slope of r compares with the slope of s.

Part B: Describe how the x-intercept of r compares with the x-intercept of s.

27. A large truck has two fuel tanks, each with a capacity of 150 gallons. One of the tanks is half full, and the other tank is empty. Fuel is pumped into the tanks until both tanks are full. The pump delivers fuel at a constant rate of $5\frac{3}{4}$ gallons per minute.

Part A. Write an equation for the total number of gallons of fuel, g, in the two tanks in terms of the time, t, in minutes, that the pump has been filling the tanks.

Part B: How much fuel is in the tanks after the pump has been delivering fuel for 8 minutes?

Part C: Graph the equation you wrote for part (a) on the coordinate plane below, including appropriate labels and scale markings.
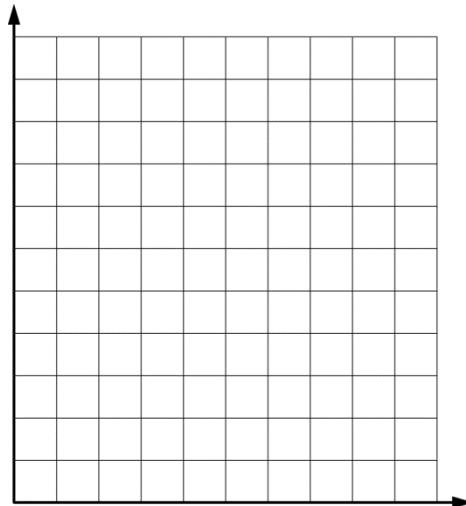
SECTION 2

Performance Task

Mr. Miller starts working for a technology company this year. His salary the first year is $40,000. According to the company's employee handbook, each following year Mr. Miller works at the company, he is eligible for a raise equal to 2% – 5% of his previous year's salary.

Mr. Miller calculates the range of his raise on his first year's salary. He adds that amount as his raise for each following year. Mr. Miller thinks that:

- In his second year working at the company, he would be earning a salary between $40,800 and $42,000, and
- In his third year, he would be earning a salary between $41,600 and $44,000.

Part A:

1. **Based on Mr. Miller's reasoning**, what salary range would Mr. Miller expect to earn in his first ten years at the company? (complete the table below)

Year	Salary Range
1st year	$ 40,000
2nd year	(40,800) -- (42,000)
3rd year	41,600 -- 44,000
4th year	42,400 -- 46,000
5th year	43,200 -- 48,000
6th year	44,000 -- 50,000
7th year	44,800 -- 52,000
8th year	45,600 -- 54,000
9th year	46,400 -- 56,000
10th year	47,200 -- 58,000

2. What is the two equations that Mr. Miller uses to calculate the salary increased range
    2% - 5% per year?

3. Mr. Miller's reasoning is incorrect. Show with diagrams, equations, expressions, or words why his
    reasoning is incorrect.

Part B:

1. Create a table of values to compare the expected salary increases for Mr. Miller based on the
    company provides "for a raise equal to 2% – 5% of **his previous year's salary**.

Year	Salary Range
1st year	$ 40,000
2nd year	( ) -- ( )
3rd year	
4th year	
5th year	
6th year	
7th year	
8th year	
9th year	
10th year	

2. Use function notation to write two functions to model the situation that Mr. Miller's salary is eligible for a raise equal to 2% or 5% of his previous year's salary.

Function 1: increases 2% of the previous year's salary

Function 2: increase 5% of the previous year's salary

3. On which year, the salary range will more than $20,000?