

TEST NAME: **IF.2**
TEST ID: **641326**
GRADE: **09**
SUBJECT: **Mathematics**
TEST CATEGORY: **School Assessment**

Student: _____

Class: _____

Date: _____

Read the passage - 'Flagstone Pathways' - and answer the question below:

Flagstone Pathways

Flagstone Pathways

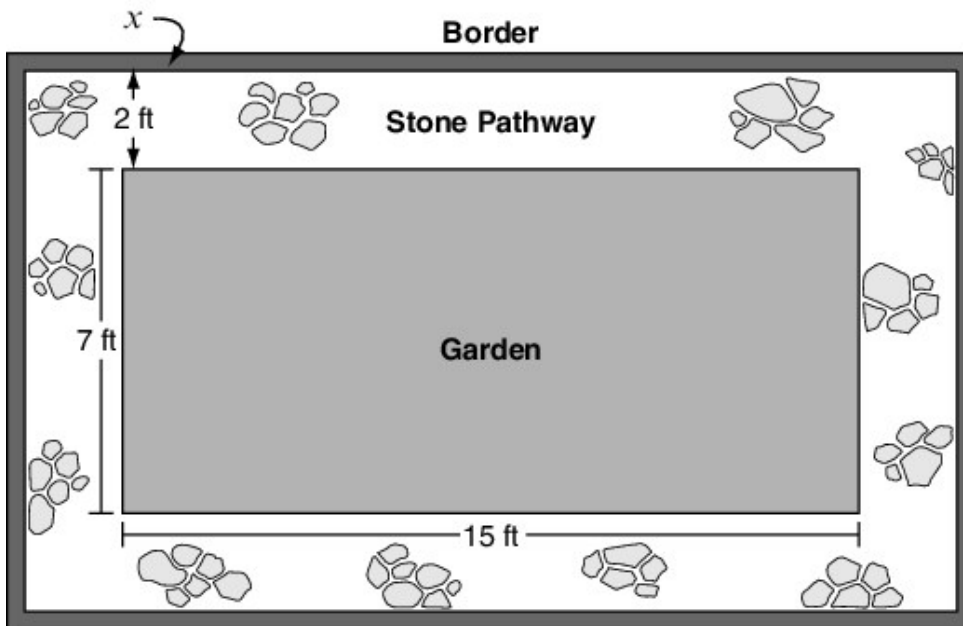
Bill's Landscaping is a local company that offers several services for families in the area, such as planning and building gardens; constructing pathways in yards, gardens, and pools; and maintaining landscaped areas.

Bill's Landscaping would like to be sure that the price it is charging per square foot of flagstone pathway is competitive in the local landscaping market and yields the maximum profit. Currently, the company charges \$18 per square foot of pathway laid. At this price, it brings in about 2,400 square feet of pathway work from customers each month.

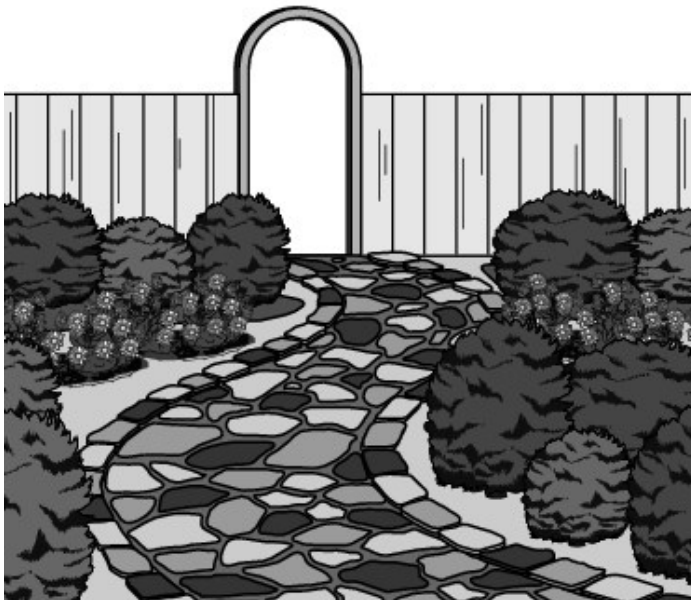
However, the owners are thinking of decreasing the price charged per square foot to be more competitive. Using information about the local landscaping market, they have determined that for every \$1 decrease in price per square foot, the amount of work brought in by customer requests for flagstone pathways will increase by 200 square feet monthly.

The Johnsons, a family living in the area, are considering hiring a company to help them build a garden. The garden will be rectangular in shape and will be surrounded by a stone pathway of uniform width throughout.

The Johnsons have heard that Bill's Landscaping is the most reliable company around but can be expensive at times. They must take this into consideration when determining the width (overall area) of the pathway. Mr. Johnson thinks that the walkable portion of the pathway should be at least 2 feet (ft) in width. Mrs. Johnson would like to have a decorative border around the pathway that will increase the width slightly. The diagram below shows the Johnsons' vision for the garden, where x represents the width of the decorative border that Mrs. Johnson would like to have.



The Johnsons are not the only family in the community that is hiring a landscaping company to help with constructing garden pathways. Recently, there has been a lot of interest in stone pathways, particularly using flagstone, in garden and backyard areas. Flagstone is a flat stone slab that comes in several different natural colors and is often irregularly shaped, although it can also be square or rectangular. The stone is used to make natural-looking pathways in backyards and other landscaping projects. The picture below shows a typical flagstone pathway.



The Johnsons have heard about the possible decrease in prices at Bill's Landscaping. They hope that this reduction in prices will allow them to hire Bill's to construct a flagstone pathway around their garden and still have enough in their budget to include a decorative border.

1. Read "Flagstone Pathways" and answer the question.

The width of the Johnsons' garden, including the stone pathway and border around the garden, can be represented by the function $W(x)$, where x represents the width of the decorative border in feet. Assuming the stone pathway is exactly equal to the minimum width suggested by Mr. Johnson, what is the value of $W(0.5)$?

- A. 1
- B. 4
- C. 12
- D. 64

-
2. If $r(x) = 120 + 18x - 3x^2$, what is $r(2)$?

- A. 120
- B. 144
- C. 168
- D. 192

3. If a ball is rolled horizontally off a 30 meter cliff, the horizontal distance it travels before landing (measured in meters) can be found using the formula below.

$$d(v) = v \sqrt{\frac{2(30)}{9.8}}$$

In this formula, v represents the ball's horizontal velocity (in meters per second).

Which value is closest to $d(98)$?

- A. 24
- B. 77
- C. 243
- D. 275

4. The function $f(x) = 19,500(0.92)^x$ can be used to predict the value of a car x years from now. What is the predicted value of the car 21 months from now?
- A. \$3,385.16
B. \$7,169.49
C. \$16,367.75
D. \$16,852.46
5. Patrick bought a boat for \$9,500. The function $f(x) = 9,500(0.70)^x$ models the value of the boat x years after he purchased it. How much did the value of the boat decrease in the first year after Patrick bought the boat?
- A. \$1,597
B. \$2,850
C. \$6,650
D. \$7,903
6. Let $a \diamond b$ be defined by $a \diamond b = 3a + 2b$. What is the value of $5 \diamond 4$?
- A. 14
B. 22
C. 23
D. 45
7. The function rule $c(t) = 0.20t$ is a model for the cost c in dollars of a telephone call that takes t minutes to complete. Which represents another way to write this function rule?
- A. $c(x) = 0.20t$
B. $c(y) = 20t$
C. $c = 0.20t$
D. $t = 0.20c$
8. The distance a car travels at a rate of 65 mph is a function of the time, t , the car travels. Express this function and evaluate it for $f(3.5)$.
- A. $f(t) = 65t$; 2275 miles
B. $f(t) = 65t$; 227.5 miles
C. $f(t) = 65 / t$; 18.57 miles
D. $f(t) = t / 65$; 0.05 miles

9. If $f(x) = 3x^2 + x - 2$, then $f(-2) =$

- A. -16
- B. 8
- C. 12
- D. 32

10. If $f(x) = 3x - 4$, what is $f\left(\frac{2}{3}\right)$?

- A. -2
- B. -1
- C. $\frac{1}{2}$
- D. $\frac{14}{9}$

11. The amount of money Sarah earns per week is modeled by the function W below where h represents the number of hours Sarah works in a week.

$$W(h) = \begin{cases} 8h, & 0 < h \leq 40 \\ 12(h - 40) + 320, & h > 40 \end{cases}$$

If Sarah worked a total of 48 hours last week, how much money did she earn?

- A. \$384
- B. \$416
- C. \$576
- D. \$896

12. The temperature, in degrees Fahrenheit, of the face of a heated household iron can be found after t hours of cooling by the formula $f(t) = 50(2)^{-2t} + 75$. Which of the following is closest to the temperature of the iron after 0.6 hours of cooling?

- A. 75.0°F
- B. 96.8°F
- C. 125.0°F
- D. 189.9°F

13. Let $r \circ s$ be defined by $r \circ s = rs + 6$. What is the value of $2 \circ (-3)$?

- A. 0
- B. 5
- C. 6
- D. 12

14. The function $f(x) = 120.882(1.012)^x$ models the population of a country, in millions, x years after 1930. What was the **approximate** population of the country in 1991?
- A. 121.9 million
 - B. 122.3 million
 - C. 250.2 million
 - D. 253.3 million
15. Natasha's parents set up a college fund for her by investing \$20,000 at 6 percent, compounded continually. Using the compound interest formula, $A = Pe^{rt}$, determine the approximate worth of Natasha's fund after four years. (Use 2.718 for e .)
- A. \$20,403
 - B. \$22,003
 - C. \$25,424
 - D. \$54,360
16. Mr. Levy invested \$6,500 at a 4.5% annual interest rate. The function $f(t) = 6,500(1.045)^t$ models the value of the investment after t years. What is the value of the investment after 18 months?
- A. \$6,872.56
 - B. \$6,943.65
 - C. \$11,349.20
 - D. \$14,355.11
17. The grocery store where Ms. Maple works pays her \$6.50 per hour. Any time she works more than 40 hours per week, she is paid time and a half for the additional hours. Her weekly pay, w , is found using the following equation, where h is the total number of hours worked.
- $$w = 6.50h + 0.5(6.50)(h - 40)$$
- How much would Ms. Maple earn if she worked 43 hours one week?
- A. \$975.00
 - B. \$399.75
 - C. \$289.25
 - D. \$279.50

18. Ricky invested \$20,000 at a 6% interest rate, compounded annually. The function $V(t) = 20,000(1.06)^t$ models the value of the investment after t years. What will be the **approximate** value of the investment after 5 years?

- A. \$14,700
- B. \$18,800
- C. \$21,200
- D. \$26,800

19. Brad threw a baseball off a cliff. The height h , of the ball, in feet, is modeled by the function below, where t represents time, in seconds, after the ball has been thrown.

$$h(t) = -16t^2 + 48t + 50$$

What is the height of the baseball after 1 second?

- A. 50 feet
- B. 66 feet
- C. 82 feet
- D. 98 feet

20. The function $f(n) = 10(2)^n$ predicts the population of coyotes in an area n years from 2010. What is the predicted number of coyotes in the area in 2015?

- A. 100
- B. 270
- C. 320
- D. 440

21. If $f(x) = 8^{-x}$, what is the value of $f\left(\frac{1}{3}\right)$?

- A. $-\frac{8}{3}$
- B. -2
- C. $\frac{1}{2}$
- D. 2

22. If $f(x) = 3x^2 + 10$, what is $f(-7)$?

- A. -137
- B. -32
- C. 52
- D. 157

23. If $f(x) = x^2 - x$, what is $f(-5)$?

- A. -30
- B. -20
- C. 20
- D. 30

24. What is the value of $f(-2)$ for the function $f(x) = \frac{1}{3}x - 4$?

- A. $\frac{-17}{3}$
- B. $\frac{-14}{3}$
- C. $\frac{-10}{3}$
- D. $\frac{22}{3}$

25. If $f(x) = 100(1.2)^x$, which of these is the value of $f(2)$?

- A. 144
- B. 240
- C. 12000
- D. 14400

26. Which of the following represents another way to write the function rule $f(x) = 3x + 1$?

- A. $f(1) = 4$
- B. $f(y) = 3x + 1$
- C. $y = 3x + 1$
- D. $x = 3y + 1$

27. In the equation $y = 3x + 2$, the expression $f(x)$ would replace which part of the equation?

- A. the slope
- B. the variable x
- C. the variable y
- D. the coefficient

28. The function $f(x) = 40,000(1.03)^x$ is used to predict the population of a town x years after 2010. What is the meaning of $f(5)$?
- A. the population of the town in the year 2010 multiplied by 5
 - B. the year the population of the town reaches 5,000
 - C. the population of the town in 2005
 - D. the population of the town in 2015
29. The function $h(t) = 200 - 16t$ represents the height of a ball dropped from 200 feet. How far had the ball traveled after falling for 11 seconds?
- A. 16 feet
 - B. 24 feet
 - C. 176 feet
 - D. 200 feet
30. If $f(x) = 2x^2 - x$, what is $f(-6)$?
- A. -78
 - B. -30
 - C. 18
 - D. 78
31. From a position 3 meters above the ground, a ball is thrown upward with an initial velocity of 30 meters per second. The formula to find the distance the ball is from the ground is $d = 30t - \frac{1}{2}(9.8)t^2 + 3$, where d represents the distance above the ground, in meters, and t is the time in seconds.
- Find the distance the ball is above the ground after 5 seconds. Show all the steps you used to find the answer.
 - Find the distance the ball is above the ground after 7 seconds. Show all the steps you used to find the answer.
 - Jillian believes that the ball will hit the ground in less than 7 seconds. Determine whether this is true and write an explanation to justify your answer.
32. If $y = -3x + 5$, what is y when $x = \frac{2}{3}$?
- A. 11
 - B. 7
 - C. 3
 - D. -1

33. The function $f(x) = 1(3)^x$ models the number of virus cells present in a sample after x minutes. **About** how many cells will be present after $1\frac{1}{2}$ minutes?
- A. 3 cells
 - B. 4 cells
 - C. 5 cells
 - D. 7 cells
34. What is the value of $f(16)$ when $f(x) = 4x - 8$?
- A. 6
 - B. 12
 - C. 32
 - D. 56
35. Terence's spending account balance is represented by the formula $A(t) = 100(0.9)^t$, where t is time elapsed in weeks. What will his account balance be after 2 weeks?
- A. 41
 - B. 45
 - C. 81
 - D. 90
36. What is the value of $f\left(\frac{2}{3}\right)$ for the function $f(x) = \frac{2x - 5}{3}$?
- A. $\frac{19}{9}$
 - B. $-\frac{1}{3}$
 - C. $-\frac{2}{3}$
 - D. $-\frac{11}{9}$
37. The function $h(t) = -16t^2 + 75t + 80$ models the height of a ball as it is thrown into the air, where h is in feet and t is in seconds. What is the height of the ball once 5 seconds have passed?
- A. 55 feet
 - B. 124 feet
 - C. 375 feet
 - D. 535 feet

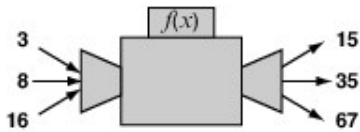
38. An Internet company uses the function $f(x) = 6.052(1.378)^x$ to predict the number of subscribers (in millions) x years after 2000. **Approximately** what is the predicted number of Internet subscribers the company will have in 2019?
- A. 442 million
 - B. 1 billion 943 million
 - C. 2 billion 677 million
 - D. 3 billion 689 million
39. The function $h(t) = 300 - 16t$ represents the height of a ball (in feet) dropped from 300 feet after t seconds. What will be the height of the ball after 2.4 seconds?
- A. 38.4 feet
 - B. 261.6 feet
 - C. 338.4 feet
 - D. 384 feet
40. One type of uranium has a daily radioactive decay rate of 0.39%. The function $f(t) = 32(2.7)^{-0.0039t}$ can be used to find how many pounds of a sample of uranium will remain after t days. **Approximately** how much of the sample will remain after 30 days?
- A. 10 pounds
 - B. 22 pounds
 - C. 28 pounds
 - D. 30 pounds

41. **Making Functions Functional**

A function is a rule that tells what operations to perform on one number to give another number. Functions can be used to show relationships between quantities and to solve all kinds of problems. For example, if you are doing home-improvement projects, you may need to do calculations to solve problems. See how functions work and then use them to solve problems.

Part A. A function is like a machine that takes one number and performs operations on it to turn it into another number. The number that goes in is called the input, and the number that comes out is the output. What operations is this function performing on the input numbers to give the output numbers? What is the equation that gives $f(x)$ from x ?

$$f(x) =$$



Part B. Functions can also work backward. The function that would make the function above work in reverse, turning the output numbers back into the input numbers, is known as the inverse function and is represented by the notation $f^{-1}(x)$. Give the operations and write the equation for the inverse function that takes the output numbers from above and turns them back into the input numbers.

$$f^{-1}(x) =$$

Test the output numbers for $f(x)$ in your equation for $f^{-1}(x)$ to make sure you get the input numbers.

Part C. Suppose you want to paint a room in your house. There are four walls that will be painted with one kind of paint, but the doors, windows, ceiling, and floor will not be painted. The length of the room is one and a half times the width, and the height is $7\frac{1}{2}$ feet. There are two doors, each 3 feet by 7 feet, and there are two windows, each 3 feet by 5 feet. You want to find out how much paint you need for the walls.

- Write an equation to give the area of the walls that will be painted (NOT including the doors and windows), $A(x)$, as a function of the width, x .
- If the width of the room is 16 feet, how many square feet of paint will be needed for the walls?

Part D. The paint you are planning to use for the walls covers about 80 square feet per quart. Using your answer from Part 3, write a function $p(x)$ that tells about how many quarts of paint you need for a room with a width of x . Explain your answer.

Part E. Several rooms in your house have the same setup as the room described in Part C. However, each room has a different width. You now need to know what size room you can paint with the extra cans of paint you bought. This means that you will need to find a function with inputs and outputs that are opposite of $p(x)$. This inverse (or reverse) function, $p^{-1}(x)$, can be used to determine the width of the room given the number of quarts of paint in the extra cans. Write the equation for $p^{-1}(x)$ and explain what the new input and output variables, x and $p^{-1}(x)$, represent.

Part F. Suppose you have 1 gallon (4 quarts) of wall paint. What size

room, with the same setup as the room described in Part C but with a different width, could you paint? Find the dimensions of the room by rounding the width to the most reasonable foot.

Use words, numbers, and/or pictures to show your work.

42. The function $f(x) = 3x + 25$ models the yearly membership cost for a movie rental club, where x is the number of movies rented.
- Last year, Sarah rented 41 movies.
 - Last year, Tim rented twice the amount of movies as Sarah.

How much more did Tim pay last year than Sarah?

- A. \$41.00
- B. \$61.50
- C. \$123.00
- D. \$148.00

43. The function $f(t) = 12,000(1.075)^t$ models the value of an investment t years from now. What is the meaning of the value of $f(5)$?

- A. the value of the investment 5 years ago
- B. the value of the investment in 5 years
- C. the initial value of the investment
- D. the interest rate the investment earns

44. The population of bacteria in a lab sample after n hours is modeled by the function $f(n) = 50(3)^{(n-1)}$. How many bacteria are in the population after 6 hours?

- A. 6,250
- B. 10,800
- C. 12,150
- D. 36,450

45. The growth of a city's population can be represented by the function $P(t) = 100,000 \cdot (1.052)^t$, where t is the number of years since 2000. What does the value of $P(5) - P(4)$ represent in terms of the situation?
- A. The population was 6,369 people in 2001.
 - B. The population was 205,200 people in 2001.
 - C. There was an increase of 6,369 people from 2004 to 2005.
 - D. There was an increase of 205,200 people from 2004 to 2005.

46. If $f(x) = x^2 - 2x + 5$, what is the value of $f(a + h)$?

47. If $g(x) = x^2 + 6$, what is the value of $g(x + 1)$?

- A. 7
- B. $x^2 + 1$
- C. $x^2 + x + 6$
- D. $x^2 + 2x + 7$

48. Suppose $f(x) = x^2$ and $g(x) = 2x - 3$. What is the value of $g(4) + f(-3)$?

- A. -4
- B. 7
- C. 14
- D. 25

49. Ethan purchased a car for \$14,000. He will make monthly payments at an annual interest rate of 9% for 5 years. The formula shown below can be used to find Ethan's monthly car payment.

$$M = L \times \frac{r}{1 - (1 + r)^{-n}}$$

M = monthly payment, L = amount of loan, r = monthly interest rate, and n = number of monthly payments

Which amount is the best estimate of Ethan's monthly payments?

- A. \$252
- B. \$291
- C. \$303
- D. \$442

50. What is the **approximate** value of $f(7.1)$ for the function $f(x) = 4.12x + 35.89$?
- A. 64.0
B. 64.5
C. 64.7
D. 65.1
51. Mike earns \$8 for each hour he works plus a 3% commission on his total daily sales. His daily earnings, P , can be determined using the equation $P = 8h + 0.03d$, where h represents the number of hours worked and d represents his total daily sales in dollars. On Monday, Mike worked 4 hours and had \$4,000 in total sales. He worked 6 hours on Tuesday and had \$15,000 in total sales. How much more did Mike earn on Tuesday than on Monday?
- A. \$152
B. \$346
C. \$498
D. \$650
52. Function $f(x)$ represents the population of bacteria x hours after 9 a.m. What does $f(2) - f(1)$ represent?
- A. the population of bacteria at 9 a.m.
B. the population of bacteria 1 hour after 9 a.m.
C. the change in the population of bacteria from 9 a.m. to 10 a.m.
D. the change in the population of bacteria from 10 a.m. to 11 a.m.
53. The probability that a new machine will not need any repairs within t years from now is modeled by an exponential function of t . This probability is multiplied by 0.2 whenever the time period t is extended by 3 years as shown by the function below.
- $$f(t) = (0.2)^{\frac{t}{3}}$$
- If the probability that the machine does not need repairs right now is 1, what is the probability that the machine will not need repairs within 12 years from now, according to the model?
- A. 0.8
B. 0.05
C. 0.008
D. 0.0016
54. Which equation represents the function notation for the equation $y = 5x + 4$?
- A. $f(4) = -5x$
B. $f(5) = x + 4$
C. $f(x) = 5x + 4$
D. $f(y) = -5x + 4$

55. The height, h , in feet, of an object thrown upward from a height of 144 feet is a function of time, t , in seconds. The height can be determined by the function $h(t) = -16t^2 + 128t + 144$. What is the height of the object at 3 seconds?

- A. 144 feet
- B. 384 feet
- C. 432 feet
- D. 672 feet

56. What is the value of $g(1)$ for the function $g(x) = 2x + 5$?

- A. 7
- B. 8
- C. 26
- D. 27

57. The diameter, in meters, of a tree trunk is modeled by the function $d(h) = 1.3h^{\frac{3}{2}}$, where h is the height of the tree in meters. What is the **approximate** diameter of a 50 meter tall tree?

- A. 110 cm
- B. 230 cm
- C. 460 cm
- D. 520 cm

58. Four grams of radium will decay according to the formula below, where A represents the number of grams remaining after t years.

$$A = 4\left(\frac{1}{2}\right)^{\frac{t}{1600}}$$

Approximately how many grams of radium will remain after 4 grams have decayed for 2400 years?

- A. 1.0 gram
- B. 1.4 grams
- C. 2.8 grams
- D. 3.0 grams

59. Mr. Lanctot was renting an apartment for \$800 per month. He was approved for a \$76,200 loan to buy a home. He will make monthly payments on the home loan for 30 years at a 4.8% annual interest rate, compounded monthly. The formula shown below can be used to determine Mr. Lanctot's monthly payment on his home loan.

$$M = A \times \frac{r(1+r)^n}{(1+r)^n - 1}$$

M = monthly payment, A = amount of the loan, r = monthly interest rate, and n = length of loan in months

Which statement correctly compares Mr. Lanctot's monthly payment on the home loan and the amount he pays on rent per month?

- A. The monthly payment on the home loan is about $\frac{1}{5}$ the amount he pays on rent per month.
- B. The monthly payment on the home loan is about 5 times the amount he pays on rent per month.
- C. The monthly payment on the home loan is about \$400 more than the amount he pays on rent per month.
- D. The monthly payment on the home loan is about \$400 less than the amount he pays on rent per month.
60. The function $g(x)$ represents the population of a rapidly growing city x years after the year 2000.

$$g(x) = 20,000(1.20)^x$$

Part A. What is the value of $g(0)$?

Part B. What does $g(0)$ represent in terms of the given context?

Part C. What was the population of the city in 2010?

Part D. What does the value $g(10) - g(9)$ represent in terms of the given context?

Use words, numbers, and/or pictures to show your work.

61. The number of miles a car can be driven depends on the number of gallons of gas in its tank. The function $m = 25g$ models a situation in which a car gets 25 miles per gallon. If the gas tank holds 20 gallons of gas, which inequality represents its range?
- A. $0 \leq g \leq 20$
- B. $0 \leq m \leq 500$
- C. $m \leq 500$
- D. $g \leq 20$

62. The population of a large city is gradually moving to outlying metropolitan areas with the decline predicted by the functional equation, $P = P_0 e^{-0.03t}$. If P_0 represents the present population of 1 million and P is the predicted population in t years, what is an estimate of the city's population five years from now? Use 2.718 for e .

- A. 1,161,816
- B. 970,448
- C. 860,721
- D. 223,164

63. The stopping distance of a car can be approximated using the formula $d = 0.05v^2 + 2v$, where d = the stopping distance in feet and v = the speed of the car in miles per hour. What is the approximate stopping distance of a car going 55 miles per hour?

- A. 110
- B. 150
- C. 260
- D. 300

64. The functions below represents the costs some homeowners pay for water and sewer usage based on the number of 100 gallon units of water used, x .

Water usage: $W(x) = 0.129x$

Sewer usage: $S(x) = 0.158x + 16.22$

Based on this information, what is the total amount in dollars a homeowner will pay if the water and sewer usage for one month is 3800 gallons?

- A. \$21.12
- B. \$24.59
- C. \$40.81
- D. \$57.02

65. Madeline was approved for a loan to buy a used vehicle. The loan will have an annual interest rate of 12% for 3 years. She does not want her monthly payment to exceed \$125 per month. Given this information, Madeline used the formula shown to determine the loan amount.

$$L = P \times \frac{1 - (1+r)^{-n}}{r}$$

L = Loan amount, P = monthly payment, r = monthly interest rate, and n = number of monthly payments

Which amount is closest to the maximum loan amount that Madeline will be able to borrow to buy a used vehicle?

- A. \$1,024
- B. \$3,226
- C. \$3,763
- D. \$4,418

66. The population P of a town for the year t can be predicted by the formula $P(t) = 9500e^{0.06t}$, where $t \geq 0$, and $t = 0$ corresponds to the year 1998. What is the predicted population for the year 2008?
- A. 10,087
 - B. 12,445
 - C. 16,302
 - D. 17,310

67. Let $x \Delta y$ be defined by $x \Delta y = x - 5y$. What is the value of $3 \Delta (-4)$?
- A. -17
 - B. -6
 - C. 8
 - D. 23

68. Use the function below to answer the question.

$$f(x) = 0.05x^2 + 9.5x - 200$$

What is the value $f(-2)$?

- A. -218.8
- B. -180.8
- C. 181.2
- D. 219.2

69. The formula for the perimeter, P , of a regular hexagon is $P(s) = 6s$, where s represents the length of one side.

Part A. Determine the perimeter of the hexagons described below. Show your work using function notation.

- A hexagon with a side length of 2 centimeters
- A hexagon with a side length of 3 centimeters
- A hexagon with a side length of 4 centimeters

Part B. Determine $P(3.75)$. Describe the process used to find the perimeter.

Part C. If the dimensions of a rectangle are n and $n + 1$, write a function, $P(n)$, that represents the perimeter of the rectangle in terms of n .

Part D. If $P(10) = 42$ for a rectangle, what are the dimensions of the rectangle? Explain the steps used to find those dimensions.

Use words, numbers, and/or pictures to show your work.

70. The function $p(x)$ represents the price, in dollars, of mailing an x -ounce letter first class:

$$p(x) = \begin{cases} 0.37 & 0 < x \leq 1 \\ 0.60 & 1 < x \leq 2 \\ 0.83 & 2 < x \leq 3 \\ 1.06 & 3 < x \leq 4 \\ 1.29 & 4 < x \leq 5 \end{cases}$$

What is the least possible total price of mailing 3 letters with an average weight of 1.4 ounces?

- A. \$1.29
- B. \$1.57
- C. \$1.80
- D. \$2.03

71. The weight, in pounds, of a baby in the first six months of life can be modeled by the function $f(x) = 1.5x + 7$, where x is the age of the baby in months. According to this model, what is the weight, in pounds, of a baby at age 5 months?

- A. 8.5
- B. 12.0
- C. 13.5
- D. 14.5

72. The function $p(x) = 8,963(1.03)^x$ models the population of a town x years since 2006. Which statement **best** describes $p(9)$?
- A. the population of the town in 2006
 - B. the population of the town in 2015
 - C. the percent change in the population of the town between 2006 and 2015
 - D. the rate of change in the population of the town between 2006 and 2015

73. In 1997 there were 31 laptop computers at Grove High School. Starting in 1998 the school bought 20 more laptop computers at the end of each year. The equation $T = 20x + 31$ can be used to determine T , the total number of laptop computers at the school x years after 1997. What was the total number of laptop computers at Grove High School at the end of 2005?
- A. 160
 - B. 171
 - C. 191
 - D. 268

74. What value is missing from the function table for $f(x) = -0.25x - 6$?

x	$f(x)$
-4	?
-1	-5.75
1	-6.25
0	-6

- A. -2.25
 - B. -4.25
 - C. -5
 - D. -7
75. At the end of 2006, the population of Riverside was 400 people. The population for this small town can be modeled by the equation below, where t represents the number of years since the end of 2006 and P represents the number of people.
- $$P = 400(1.2)^t$$
- Based on this model, approximately what was the increase in the population of Riverside at the end of 2009 compared to the end of 2006?
- A. 291
 - B. 691
 - C. 1040
 - D. 1440

76. The function $P(t) = 5,000(1.015)^t$ represents the population of the city of Springfield, where t is time in years since 2010. What does the value of $P(7)$ mean in terms of this context?
- A. Springfield has a population of 5,549 people in 2007.
 - B. Springfield has a population of 5,549 people in 2017.
 - C. Springfield has a population of 35,525 people in 2007.
 - D. Springfield has a population of 35,525 people in 2017.
77. Suppose the function $g(x) = 101.25(1.025)^x$ predicts the average weekly cost of food for a family of five x years after January, 2012. **Approximately** what is the predicted average weekly cost of food for the family in January, 2018?
- A. \$114.56
 - B. \$117.42
 - C. \$136.17
 - D. \$157.92
78. A bacteria doubles in population every hour. At 9:00 a.m., the population is 12 bacteria. The function $P(t) = 12 \cdot 2^t$ models the bacteria population after t hours. What does the value of $P(5)$ represent regarding the bacteria's population?
- A. The population is 120 bacteria at 5:00 a.m.
 - B. The population is 120 bacteria at 2:00 p.m.
 - C. The population is 384 bacteria at 5:00 a.m.
 - D. The population is 384 bacteria at 2:00 p.m.
79. The function $f(x) = 23,900(1.05)^x$ models Alice's expected salary x years from now. **Approximately** how much will Alice's expected salary be 7 years from now?
- A. \$25,095
 - B. \$29,875
 - C. \$33,521
 - D. \$33,630

80. Which statement represents another way to write the function rule, $y = 3x + 5$?

- A. $y = 3y + 5$
- B. $x = 3y + 5$
- C. $f(x) = 3x + 5$
- D. $f(y) = 3x + 5$

81. What is the value of $f(-6)$ for the function $f(x) = \frac{1}{2}x - 7$?

- A. -10
- B. -4
- C. 4
- D. 10

82. Which equality represents $y = 3x^2 + 2$ written in function notation?

- A. $f(y) = 3x^2 + 2$
- B. $f(x) = 3x^2 + 2$
- C. $f(3) = x^2 + 2$
- D. $f(2) = 3x^2$

83. Ms. Mays is getting a mortgage loan for \$70,000 to buy a home. She wants to compare her monthly payments based on the two finance options available for this loan.

- She can get a 20-year mortgage loan at an annual interest rate of 6%.
- She can get a 30-year mortgage loan at an annual interest rate of 9%.

$$M = A \times \frac{r}{1 - (1 + r)^{-n}}$$

M = monthly payment, A = amount of the loan, r = monthly interest rate, and n = length of loan in months

Which statement about these two monthly payments is true?

- A. The monthly payment for the 20-year mortgage is about \$105 more than the monthly payment for the 30-year mortgage.
- B. The monthly payment for the 20-year mortgage is about \$105 less than the monthly payment for the 30-year mortgage.
- C. The monthly payment for the 20-year mortgage is about \$62 less than the monthly payment for the 30-year mortgage.
- D. The monthly payment for the 20-year mortgage is about \$62 more than the monthly payment for the 30-year mortgage.

84. An electrician's shop charges a \$55 service fee plus \$50 per hour for labor. The linear equation that models this is $c = 50h + 55$, where h is the number of labor hours and c is the total cost. How much would the shop charge a customer for a job that takes 17 hours?

- A. \$850
- B. \$905
- C. \$985
- D. \$1,785

85. Let f be defined by $f(m) = \frac{m^2 + m}{2}$. What is the value of $f(6)$?

- A. 9
- B. 12
- C. 21
- D. 39

86. Use the function given to answer the question below.

$$f(x) = \frac{2}{5}x + 24$$

What is the value of x when $f(x) = 25$?

- A. $\frac{2}{5}$
- B. 1
- C. $\frac{5}{2}$
- D. 34

87. What is the value of $g(-2)$ for the function $g(x) = 3x + 2$?

- A. -4
- B. $-\frac{4}{3}$
- C. $\frac{3}{4}$
- D. 3

88. The area, A , of a square is a function of the length, x , of a side of the square. Which of the following expresses this function, $A(x)$, and the value at $x = 2.5$ cm?
- A. $A(x) = 2x$; 5 cm^2
 - B. $A(x) = 4x$; 10 cm^2
 - C. $A(x) = x^2$; 6.25 cm^2
 - D. $A(x) = 4x^2$; 25 cm^2
89. A car company uses the function $g(x) = 25,400(0.88)^x$ to predict the value of a car x years from now. What will be the **approximate** value of the car 6 years from now?
- A. \$7,113
 - B. \$11,796
 - C. \$18,288
 - D. \$22,352
90. The function rule $A = \pi r^2$ is a model for the area A of a circle with a radius r . Which of the following represents this equation written in function notation?
- A. $A(\pi) = r^2$
 - B. $A(r) = \pi r^2$
 - C. $A(x) = \pi r^2$
 - D. $A(y) = \pi r^2$
91. The function $f(x) = 3(1.07)^x$ is used to predict the height of a tree (in feet) x years after it was planted. **Approximately** how tall is the tree predicted to be after 18 months?
- A. 3.32 feet
 - B. 4.82 feet
 - C. 5.78 feet
 - D. 10.14 feet
92. Which equation could best be used to determine the value of $f(3)$ for the function $f(x) = 2x + 4$?
- A. $f(3) = 23 + 4$
 - B. $f(3) = 2(3) + 4$
 - C. $f(3) = 3(2x) + 4$
 - D. $f(3) = 3(2x + 4)$

93. What is the **approximate** value of $f(5)$ for the function $f(x)=6.87(2.5)^{(x-1)}$?
- A. 268.36
 - B. 294.98
 - C. 670.89
 - D. 866.29
94. The population of a certain state can be represented by the function $f(x)$, where x represents the number of years since 2000. If the population of this state increases by 125,000 people from 2011 to 2012, write the equation, using function notation, that represents this increase.
95. A club uses the function $f(x)=121(1.12)^x$ to predict the number of members it will have x years after 2010. What is the predicted number of members the club will have in 2020?
- A. 135
 - B. 376
 - C. 1,167
 - D. 1,355
96. Given the function $f(x) = \frac{x}{3} - 2$, what is $f(2)$?
- A. 4
 - B. $\frac{8}{3}$
 - C. 0
 - D. $-\frac{4}{3}$
97. What is the value of $f(-2)$ for the function $f(x) = 2(3)^x$?
- A. -12
 - B. $\frac{1}{18}$
 - C. $\frac{2}{9}$
 - D. 18

98. The function rule $A = s^2$ is a model for the area, A , of a square with side of length s . Which of the following represents another way to write this function rule?

- A. $A = 2s$
- B. $s = A^2$
- C. $A(s) = s^2$
- D. $A(x) = s^2$

99. A bank approved the Lopez family for a \$100,000 loan to purchase a home. They will pay the loan back in monthly payments for 30 years at a 6% annual interest rate, compounded monthly. The formula below was used to determine the monthly payment for this loan.

$$M = A \times \frac{r}{1 - (1 + r)^{-n}}$$

M = monthly payment, A = amount of the loan, r = monthly interest rate, and n = length of loan in months

Which amount is closest to the monthly payment for this loan?

- A. \$360
- B. \$429
- C. \$600
- D. \$726

100. Which equation represents the function notation of $y = 4x^2 - 2$?

- A. $f(x) = 4y^2 - 2$
- B. $f(x) = 4x^2 - 2$