

TEST NAME: **IF.8 Schoolnet NEW**
TEST ID: **984845**
GRADE: **09 - Ninth Grade**
SUBJECT: **Mathematics**
TEST CATEGORY: **School Assessment**

Student: _____

Class: _____

Date: _____

1. Which of the following defines every x coordinate where the graph $y = 2x^2 + 6x$ intersects the x -axis?

- A. $x = 0$ only
- B. $x = -3$ only
- C. $x = 0$ and $x = 3$
- D. $x = 0$ and $x = -3$

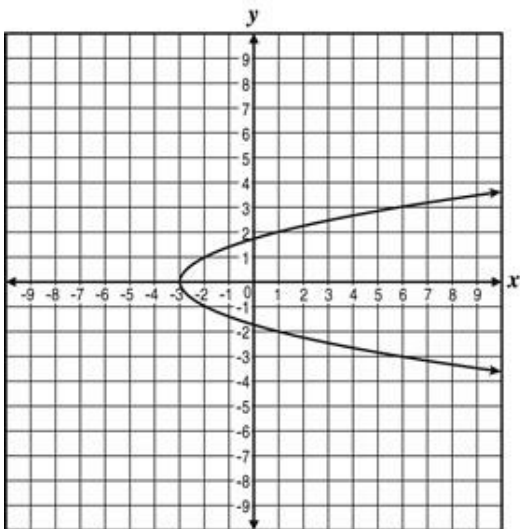
2. James kicked a ball off the ground into the air. The function $h(t) = -16t^2 + 40t$ models the height (in feet) of the ball t seconds after it was kicked. How long did it take the ball to hit the ground after being kicked?

- A. 1.25 seconds
- B. 2.5 seconds
- C. 4 seconds
- D. 10 seconds

3. The factors of a quadratic function are $2x - 3$ and $x - 3$. What is the axis of symmetry of this function?

- A. $x = \frac{9}{4}$
- B. $x = \frac{9}{2}$
- C. $x = -\frac{9}{2}$
- D. $x = -\frac{9}{4}$

4. The following is the graph of $y = \pm\sqrt{x+3}$.



Which of the following describes the symmetry of this conic section?

- A. symmetric with respect to x-axis
B. symmetric with respect to y-axis
C. symmetric with respect to $x = -3$
D. symmetric with respect to $y = -3$
5. The function $h(t) = -16t^2 + 16t + 32$ models the height of a ball t seconds after it was thrown into the air. How long does it take for the ball to hit the ground?
- A. 1 second
B. 2 seconds
C. 4 seconds
D. 8 seconds
6. How many times does the graph of the quadratic function $f(x) = x^2 - 9$ intersect the x-axis?
- A. 0
B. 1
C. 2
D. 3
7. What are the coordinates of the x-intercepts of the graph of $y = x^2 - 4x$?
- A. (0, 0)
B. (0, 0) and (0, -4)
C. (0, 0) and (4, 0)
D. (4, 0)

8. Steve threw a ball into the air. The height of the ball t seconds after it was thrown into the air is modeled by the function $h(t) = -16t^2 + 40t + 144$. How long does it take the ball to hit the ground?
- A. 1.25 seconds
 - B. 2.0 seconds
 - C. 2.5 seconds
 - D. 4.5 seconds
9. A graph of a quadratic function has x-intercepts of $(6, 0)$ and $(-4, 0)$. Which quadratic function could be represented by this graph?
- A. $f(x) = x^2 + 10x + 24$
 - B. $f(x) = x^2 + 10x - 24$
 - C. $f(x) = x^2 - 2x - 24$
 - D. $f(x) = x^2 + 2x - 24$
10. Which function has an axis of symmetry at $x = 3$?
- A. $y = x^2 - 9$
 - B. $y = x^2 + 6x + 9$
 - C. $y = x^2 - 6x + 9$
 - D. $y = x^2 - 36$
11. A company's profit is described by the formula $P(x) = -5x^2 + 600x + 15,000$, where x is the price in dollars that the company charges for its product. What should the company charge for the product to generate the maximum profit, P ?
- A. \$25
 - B. \$55
 - C. \$60
 - D. \$120

12. Suppose the equation $h(t) = -t^2 + 5t + 14$ models the height of a ball thrown into the air off the bleachers. Which statement about the flight of the ball is true?
- The ball starts from a height of 19 feet.
 - The ball takes 5 seconds before it hits the ground.
 - The ball takes 14 seconds before it hits the ground.
 - The ball reaches a maximum height of 20.25 feet.
13. What is the number of x-intercepts of the graph of the function $y = x^2 + 11x + 28$?
- 0
 - 1
 - 2
 - 4
14. The graph of a quadratic function has a vertex of $(-2, -4)$ and passes through the origin. What is its equation written in standard form?
- $y = -x^2$
 - $y = x^2 + 4x$
 - $y = x^2 - 4x$
 - $y = \frac{1}{8}x^2 + x$
15. If $a > 0$, how many x-intercepts does the graph of $y = ax^2 + 3$ have?
- None
 - One
 - Two
 - More than two
16. Where does the graph of $y = -2x^2 + 6x$ cross the x-axis?
- $x = 0$ only
 - $x = 3$ only
 - $x = 0$ and $x = 3$
 - $x = 0$ and $x = -3$
17. For how many values of x does the graph of $f(x) = x^2 - 3$ intersect the x-axis?
- 0
 - 1
 - 2
 - 3

18. Hampton Furniture produces couches in its factory. The quadratic function, $p(n) = -15n^2 + 615n - 600$, can be used to determine the company's weekly profit where n is the number of couches made. What is the largest number of couches the factory can produce in 1 week and still make a profit?
- A. 20
 - B. 21
 - C. 39
 - D. 40

19. A record label has collected the following data relating the selling price of an album to the profit generated.

Album Profit as Function of Selling Price

Selling Price (\$)	Profit (\$)
6	2,800
10	6,000
17	3,900

The relationship can be modeled by the quadratic equation $p = -100s^2 + 2400s - 8000$, where p represents the profit and s represents the selling price. Which selling price will maximize profits?

- A. \$4
 - B. \$8
 - C. \$12
 - D. \$20
20. Jason kicked a ball into the air. The function $h(t) = 80t - 16t^2$ models the height of the ball, in feet, t seconds after it was kicked. How long does it take the ball to hit the ground?
- A. 2.5 seconds
 - B. 5 seconds
 - C. 8.5 seconds
 - D. 10 seconds

21. Which option gives $f(x) = x^2 - 4x - 12$ rewritten in vertex form as well as the function's correct axis of symmetry?
- A. $f(x) = (x + 2)(x - 6); x = -2$
 - B. $f(x) = (x + 2)(x - 6); x = 6$
 - C. $f(x) = (x - 2)^2 - 16; x = -16$
 - D. $f(x) = (x - 2)^2 - 16; x = 2$
22. What are the x-intercepts of the graph of $y = x^2 + 3x$?
- A. $(0, 0)$
 - B. $(-3, 0)$
 - C. $(0, 0)$ and $(3, 0)$
 - D. $(0, 0)$ and $(-3, 0)$
23. How many times does the graph of the quadratic function $f(x) = 3x^2 + 2x + 5$ intersect the x-axis?
- A. 0
 - B. 1
 - C. 2
 - D. 5
24. What are the zeros of the quadratic function $f(x) = x^2 - 3x - 18$?
- A. $x = 2$ and $x = -9$
 - B. $x = -2$ and $x = 9$
 - C. $x = 3$ and $x = -6$
 - D. $x = -3$ and $x = 6$
25. The height in feet, y , a kangaroo reaches x seconds after it has jumped in the air is modeled by the quadratic function $f(x) = -16x^2 + 24x$. Which equation shows the correctly factored version of the function and the number of seconds it takes for the kangaroo to return to the ground?
- A. $-8x(2x - 3); 8$ seconds
 - B. $-8x(2x - 3); 1.5$ seconds
 - C. $8x(2x + 3); 8$ seconds
 - D. $8x(2x + 3); 1.5$ seconds

26. How many times does the graph of the quadratic function $f(x) = 9x^2 + 36x + 36$ intersect the x-axis?
- A. 0
 - B. 1
 - C. 2
 - D. 3
27. A rocket is launched into the air at a velocity, v , of 96 feet per second. Its height can be modeled by the equation $h = vt - 16t^2$, where t is the time in seconds and h is the height. How long will it take for the rocket to reach its highest point?
- A. 2 seconds
 - B. 3 seconds
 - C. 6 seconds
 - D. 7 seconds
28. What are the x-intercepts of the graph of $y = x^2 + 4x - 12$?
- A. $(-6, 0)$ and $(-2, 0)$
 - B. $(-6, 0)$ and $(2, 0)$
 - C. $(6, 0)$ and $(-2, 0)$
 - D. $(6, 0)$ and $(2, 0)$
29. What is the number of x-intercepts of the graph of the function $f(x) = x^2 + 2x + 4$?
- A. 0
 - B. 1
 - C. 2
 - D. 4
30. What is the number of x-intercepts of the graph of the function $f(x) = 9x^2 + 4$?
- A. 0
 - B. 1
 - C. 2
 - D. 4
31. What is the number of x-intercepts of the graph of the function $f(x) = 25x^2 + 4$?
- A. 0
 - B. 1
 - C. 2
 - D. 4

32. Two functions are shown.

$$f(x) = x^2 - 6x + 11$$

$$g(x) = x^2 + 6x + 11$$

In which quadrant does each function's minimum occur?

- A. $f(x)$: Quadrant I
 $g(x)$: Quadrant II
- B. $f(x)$: Quadrant I
 $g(x)$: Quadrant IV
- C. $f(x)$: Quadrant II
 $g(x)$: Quadrant I
- D. $f(x)$: Quadrant IV
 $g(x)$: Quadrant III

33. How many times does the graph of the quadratic function $f(x) = (x - 6)^2$ intersect the x-axis?

- A. 0
- B. 1
- C. 2
- D. 6

34. Ryan jumped off a diving board and into the water below. His height above the water surface is modeled by the function $h(t) = -16t^2 + 8t + 24$, where t represents the time in seconds after he jumped. Which answer choice shows the correct factorization of the equation and how long it will take for Ryan to reach the water?

- A. $-8(t + 1)(2t - 3)$; 1 second
- B. $-8(t - 1)(2t + 3)$; 1 second
- C. $-8(t + 1)(2t - 3)$; 1.5 seconds
- D. $-8(t - 1)(2t + 3)$; 1.5 seconds

35. A company produces swimming pools. Its daily cost can be modeled with the function $P(x) = 20x^2 - 240x$, where x is the number of swimming pools produced. If the company makes at least 1 pool a day, how many pools need to be produced for the company to break even?
- A. 3
 - B. 6
 - C. 12
 - D. 15
36. The path of a roller coaster over a particular length of track can be represented by a quadratic function f , where $f(x)$ represents the vertical displacement above or below a support bar (in meters), and x represents the horizontal displacement to the left or right of a flagpole (in meters). The roller coaster dips below the support bar for values of x between -2 and 1 . Which function could represent f ?
- A. $f(x) = (x - 2)^2 + 1$
 - B. $f(x) = (x + 2)^2 + 1$
 - C. $f(x) = (x - 2)(x + 1)$
 - D. $f(x) = (x + 2)(x - 1)$
37. What is the number of x -intercepts of the graph of the quadratic function $f(x) = 9x^2 + 30x + 25$?
- A. 0
 - B. 1
 - C. 2
 - D. 3
38. A company's profit is described by the equation $P(x) = -5x^2 + 300x + 15,000$, where x is the price in dollars that the company charges for its product. What should the company charge for the product to generate the maximum profit?
- A. \$20
 - B. \$30
 - C. \$50
 - D. \$60

39. The graph of $y = x^2 + 7x$ crosses the x-axis at
- A. $x = 0$ only.
 - B. $x = -7$ only.
 - C. $x = 0$ and $x = 7$.
 - D. $x = 0$ and $x = -7$.
40. Which is an equation of the axis of symmetry of the function $f(x) = 4x^2 + 32x + 64$?
- A. $x = -16$
 - B. $x = -4$
 - C. $x = 4$
 - D. $x = 16$
41. How many times does the graph of the quadratic function $f(x) = 9x^2 + 24x + 16$ intersect the x-axis?
- A. 0
 - B. 1
 - C. 2
 - D. 3
42. What is the number of x-intercepts of the graph of the quadratic function $f(x) = 4x^2 + 12x + 8$?
- A. 4
 - B. 2
 - C. 1
 - D. 0
43. What is the number of x-intercepts of the graph of the function $f(x) = 16x^2 + 25$?
- A. 0
 - B. 1
 - C. 2
 - D. 3
44. How many times does the graph of the quadratic function $f(x) = x^2 + 1$ intersect the x-axis?
- A. 3
 - B. 2
 - C. 1
 - D. 0

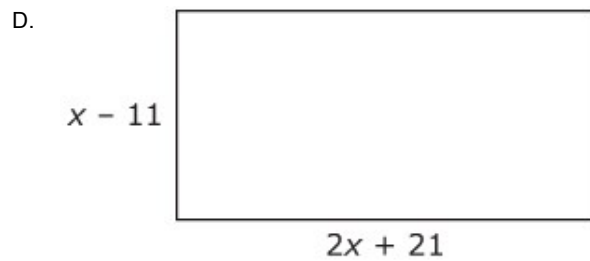
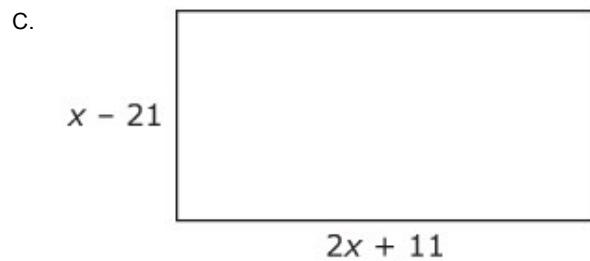
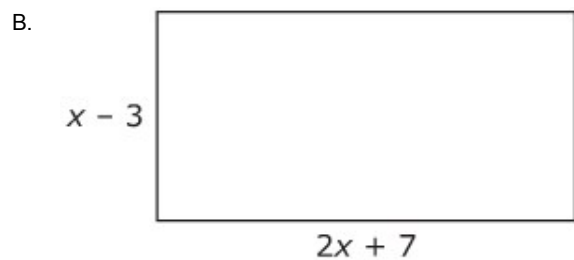
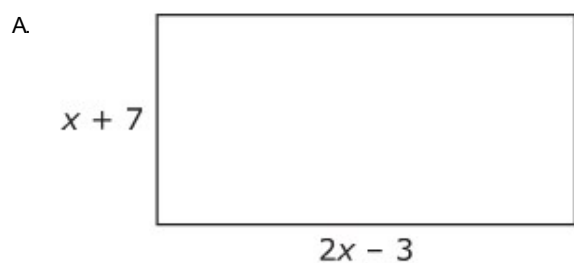
45. Which of the following functions describes a graph that will intersect the x-axis in exactly one point?
- A. $y = x^2 - 4x$
 - B. $y = x^2 + 4x$
 - C. $y = x^2 + 6x - 9$
 - D. $y = x^2 + 6x + 9$
46. A study shows that the number of bacteria on refrigerated food depends on the temperature of the food. The number of bacteria, $N(T)$, as a function of the temperature of the refrigerated food in degrees Celsius can be modeled by $N(T) = 16T^2 - 20T + 80$. Which of these equations could be used to find the temperature at which the number of bacteria is at its minimum?
- A. $N(T) = 16\left(T - \frac{5}{4}\right)^2 + \frac{345}{4}$
 - B. $N(T) = 16\left(T - \frac{5}{8}\right)^2 + \frac{295}{4}$
 - C. $N(T) = 16\left(T - \frac{5}{4}\right)^2 + 105$
 - D. $N(T) = 16\left(T - \frac{5}{8}\right)^2 + 80$
47. A ball was kicked straight up into the air from at a velocity of 80 feet per second. The function $h(t) = -16t^2 + 80t$ models the height of the ball t seconds after it was kicked. For how many seconds is the ball descending?
- A. 2.0 seconds
 - B. 2.5 seconds
 - C. 3.5 seconds
 - D. 5.0 seconds

48. What are the zeros of the function below?

$$f(x) = (x - 1)^2 - 4$$

- A. -3 and 1
- B. -1 and 3
- C. -1 and -4
- D. 1 and 4

49. Which area model shows two factors with a product of $2x^2 + 11x - 21$?



50. Ana throws a ball from her window. The height of the ball in feet after t seconds is modeled by the function $f(t) = -16t^2 + 64t + 192$. How can the function be rewritten to calculate the time at which the ball strikes the ground?

- A. $f(t) = -16(t + 6)(t + 2)$
- B. $f(t) = -16(t + 6)(t - 2)$
- C. $f(t) = -16(t - 6)(t + 2)$
- D. $f(t) = -16(t - 6)(t - 2)$

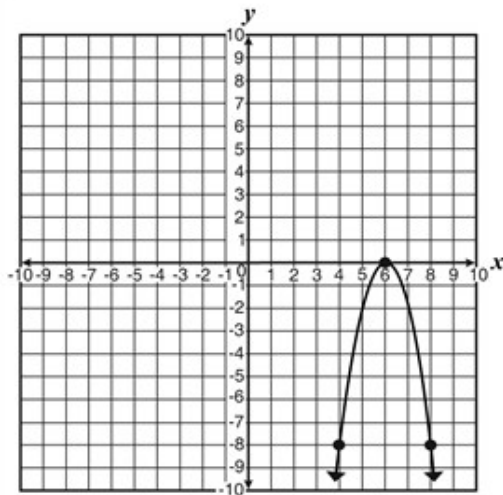
51. A graph of a quadratic function has x-intercepts of $(-4, 0)$ and $(8, 0)$. Which quadratic function matches this graph?

- A. $f(x) = x^2 - 4x - 32$
- B. $f(x) = x^2 + 4x - 32$
- C. $f(x) = x^2 - 12x + 32$
- D. $f(x) = x^2 + 12x + 32$

52. What is the number of x-intercepts of the graph of the function $y = x^2 + x - 12$?

- A. 0
- B. 1
- C. 2
- D. 12

53. The graph shown on the coordinate plane is a quadratic function.



Which equation represents the quadratic function in standard form?

- A. $f(x) = \frac{-7}{8}x^2 + 6$
- B. $f(x) = 2x^2 - 16x + 24$
- C. $f(x) = 4x^2 - 48x + 144$
- D. $f(x) = -2x^2 + 24x - 72$

54. How many times does the graph of the quadratic function $y = 3x^2 - 21x$ intersect the x-axis?

- A. 3
- B. 2
- C. 1
- D. 0

55. Which ordered pairs are the x-intercepts of the graph of $y = x^2 - 2x - 3$?

- A. $(-3, 0)$ and $(1, 0)$
- B. $(0, -3)$ and $(1, 0)$
- C. $(0, 3)$ and $(0, -1)$
- D. $(3, 0)$ and $(-1, 0)$

56. How many x-intercepts are there in the graph of the quadratic function $f(x) = 4x^2 + 6$?

- A. 3
- B. 2
- C. 1
- D. 0

57. The graph of $y = -x^2 + 8x$ crosses the x-axis at

- A. $x = 0$ only.
- B. $x = 8$ only.
- C. $x = 0$ and $x = 8$.
- D. $x = 0$ and $x = -8$.

58. The graph of $y = x^2 - 7x$ crosses the x-axis at

- A. $x = 0$ only.
- B. $x = 7$ only.
- C. $x = 0$ and $x = 7$.
- D. $x = 0$ and $x = -7$.

59. How many times does the graph of the quadratic function $f(x) = x^2 - 4$ intersect the x-axis?

- A. 0
- B. 1
- C. 2
- D. 3

60. The Watson family is going on a road trip. The data in the table shows the relationship between speed and fuel economy for their car.

Fuel Economy
vs.
Vehicle Speed

Speed (miles per hour)	Fuel Economy (miles per gallon)
30	22.0
40	22.5
50	21.5

The data can be modeled by the quadratic function $y = -0.0075x^2 + 0.575x + 11.5$, where x represents the speed in miles per hour, and y represents the fuel economy in miles per gallon. Which speed, rounded to the nearest whole number, will give them the best fuel economy?

- A. 23 mph
- B. 32 mph
- C. 38 mph
- D. 40 mph

61. How many times does the graph of the quadratic function $y = x^2 - x - 12$ intersect the x-axis?

- A. 4
- B. 2
- C. 1
- D. 0

62. How many times does the graph of the function $f(x) = 4x^2 - 81$ intercept the x-axis?

- A. 0
- B. 1
- C. 2
- D. 9

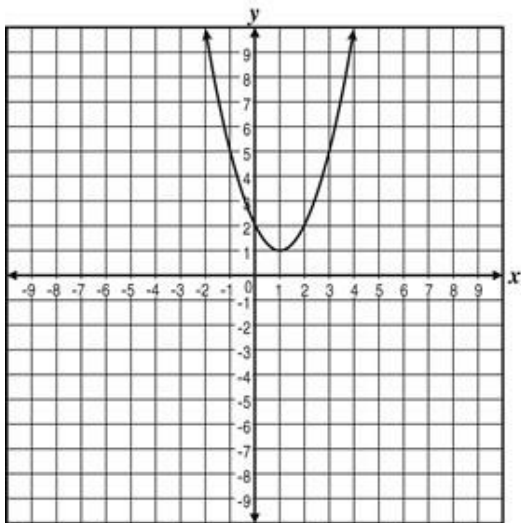
63. Two rockets were launched from a rooftop. The heights of the rockets x seconds after being launched are modeled by the functions shown below.

Rocket F: $f(x) = -4x^2 + 29x + 24$
Rocket G: $g(x) = -5x^2 + 26x + 24$

Which statement is true?

- A. Rocket F hit the ground 2 seconds after Rocket G.
- B. Rocket F hit the ground 2 seconds before Rocket G.
- C. Rocket F hit the ground 3 seconds after Rocket G.
- D. Rocket F hit the ground 3 seconds before Rocket G.

64. This graph represents the function $f(x) = x^2 - 2x + 2$.



What is the line of symmetry?

- A. $y = 1$
- B. $x = 1$
- C. $y = 2$
- D. $x = 2$

65. What is the standard form of the equation $x^2 + 4y^2 - 6x + 16y - 75 = 0$?

A. $\frac{(x-3)^2}{10} + \frac{(y+2)^2}{5} = 1$

B. $(x-3)^2 + (y+2)^2 = 100$

C. $\frac{(x-3)^2}{100} + \frac{(y+2)^2}{25} = 1$

D. $(x+3)^2 - (y-2)^2 = 100$

66. The graph of which of the following equations has x-intercepts of 3 and -3?

A. $y - 3 = x$

B. $y + 3 = x$

C. $y + 9 = x^2$

D. $x + 9 = y^2$

67. Which of these correctly transforms $y = 3x^2 + 24x - 47$ into vertex form and identifies the vertex?

A. $y = 3(x+12)^2 - 191$ with the vertex at $(-12, -191)$

B. $y = 3(x+12)^2 - 191$ with the vertex at $(12, -191)$

C. $y = 3(x+4)^2 - 95$ with the vertex at $(-4, -95)$

D. $y = 3(x+4)^2 - 95$ with the vertex at $(4, -95)$

68. What is the sum of the zeros of the function $y = 6x^2 - x - 2$?

A. 0

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

C. $\frac{2}{3}$

D. 4

69. Jenny used the expression $-16x^2 + 38x + 5$ to determine the height of an object x seconds after it was hit into the air. How long does it take the object to hit the ground?

- A. $\frac{1}{8}$ second
- B. $\frac{2}{5}$ second
- C. 2.5 seconds
- D. 8 seconds

70. The area of a square patio can be modeled by the function $y = x^2 - 10x + 25$. The area of a second square patio can be modeled by the function $y = x^2 - 30x + 225$. Let x represent the length of the patio and y represent the area of the patio. What is the difference between the length of the larger patio and the smaller patio?

- A. 5
- B. 10
- C. 15
- D. 20

71. Chelsea transformed the function $f(x) = -x^2 - 14x - 52$ into $f(x) = -(x + 7)^2 - 3$. She then wrote 4 statements about the function. Which statement is incorrect?

- A. The axis of symmetry is $x = -7$.
- B. The vertex is located at $(-7, -3)$.
- C. The minimum value of the function is -7 .
- D. The maximum value of the function is -3 .

72. Three statements about $f(x) = 2(x - 3)^2 + 5$ are given.

1. The axis of symmetry is $x = 3$.
2. The vertex is located at $(3, 5)$.
3. The function's minimum value is 5.

Which statement or statements are correct?

- A. all 3 statements
- B. statement 3 only
- C. statements 1 and 2
- D. statements 2 and 3

73. How many times does the graph of the quadratic function $f(x) = 3x^2 - 6x + 3$ intersect the x -axis?
- A. 0
 - B. 1
 - C. 2
 - D. 3
74. Suppose a company has daily production costs that are modeled by the function $C(x) = 800 - 10x + 0.25x^2$, where C is the total cost in dollars and x is the number of units produced. How many units should be produced each day to ensure the lowest cost?
- A. 17 units
 - B. 18 units
 - C. 19 units
 - D. 20 units
75. The value of a set of cooking dishes can be modeled with the function $f(x) = 900(0.9012)^{\left(\frac{5}{6}x\right)}$, where x represents the number of years since the dishes were purchased. Which statement **best** describes the value of the dishes over time?
- A. The value of the dishes is increasing by 90.12% each year.
 - B. The value of the dishes is decreasing by 9.8% each year.
 - C. The value of the dishes is increasing by approximately 91.7% each year.
 - D. The value of the dishes is decreasing by approximately 8.3% each year.
76. Which function represents an initial population that increases 22% per year where A represents the initial value and x represents time in years?
- A. $y = A(0.22)^x$
 - B. $y = A(0.68)^x$
 - C. $y = A(1.22)^x$
 - D. $y = A(1.68)^x$

77. A scientist is observing the size of a sample of bacteria. The function $f(t) = 1,000(0.995)^t$ models the size of the sample t hours after the scientist began his observations. Which statement is true about the size of the sample?
- A. The sample is growing at a rate of 99.5% per hour.
 - B. The sample is decaying at a rate of 99.5% per hour.
 - C. The sample is growing at a rate of 0.5% per hour.
 - D. The sample is decaying at a rate of 0.5% per hour.
78. The population of rabbits in a local park reserve can be modeled by the function $f(x) = 25250(1.08)^t$, where t represents the number of years. Which statement is true based on the function?
- A. The population is decreasing at the rate of 8%.
 - B. The population is increasing at the rate of 8%.
 - C. The population is decreasing at the rate of 92%.
 - D. The population is increasing at the rate of 92%.
79. Which function could represent a population that is growing at a rate of 15% per year, t ?
- A. $P = 1,500(0.85)^t$
 - B. $P = 0.85(1,500)^t$
 - C. $P = 1,500(1.15)^t$
 - D. $P = 1.15(1,500)^t$

80. In 2008, the enrollment at Greenwood Elementary School was 865 students. The equation $N = 865(0.92)^t$ can be used to determine the number, N , of students enrolled t years after 2008. Which statement about the change in enrollment is **true**?
- The enrollment at Greenwood Elementary School is decaying at the rate of 0.92% each year.
 - The enrollment at Greenwood Elementary School is growing at the rate of 0.92% each year.
 - The enrollment at Greenwood Elementary School is decaying at the rate of 8% each year.
 - The enrollment at Greenwood Elementary School is growing at the rate of 8% each year.
81. The function $f(x) = 1.69(1.03)^x$ models the value of an investment, in thousands, after x years. What is the yearly interest rate the investment is earning?
- 3%
 - 31%
 - 69%
 - 97%
82. Which function represents exponential decay?
- $y = 7^{-x}$
 - $y = 3^{x-2}$
 - $y = \frac{1}{2} \cdot 4^x$
 - $y = 8^x - 1$
83. The intensity I of a d -decibel sound is given by the formula $I = A \cdot 10^{0.1d}$ where A is the intensity of a 0-decibel sound. How much more intense is a 105-decibel sound than a 100-decibel sound?
- 1.05 times
 - $10^{0.5}$ times
 - 5 times
 - $10^{1.05}$ times

84. A new model of a cell phone was released while the original model was still being sold. The average number of the original model sold each week was 2750, which decreased by 21% each week after the new model was released. Which function can be used to determine the average number of original model cell phones sold each week x weeks after the new model was released?
- A. $y = 2750(0.21)^x$
 B. $y = 2750(0.79)^x$
 C. $y = 2750(1.21)^x$
 D. $y = 2750(1.79)^x$
85. The population growth for a community can be modeled by $f(x) = 950(1.21)^{\frac{x}{2}}$. Which function is equivalent to $f(x)$?
- A. $g(x) = 950(0.605)^x$
 B. $g(x) = 950(1.1)^x$
 C. $g(x) = 950(1.4641)^x$
 D. $g(x) = 950(2.42)^x$
86. The hydrogen ion concentration of an acid is given by the formula $C = 10^{(-p)}$ where p is the pH. If solution A has a pH of 4, and solution B has a pH of 2, what is the ratio of the hydrogen ion concentrations of solution A to solution B?
- A. 1:100
 B. 1:2
 C. 2:1
 D. 100:1
87. The function $f(t) = 24,500(0.84)^t$ models the population of a town t years after 2008. What rate is the population of the town decreasing each year?
- A. 16%
 B. 24.5%
 C. 75.5%
 D. 84%

88. The function $f(x) = 19,000(0.89)^x$ models the value of a boat x years after its purchase. Which statement correctly describes the value of the boat?
- A. The value is decreasing by 11% per year.
 - B. The value is decreasing by 89% per year.
 - C. The value is increasing by 11% per year.
 - D. The value is increasing by 89% per year.
89. The function $y = 600(1.03)^x$ models the value of a lady's ring x years after its purchase. What percent does the value of the ring increase by each year?
- A. 0.03%
 - B. 1.03%
 - C. 3.00%
 - D. 103%
90. Genevieve deposited \$400 into her bank account. The equation $A(t) = 400(1.07)^t$ can be used to calculate the value of her money after t years. What is the annual interest rate she is earning on her deposit?
- A. 0.07%
 - B. 1.07%
 - C. 7%
 - D. 107%
91. The population of a town t years after 2000 is modeled by the function $P(t) = 37,000(0.97)^{\frac{t}{12}}$. At what rate is the population decreasing each year?
- A. 0.25%
 - B. 0.69%
 - C. 3%
 - D. 9%

92. The table below shows the increase in continuous growth for a certain strain of bacteria that is measured in t days.

BACTERIA GROWTH

Number of days, t	Number of bacteria, y
0	40
1	80
2	159
3	317
4	632

The equation $y = 40e^{6.21t}$ represents the approximate number of bacteria after 9 days. What is the rate of change for this strain of bacteria?

- A. 56%
- B. 69%
- C. 200%
- D. 621%
93. The number of bacteria in a Petri dish increases by 18% every hour. If there were initially 200 bacteria placed in the Petri dish, which function can be used to determine the number of bacteria in the Petri dish in exactly x hours?
- A. $y = 200(0.18)^x$
- B. $y = 200(0.82)^x$
- C. $y = 200(1.18)^x$
- D. $y = 200(1.82)^x$
94. Which of the following functions is an exponential decay function?
- A. $y = 0.3x^5$
- B. $y = 3x^{-5}$
- C. $y = 5 \cdot 3^x$
- D. $y = 5 \cdot 0.3^x$

95. The function $p(x) = 104(1.09)^x$ models the population of blue birds in an area x years after 1980. At what rate is the population of blue birds increasing each year?
- A. 4%
 - B. 9%
 - C. 91%
 - D. 96%
96. The number of people that subscribe to a magazine can be modeled by the function $s(t) = 57(1.03)^{12t}$, where t is the number of months since the magazine was released. Which statement **best** describes how the number of people who subscribe to the magazine is changing?
- A. increasing by about 43% annually
 - B. increasing by about 43% monthly
 - C. increasing by about 3% annually
 - D. increasing by about 3% monthly
97. The population of a particular city grows exponentially, increasing 1.8% each year. Its population in 2012 is represented by the expression below.
 $130,000(1.018)^{47}$
- In what year was the population of this city 130,000?
- A. 1965
 - B. 1994
 - C. 2012
 - D. 2018
98. Which expression represents exponential growth?
- A. $10(0.02)^{-x}$
 - B. $10(\sqrt{2})^{-x}$
 - C. $10(2)^{-x}$
 - D. $10(2.2)^{-x}$

99. Which statement best describes the equation $y = A(0.55)^x$, where A represents the initial value and x represents time in years?
- A. y represents a function with an exponential decay of 45%.
 - B. y represents a function with an exponential decay of 55%.
 - C. y represents a function with an exponential growth of 45%.
 - D. y represents a function with an exponential growth of 55%.
100. A scientist studied the population growth of a certain type of bacteria. He concluded that if you start with 2 bacteria, then the population, P , would triple with each passing day, x . Which of these equations represents the population growth of this bacteria?
- A. $P = 2 \cdot x^3$
 - B. $P = 3 \cdot x^2$
 - C. $P = 2 \cdot 3^x$
 - D. $P = 3 \cdot 2^x$
101. The function $f(x) = 250(1.12)^x$ models the number of students at a school x years after it opened. By what rate is the number of students increasing each year?
- A. 0.12%
 - B. 0.88%
 - C. 12%
 - D. 88%
102. The function $f(x) = 1000(1.25)^{-x}$ models the value of an investment over x years. Which statement **best** describes the investment modeled by $f(x)$?
- A. The investment grows at the rate of 25% per year.
 - B. The investment grows at the rate of 20% per year.
 - C. The investment decreases at the rate of 20% per year.
 - D. The investment decreases at the rate of 25% per year.

103. Yvonne bought a car for \$10,300. After 3 years, the value of the car was \$6,250. The value of this car decreases exponentially over time. In approximately what number of additional months will the value of Yvonne's car be 50% of the price she originally paid?
- A. 1.2 months
 - B. 4.2 months
 - C. 14.4 months
 - D. 50.4 months
104. The function $f(t) = 500\left(1 + \frac{0.18}{12}\right)^{12t}$ models the population of rabbits in an area after t years. What is the **approximate** rate the population of rabbits is growing each year?
- A. 1.015%
 - B. 1.5%
 - C. 18%
 - D. 20%
105. The value of a car x years after it was purchased is modeled by the function $f(x) = 15,550(0.84)^x$. Which **best** describes the value of the car?
- A. The value of the car is decreasing by 16% each year.
 - B. The value of the car is increasing by 16% each year.
 - C. The value of the car is decreasing by 84% each year.
 - D. The value of the car is increasing by 84% each year.
106. Amy deposited \$2500 into a savings account. The value of the account after t years is given by the equation shown below.
- $$V = 2,500(1 + 0.018)^{4t}$$
- Which of these statements about the growth rate of the savings account is **true**?
- A. It is growing at an annual rate of 1.8% compounded quarterly.
 - B. It is growing at an annual rate of 1.8% compounded yearly.
 - C. It is growing at an annual rate of 7.2% compounded quarterly.
 - D. It is growing at an annual rate of 7.2% compounded yearly.

107. Which statement best describes the equation $y = A(2.5)^x$, where A represents the initial value and x represents time in years?
- A. y represents a function with an exponential decay of 2.5%.
 - B. y represents a function with an exponential decay of 150%.
 - C. y represents a function with an exponential growth of 2.5%.
 - D. y represents a function with an exponential growth of 150%.
108. Lucy initially invested \$1,000 in a stock. The value of the stock increased exponentially over time. After 5 years, the value of the stock was \$1,675. If no deposits or withdrawals are made, in approximately what number of additional years would the value of the stock be triple the original investment?
- A. 1 year
 - B. 6 years
 - C. 11 years
 - D. 25 years
109. The function $f(x) = 2,000(1.059)^{\left(\frac{3}{8}x\right)}$ represents the value of an antique x years after it was purchased. Which statement describes the value of the antique over time?
- A. The value is increasing by 5.9% each year.
 - B. The value is decreasing by 5.9% each year.
 - C. The value is increasing by approximately 2.2% each year.
 - D. The value is decreasing by approximately 2.2% each year.
110. The function $f(x) = 12,500(0.89)^x$ models the value of a car x years after its purchase. Which statement is true about the value of the car?
- A. The value of the car is decreasing at a rate of 11% per year.
 - B. The value of the car is decreasing at a rate of 89% per year.
 - C. The value of the car is increasing at a rate of 11% per year.
 - D. The value of the car is increasing at a rate of 89% per year.
111. The function $f(x) = 2,500(0.97)^x$ models the value of an investment after x months. Which statement is true about the value of the investment?
- A. The value of the investment increases by 3% each month.
 - B. The value of the investment decreases by 3% each month.
 - C. The value of the investment increases by 97% each month.
 - D. The value of the investment decreases by 97% each month.

112. Which expression represents the total amount earned on \$2,500 invested in a savings account yielding 0.65% per year for 5 years?
- A. $2500(0.35)^5 - 2500$
 - B. $2500(0.9935)^5 - 2500$
 - C. $2500(1.0065)^5 - 2500$
 - D. $2500(1.65)^5 - 2500$
113. What is the y-intercept of the graph of the function $f(x) = 2 \cdot 3^{(x-2)}$?
- A. $\frac{2}{9}$
 - B. $\frac{2}{3}$
 - C. 2
 - D. 18
114. A population of insects, in thousands, can be modeled using the function $p(t) = 1.75(0.97)^t$, where t is time in months. Which statement **best** describes the population of insects?
- A. The population is decaying at a rate of 3% each month.
 - B. The population is decaying at a rate of 25% each month.
 - C. The population is growing at a rate of 75% each month.
 - D. The population is growing at a rate of 97% each month.
115. The function $v(x) = 20,000(0.87)^x$ models the value of a car x years after its purchase. Which **best** describes the rate of change in the value of the car?
- A. exponential growth of 87% each year
 - B. exponential growth of 13% each year
 - C. exponential decay of 87% each year
 - D. exponential decay of 13% each year

