

**End of Course Assessment
Advanced Algebra**

Multiple Choice (2 pts each)

Identify the choice that best completes the statement or answers the question.

1. **(A.REI.4)** Complete the square for the expression $x^2 - 16x + \underline{\hspace{2cm}}$. Write the resulting expression as a binomial squared. 1.
- a. $(x-8)^2$ b. $(x+8)^2$ c. $(x+16)^2$ d. $(x-16)^2$

2. **(N.CN.7)** Find the zeros of $g(x) = 4x^2 - x + 5$ by using the Quadratic Formula. 2.
- a. $x = \frac{1}{2} \pm \frac{\sqrt{79}}{2}i$ b. $x = \frac{1}{8} \pm \frac{79}{8}i$ c. $x = \frac{1}{8} \pm \frac{\sqrt{81}}{8}i$ d. $x = \frac{1}{8} \pm \frac{\sqrt{79}}{8}i$

3. **(A.CED.2)** The table shows approximate fuel consumption in miles per gallon, given the tread height of the tire in mm. Use your graphing calculator to find a quadratic model for the fuel consumption given the tread height. Use the model to estimate the fuel consumption for a car with a tread height of 15 mm.

Tread Height (mm)	Fuel Consumption (miles per gallon)
2	37.48
5	40
12	40.28
20	31
27	14.48
30	5

- a. $F = -0.08t^2 + 1.6t + 35$; 35 miles per gallon 3.
- b. $F = -0.08t^2 + 1.4t + 32$; 28 mm
- c. $F = -0.08t^2 + 0.58t + 35$; 25 miles per gallon
- d. $F = -0.08t^2 + 1.4t + 35$; 38 miles per gallon

4. **(F.BF.3)** $f(x) = 0.9^x$ is transformed 4 units left, compressed vertically by a factor of $\frac{1}{2}$, and reflected across the x-axis. Write the transformed function $g(x)$. 4.

- a. $g(x) = \left(\frac{-1}{2}\right)0.9^{x+4}$ b. $g(x) = \left(\frac{-1}{2}\right)0.9^{x-4}$

c. $g(x) = \left(\frac{1}{2}\right) 0.9^{-x-4}$

d. $g(x) = -0.9^{2(x+4)}$

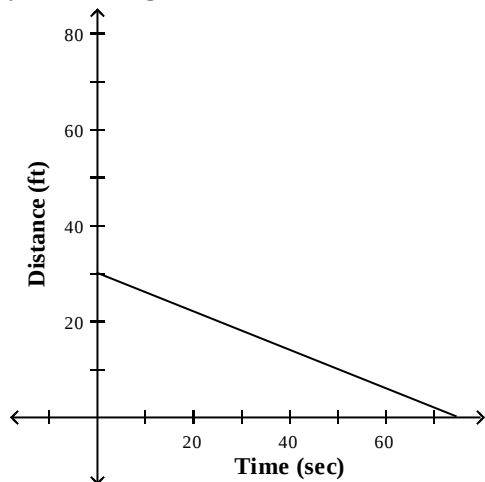
5. **(A.CED.2)(F.IF.7a)** A swimmer is racing to the other side of the pool. The pool is 75 feet long. The swimmer travels 2.5 feet per second. Create a table, equation, and graph to represent the swimmer's distance to the other side of the pool with relation to time. When will the swimmer reach the other side of the pool?

5. _____

a.

time	0	2	4	6	8
distance	75	65	55	45	35

$$d = 2.5t - 75$$

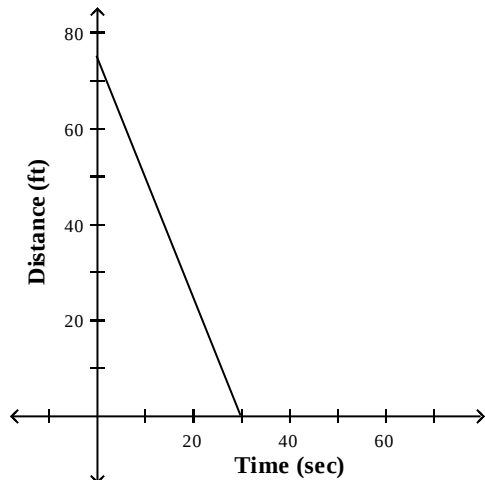


The swimmer reaches the other side of the pool in 75 seconds.

b.

time	0	2	4	6	8
distance	75	70	65	60	55

$$d = 75 + 2.5t$$

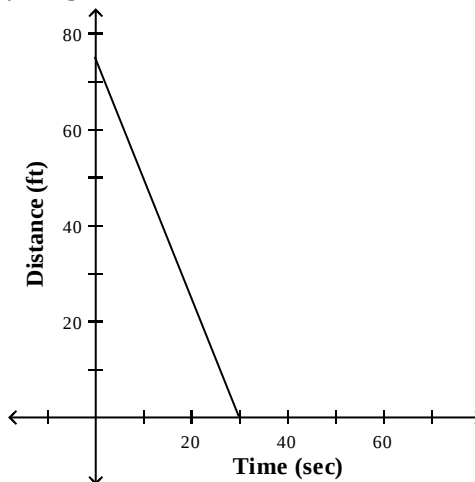


The swimmer reaches the other side of the pool in 30 seconds.

c.

time	0	2	4	6	8
distance	75	70	65	60	55

$$d = 75 - 2.5t$$

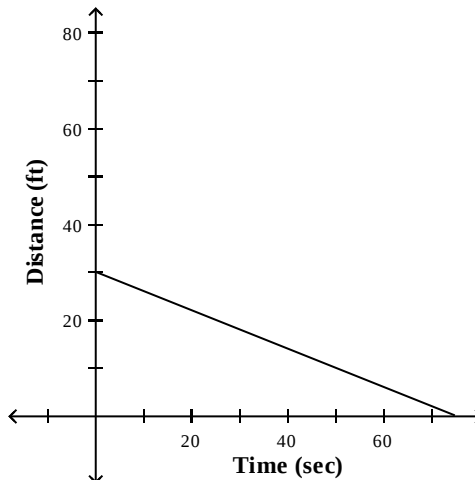


The swimmer reaches the other side of the pool in 30 seconds.

d.

time	0	2	4	6	8
distance	75	65	55	45	35

$$d = 2.5t + 75$$



The swimmer reaches the other side of the pool in 75 seconds.

6. **(F.BF.1b)** Given $f(x) = 2x^2 + 8x - 4$ and $g(x) = -5x + 6$ find $(f-g)(x)$.

6. _____

- a. $(f - g)(x) = 2x^2 + 13x - 10$ c. $(f - g)(x) = 2x^2 + 3x + 2$
b. $(f - g)(x) = 7x^2 + 2x - 4$ d. $(f - g)(x) = 7x^2 + 8x - 10$

7. **(S.CP.9)** Joel owns 12 shirts and is selecting the ones he will wear to school next week. How many different ways can Joel choose a group of 5 shirts? (Note that he will not wear the same shirt more than once during the week.)

7. _____

- a. 792 ways c. 95,040 ways
b. 17 ways d. 60 ways

8. **(S.CP.3,6,8)** The table shows the distribution of the labor force in the United States in the year 2000. Suppose that a worker is selected at random. Find the probability that a female works in the Industry field. Express your answer as a decimal, and round to the nearest thousandth.

8. _____

	Agriculture	Industry	Services
Male	3,132,000	25,056,000	50,112,000
Female	667,000	8,004,000	57,362,000

- a. 0.141 c. 0.121
b. 0.242 d. 0.312

9. **(S.CP.7)** Randa is playing a board game. The players take turns rolling a pair of number cubes. On her next turn, Randa must roll a sum of 5 to win the game, but if she rolls doubles, she gets an extra turn. Explain why the events “roll a 5” and “roll doubles” are mutually exclusive.

9. _____

- a. The events are mutually exclusive because you only roll one cube to get a 5.
c. The events are mutually exclusive because you only roll one cube to get a 5.
b. The events are mutually exclusive because $\frac{1}{9} \neq \frac{1}{6}$.
d. The events are mutually exclusive because the sum of a double roll can never equal 5.

10. **(S.ID.2,3)** Which of the following is true about these two data sets?

10. _____

{71, 71, 75, 77, 83, 91, 92} and {73, 75, 76, 76, 83, 87, 90}

- a. The medians are equal. c. The means are equal.
b. The ranges are equal. d. The variances are equal.

11. **(F.BF.2)** Find the first 5 terms of the sequence with $a_1 = 6$ and $a_n = 2a_{n-1} - 1$ for $n \geq 2$

11. _____

- a. 1, 2, 3, 4, 5 c. 6, 12, 24, 48, 96
b. 6, 7, 8, 9, 10 d. 6, 11, 21, 41, 81

12. **(F.BF.2)** Find the first 5 terms of the sequence $a_n = 2^n - 5$

12. _____

- a. -3, -1, 3, 11, 27 c. -4, -1, 4, 11, 20
b. 7, 9, 13, 21, 37 d. -3, -1, 1, 3, 5

Short Answer Section

13. **(F.BF.3)** Using the graph of $f(x) = x^2$ as a guide, describe the transformations, for the function $g(x) = -2x^2 + 3$ (4 pts)

14. **(F.IF.7)** Consider the function $f(x) = -4x^2 - 8x + 6$.

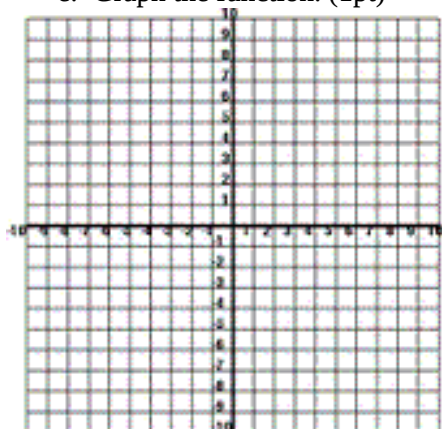
- a. Determine whether the graph opens upward or downward. (1 pt)

- b. Give the equation for the axis of symmetry (1pt)

- c. State the coordinates of the vertex (1pt)

- d. Give the coordinates of the y -intercept. (1pt)

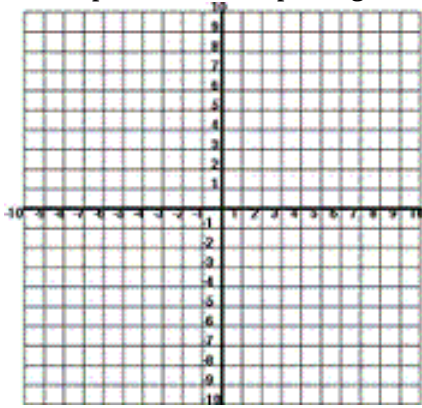
- e. Graph the function. (1pt)



15. **(A.CED.2)(F.IF.7e)**

- a. Tell whether the function $y = 2(5)^x$ shows growth or decay. (1pt)

b. Graph the function passing through three key points. (3pts)



x	y
-1	
0	
1	

16. **(F.BF.4a)** Use inverse operations to write the inverse of $f(x) = x + \frac{2}{3}$ (2pts)

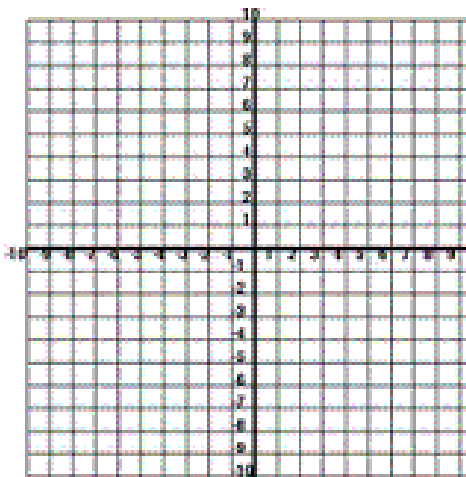
17. **(N.CN.7)(A.REI.4)** Find the zeros of the function by factoring. Show work. (3 pts)

$$f(x) = 2x^2 - x - 6.$$

18. **(F.BF.5)** Write the logarithmic equation $\log_4 16 = x$ in exponential form. (1pt)

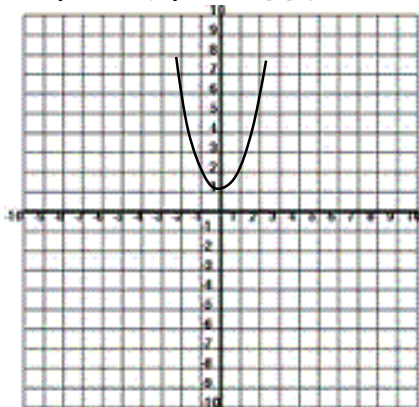
19. **(A.APR.7)** Simplify $\frac{8x^4y^2}{3z^3} \div \frac{4y^4}{9xy^2z^6}$. Assume that all expressions are defined. (3pts)

20. **(F.BF.3)(F.IF.7.b)** Graph $g(x) = g(x) = 4\sqrt{x-3}$. Identify three exact points on the graph (3pts)



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21. **(F.BF.1c,3)** Given $f(x) = x^2 + 1$ and $g(x) = 2f(x) - 6$, graph $g(x)$. (2pts)



22. **(F.BF.3)** The price of dance lessons depends upon the number of lessons that you select. If x is the number of lessons then the fee for the lessons (in dollars) can be found using the piecewise function

$$f(x) = \begin{cases} 40x & \text{if } 0 < x \leq 4 \\ 30x & \text{if } 4 < x \leq 8 \\ 25x & \text{if } x > 8 \end{cases}$$

Evaluate $f(2)$ and explain its meaning. (2pts)

23. **(S.IC.4,6)** Voters in Jackson County are going to vote on a half-percent sales tax increase to support music in local schools. According to a random survey, 40% plan to vote for the tax and 60% plan to vote against it. The survey's margin of error is $\pm 6\%$. Determine whether the survey clearly projects whether the sales tax will pass. Justify your response. (2pts)

24. **(S.IC.4,6)** A bacteria population starts at 2,032 and decreases at about 15% per day.

a. Write a function representing the number of bacteria present each day. (1pt)

b. After how many days will there be fewer than 321 bacteria? (3pts)

Advanced Algebra Answer Key

- 1. A (2pt)
- 2. D (2pt)
- 3. D (2pt)
- 4. A (2pt)
- 5. C (2pt)
- 6. A (2pt)
- 7. A (2pt)
- 8. C (2pt)
- 9. D (2pt)
- 10. C (2pt)
- 11. D (2pt)
- 12. A (2pt)

Sub total – 24 points

13. Vertical Reflection(Reflection over x-axis), Translated up 3, Vertical stretch by a factor of 2 (4pt)

- 14. a. Downward (1pt)
- b. $x = -1$ (1pt)
- c. $(-1,10)$ (1pt)
- d. $(0,6)$ (1pt)
- e. (1pt)

- 15. a. Growth (1pt)
- b. (3pt)

16. $f^{-1}(x) = x - \frac{2}{3}$ (2pt)

17. $0 = (2x + 3)(x - 2)$ $x = -3/2$ $x = 2$ (3pt)

18. $4^x = 16$ (1pt)

19. $6x^5z^3$ (3pt)

20. $(3,0)$ $(4,4)$ $(7,8)$ (3pt)

21. (2pt)

22. $f(2) = 80$ The cost for 2 lessons is \$80 (2pt)

23. The survey clearly projects a vote against because $60 - 6\% = 54\%$ and $40 + 6\% = 46\%$ This means that if the survey was off the entire margin of error 54% would still vote against and only 46% for the measure with no overlap (2pt)

- 24. a. $y = 2032(0.85^x)$ (1pt)
- b. $x = 11.35$ or after 12 years (3pt)

Total Points possible: 59