Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 Which expression is equivalent to $16x^2 - 36$?

(1) $4(2x - 3)(2x - 3)$

(2) $4(2x + 3)(2x - 3)$

(3) $(4x - 6)(4x - 6)$

(4) $(4x + 6)(4x + 6)$

2 What is the solution set of the equation $(x - 2)(x - a) = 0$?

(1) -2 and a

(2) -2 and $-a$

(3) 2 and a

(4) 2 and $-a$

3 Analysis of data from a statistical study shows a linear relationship in the data with a correlation coefficient of -0.524. Which statement best summarizes this result?

(1) There is a strong positive correlation between the variables.

(2) There is a strong negative correlation between the variables.

(3) There is a moderate positive correlation between the variables.

(4) There is a moderate negative correlation between the variables.

4 Boyle's Law involves the pressure and volume of gas in a container. It can be represented by the formula $P_1V_1 = P_2V_2$. When the formula is solved for P_2, the result is

(1) $P_1V_1V_2$

(2) $\frac{V_2}{P_1V_1}$

(3) $\frac{P_1V_1}{V_2}$

(4) $\frac{P_1V_2}{V_1}$

Use this space for computations.

5 A radio station did a survey to determine what kind of music to play by taking a sample of middle school, high school, and college students. They were asked which of three different types of music they prefer on the radio: hip-hop, alternative, or classic rock. The results are summarized in the table below.

	Hip-Hop	Alternative	Classic Rock
Middle School	28	18	4
High School	22	22	6
College	16	20	14

What percentage of college students prefer classic rock?

(1) 14%

(2) 28%

(3) 33%

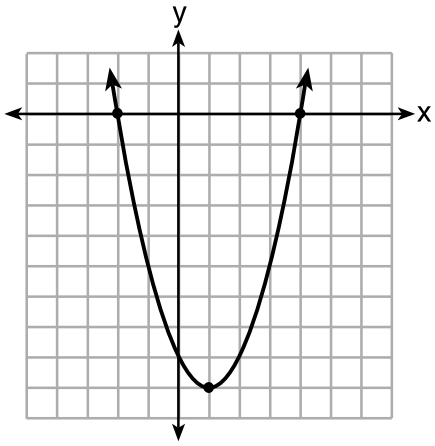
(4) 58%

6 Which function has zeros of -4 and 2?

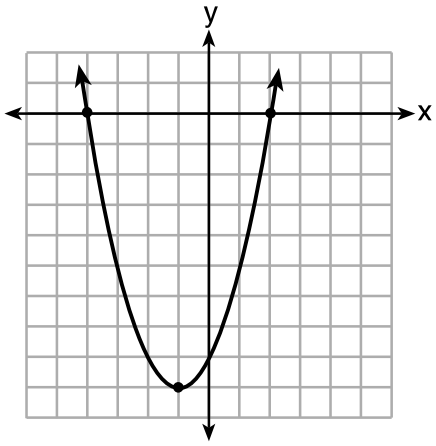
(1) $f(x) = x^2 + 7x - 8$

(3) $g(x) = x^2 - 7x - 8$

(2)



(4)



Use this space for computations.

7 Which expression is equivalent to $2(3g - 4) - (8g + 3)$?

(1) $-2g - 1$

(2) $-2g - 5$

(3) $-2g - 7$

(4) $-2g - 11$

8 In 2014, the cost to mail a letter was 49¢ for up to one ounce. Every additional ounce cost 21¢. Which recursive function could be used to determine the cost of a 3-ounce letter, in cents?

(1) $a_1 = 49; a_n = a_{n-1} + 21$

(2) $a_1 = 0; a_n = 49a_{n-1} + 21$

(3) $a_1 = 21; a_n = a_{n-1} + 49$

(4) $a_1 = 0; a_n = 21a_{n-1} + 49$

9 A car leaves Albany, NY, and travels west toward Buffalo, NY. The equation $D = 280 - 59t$ can be used to represent the distance, D, from Buffalo after t hours. In this equation, the 59 represents the

(1) car's distance from Albany

(2) speed of the car

(3) distance between Buffalo and Albany

(4) number of hours driving

10 Faith wants to use the formula $C(f) = \frac{5}{9}(f - 32)$ to convert degrees Fahrenheit, f, to degrees Celsius, $C(f)$. If Faith calculated $C(68)$, what would her result be?

(1) 20° Celsius

(2) 20° Fahrenheit

(3) 154° Celsius

(4) 154° Fahrenheit

Use this space for computations.

11 Which scenario represents exponential growth?

(1) A water tank is filled at a rate of 2 gallons/minute.

(2) A vine grows 6 inches every week.

(3) A species of fly doubles its population every month during the summer.

(4) A car increases its distance from a garage as it travels at a constant speed of 25 miles per hour.

12 What is the *minimum* value of the function $y = |x + 3| - 2$?

(1) -2

(2) 2

(3) 3

(4) -3

13 What type of relationship exists between the number of pages printed on a printer and the amount of ink used by that printer?

(1) positive correlation, but not causal

(2) positive correlation, and causal

(3) negative correlation, but not causal

(4) negative correlation, and causal

14 A computer application generates a sequence of musical notes using the function $f(n) = 6(16)^n$, where n is the number of the note in the sequence and $f(n)$ is the note frequency in hertz. Which function will generate the same note sequence as $f(n)$?

(1) $g(n) = 12(2)^{4n}$

(2) $h(n) = 6(2)^{4n}$

(3) $p(n) = 12(4)^{2n}$

(4) $k(n) = 6(8)^{2n}$

Use this space for computations.

15 Which value of x is a solution to the equation $13 - 36x^2 = -12$?

(1) $\frac{36}{25}$

(2) $\frac{25}{36}$

(3) $-\frac{6}{5}$

(4) $-\frac{5}{6}$

16 Which point is a solution to the system below?

$$2y < -12x + 4$$
$$y < -6x + 4$$

(1) $\left(1,\frac{1}{2}\right)$

(2) $(0,6)$

(3) $\left(-\frac{1}{2},5\right)$

(4) $(-3,2)$

17 When the function $f(x) = x^2$ is multiplied by the value a, where $a > 1$, the graph of the new function, $g(x) = ax^2$

(1) opens upward and is wider

(2) opens upward and is narrower

(3) opens downward and is wider

(4) opens downward and is narrower

18 Andy has \$310 in his account. Each week, w, he withdraws \$30 for his expenses. Which expression could be used if he wanted to find out how much money he had left after 8 weeks?

(1) $310 - 8w$

(2) $280 + 30(w - 1)$

(3) $310w - 30$

(4) $280 - 30(w - 1)$

Use this space for computations.

19 The daily cost of production in a factory is calculated using $c(x) = 200 + 16x$, where x is the number of complete products manufactured. Which set of numbers best defines the domain of $c(x)$?

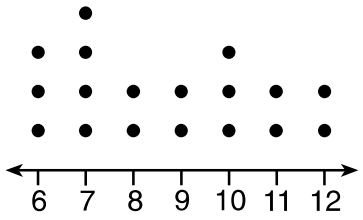
(1) integers

(2) positive real numbers

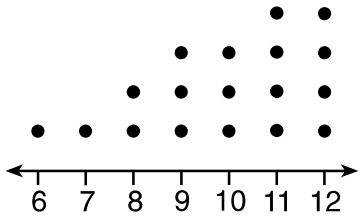
(3) positive rational numbers

(4) whole numbers

20 Noah conducted a survey on sports participation. He created the following two dot plots to represent the number of students participating, by age, in soccer and basketball.



Soccer Players' Ages



Basketball Players' Ages

Which statement about the given data sets is correct?

(1) The data for soccer players are skewed right.

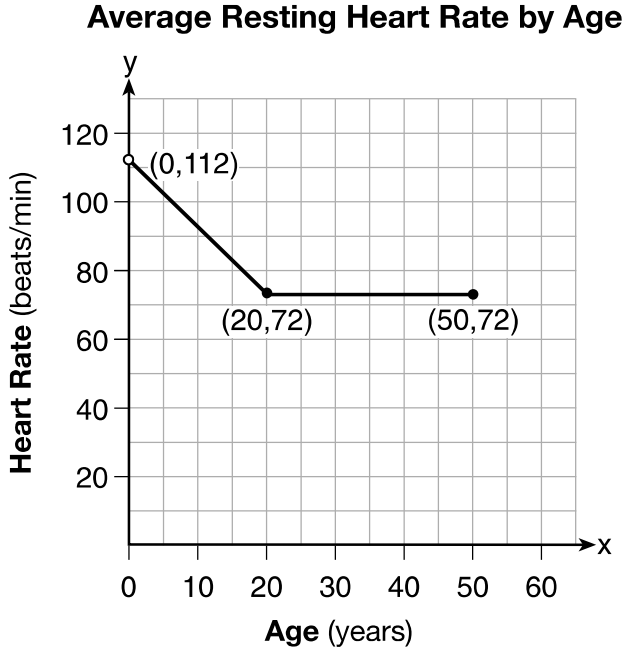
(2) The data for soccer players have less spread than the data for basketball players.

(3) The data for basketball players have the same median as the data for soccer players.

(4) The data for basketball players have a greater mean than the data for soccer players.

Use this space for computations.

21 A graph of average resting heart rates is shown below. The average resting heart rate for adults is 72 beats per minute, but doctors consider resting rates from 60-100 beats per minute within normal range.



Which statement about average resting heart rates is *not* supported by the graph?

(1) A 10-year-old has the same average resting heart rate as a 20-year-old.

(2) A 20-year-old has the same average resting heart rate as a 30-year-old.

(3) A 40-year-old may have the same average resting heart rate for ten years.

(4) The average resting heart rate for teenagers steadily decreases.

22 The method of completing the square was used to solve the equation $2x^2 - 12x + 6 = 0$. Which equation is a correct step when using this method?

(1) $(x - 3)^2 = 6$

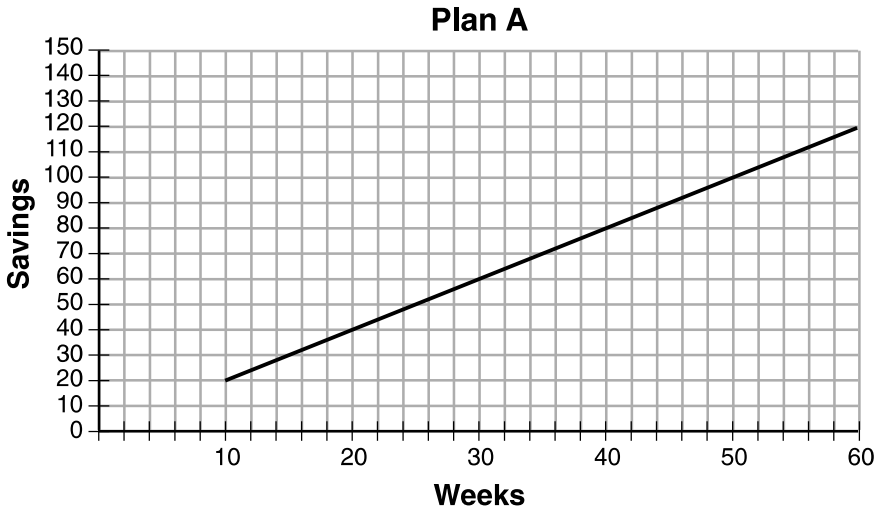
(2) $(x - 3)^2 = -6$

(3) $(x - 3)^2 = 3$

(4) $(x - 3)^2 = -3$

Use this space for computations.

23 Nancy works for a company that offers two types of savings plans. Plan *A* is represented on the graph below.



Plan *B* is represented by the function $f(x) = 0.01 + 0.05x^2$, where x is the number of weeks. Nancy wants to have the highest savings possible after a year. Nancy picks Plan *B*.

Her decision is

(1) correct, because Plan *B* is an exponential function and will increase at a faster rate

(2) correct, because Plan *B* is a quadratic function and will increase at a faster rate

(3) incorrect, because Plan *A* will have a higher value after 1 year

(4) incorrect, because Plan *B* is a quadratic function and will increase at a slower rate

24 The 2014 winner of the Boston Marathon runs as many as 120 miles per week. During the last few weeks of his training for an event, his mileage can be modeled by $M(w) = 120(.90)^{w-1}$, where w represents the number of weeks since training began. Which statement is true about the model $M(w)$?

(1) The number of miles he runs will increase by 90% each week.

(2) The number of miles he runs will be 10% of the previous week.

(3) $M(w)$ represents the total mileage run in a given week.

(4) w represents the number of weeks left until his marathon.