For questions 1 through 24, mark your answer choice on the answer sheet provided. Make sure that any erasures are cleanly erased and that no stray marks are on the answer grid. After completing items 1 through 24, answer each of the tie-breaker items. Be sure that your name is printed on each of the tie-breaker pages.

1. Determine all possible relationships between the following two quadratic equations.

$$f(x) = ax^2 \qquad g(x) = bx^2 \qquad \text{where a > b and |a| > |b|}$$

    I. The graph of f(x) is "wider" than g(x)
    II. The graph of g(x) is "wider" than f(x)
    III. The graph of g(x) is a reflection of f(x)
    IV. The graph of f(x) is shifted up from g(x)

    a. II
    b. III
    c. I or IV
    d. I or III
    e. II or III

2. On a map, Luis's house is located at $\left(\dfrac{4}{a}, -3a\right)$ and Melvin's house is at $\left(-5a, \dfrac{3a}{7}\right)$. What are the coordinates for Raquel's home if she lives exactly halfway between Luis and Melvin?

    a. $\left(\dfrac{5a^2 - 4}{2a}, \dfrac{9a}{7}\right)$

    b. $\left(\dfrac{4 - 5a}{a}, \dfrac{9a}{7}\right)$

    c. $\left(\dfrac{4 - 5a^2}{2a}, -\dfrac{9a}{7}\right)$

    d. $\left(\dfrac{4 - 5a}{2}, -\dfrac{18a}{7}\right)$

    e. $\left(\dfrac{4 - 5a}{a}, \dfrac{18a}{7}\right)$

3. Which statement is correct for the list of numbers below?

$$2.35 \times 10^{-8}, \ 0.000000029, \ 1.82 \times 10^{8}, \ 1290000000, \ 1.05 \times 10^{9}$$

    a. The list is in increasing order.
    b. The list is in decreasing order.
    c. If 0.000000029 is removed, the list will be in increasing order.
    d. If 0.000000029 is removed, the list will be in decreasing order.
    e. If 1,290,000,000 is removed, the list will be in increasing order.

4. Sales for a business were 3 million dollars more the second year than the first, and sales for the third year were double the sales for the second year. If sales for the third year were 38 million dollars, what were the sales, in millions of dollars, for the first year?
   a. 16

   b. 17.5

   c. 20.5

   d. 22

   e. 35

5. A box is to be made out of a piece of cardboard that measures 18 by 24 inches. Squares, of length x inches, will be cut from each corner and then the ends and sides will be folded up. Write an equation that will determine the volume of the box.
   a. $V = 432 - 42x + x^2$
   b. $V = 432 - 84x + 4x^2$
   c. $V = 432x - 42x^2 + x^3$
   d. $V = 432x - 84x^2 + 4x^3$
   e. $V = 864x - 168x^2 + 4x^3$
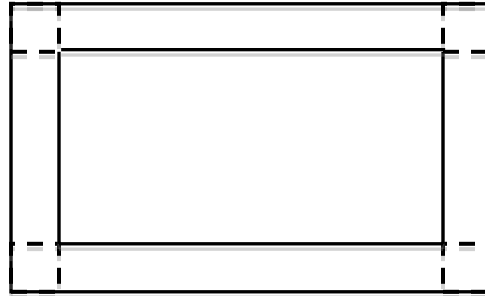
6. If the graph of a line has a negative slope and a positive y-intercept, what happens to the x-intercept if the slope and the y-intercept are tripled?
   a. The x-intercept remains the same.
   b. The x-intercept becomes three times as large.
   c. The x-intercept becomes one-third as large.
   d. The x-intercept becomes one-ninth as large.
   e. The x-intercept becomes nine times as large.

7. Solve for x, $- | 2x + 1 | < -3$.
   a. $x > 1$ or $x < -2$
   b. $x < 2$
   c. $x > 2$
   d. $-2 < x < 1$
   e. $-1 < x < 2$

8. What is the value of $[(-2)^2(8 - 2 * 3) + 7] - \left(16 \div 2 + \sqrt{36}\right)$?
   a. -79
   b. -3
   c. 1
   d. 24
   e. 61

9. For the function $f(x)$, $f(2.3) = -7.2$ and $f(8.4) = 9.1$. What is the equation for the function $f(x)$?

   a. $f(x) = \frac{16.3}{6.1}(x - 8.4) + 9.1$

   b. $f(x) = \frac{16.3}{6.1}(x + 8.4) + 9.1$

   c. $f(x) = \frac{6.1}{16.3}(x - 7.2) + 2.3$

   d. $f(x) = \frac{6.1}{16.3}(x - 7.2) + 2.3$

   e. $f(x) = \frac{6.1}{16.3}(x + 7.2) + 2.3$

10. Mary counts the cars in the parking lot in front of her husband's store. The table below shows how many of each color Mary sees.

Color	Number of Cars
Blue	3
Green	2
Black	7
White	4
Red	6

If Mary sees one car drive away and then another, what is the probability that the first car was not green and the second car was green?

   a. $\frac{10}{231}$

   b. $\frac{20}{231}$

   c. $\frac{10}{121}$

   d. $\frac{2}{21}$

   e. $\frac{10}{11}$

11. What is the *y*-intercept of the graph of $\dfrac{37}{13}x + \dfrac{7}{100}y = \dfrac{67}{17}$?

    a. The y-intercept is $\dfrac{806}{629}$

    b. The y-intercept is $\dfrac{6700}{119}$

    c. The y-intercept is $\dfrac{67}{17}$

    d. The y-intercept is $\dfrac{7}{100}$

    e. The y-intercept is $\dfrac{37}{13}$

12. Given the inequality $2x + \mathbf{b} < 7$ What value of b will give the solution: $x < 1$.
    a. b = 7/2
    b. b < 2/7
    c. b = 2/7
    d. b < 5
    e. b = 5

13. The equation of line l is $6x + 5y = 3$, and the equation of line q is $5x - 6y = 0$. Which statement about the two lines is true?
    a. Lines l and q are perpendicular.
    b. Lines l and q are parallel.
    c. Lines l and q have the same y-intercept.
    d. Lines l and q have the same x-intercept.
    e. None of these

14. Which of the following is always true?
    a. If n is a negative integer, then $x^{-n} = 1$.
    b. If x is a positive, then x^{-n} is negative.
    c. If n is a positive integer, then $x^{-n} = \dfrac{1}{x^n}$.
    d. If n is zero, then $x^{-n} = 1$.
    e. If x is zero, then $x^{-n} = 1$.

15. Which of the following is true about the equation $\mathbf{0 = -6x + x^2 + 7}$?
    a. Crosses the x-axis at x = 7
    b. Opens down
    c. Vertex at (-3, -2)
    d. All of the above
    e. None of the above

16. The equation $y = -5.25x + 320.75$ models the amount of money (y) in dollars Jillian has at the end of x weeks. Which scenario is modeled by the equation?
    a. Jillian owes $320.75 and is paying $5.25 each week.
    b. Jillian has $320.75 and is paying $5.25 each week.
    c. Jillian owes $320.75 and is receiving $5.25 each week.
    d. Jillian has $320.75 and is receiving $5.25 each week.
    e. None of the above.

17. Todd works as a waiter and records the tips he receives from each customer. The first 8 customers give him the tips below.

$1.00	$1.50	$1.50	$2.00
$2.50	$3.00	$3.50	$5.00

    How much does Todd have to receive for his next tip to increase the mean of the tips by $0.50?
    a. $2.50
    b. $3.00
    c. $5.00
    d. $7.00
    e. $9.00

18. In the 2000 census, the population of Conway was approximately 43,000. The growth rate since then has been 4% per year. What function represents this situation?
    a. $P(t)=43000(4)^t$
    b. $P(t)=43000(1.4)^t$
    c. $P(t)=(1.04)(43000)^t$
    d. $P(t)=43000(1+0.04)^t$
    e. $P(t)=43000(1-0.04)^t$

19. Which of the following equations is a line that goes through the point $\left(-\frac{1}{2}, \frac{2}{3}\right)$ and also never intersects the line $\frac{2}{3}x + \frac{7}{5}y = \frac{2}{9}$?

    a. $y = -\frac{10}{21}x + \frac{10}{63}$

    b. $y = \frac{10}{21}x + \frac{3}{7}$

    c. $y = \frac{21}{10}x + \frac{103}{60}$

    d. $y = -\frac{21}{10}x + \frac{10}{63}$

    e. None of the above.

20. Two small pitchers and one large pitcher can hold a total of 8 cups of water. One large pitcher minus one small pitcher constitutes 2 cups of water. How many cups of water can the smaller pitcher hold?
   a. 1 cup
   b. 2 cups
   c. 4 cups
   d. 6 cups
   e. Not enough information

21. Below are graphs representing the number of hours spent on homework a 7th grade class and an 8th grade class. Which must be true about the number of hours spent on homework?
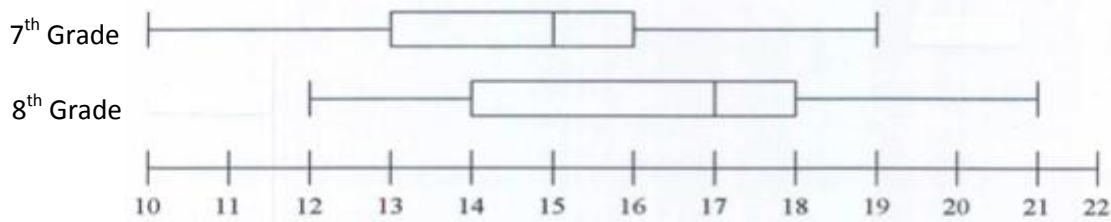
   a. The range of the 7th grade class is larger.
   b. The mean of the 7th grade class is higher.
   c. The median of the 7th grade class is higher.
   d. The interquartile range of the 8th grade class is larger.
   e. The interquartile range of the 7th grade class is larger.

22. If $f(x)=9x^2+bx+25$ is a perfect square, which positive integer value of **b** completes the quadratic?
   a. b = 10
   b. b = 16
   c. b = 30
   d. b = 64
   e. None of the above

23. The graph of $f(x)=5(1.2)^x$ is graphed below.
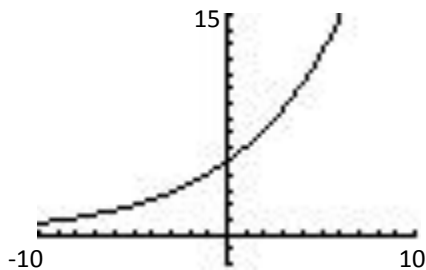

   What is the range of the function?
   a. [-10, 6]
   b. [1, 15]
   c. [0, ∞)
   d. (0, ∞)
   e. all real numbers

24. A lawn care company recorded the distribution of lawn sizes in a subdivision, as shown in the table below.

Size of Lawn (ft^2)	Number of Lawns
1,000-1,499	3
1,499-1,999	8
2,000-2,499	12
2,499-2,999	11
3,000-3,499	9
3,499-3,999	1

Which of the following graphs represents a cumulative frequency histogram of the data above?

a.

b.

c.

d.

e.
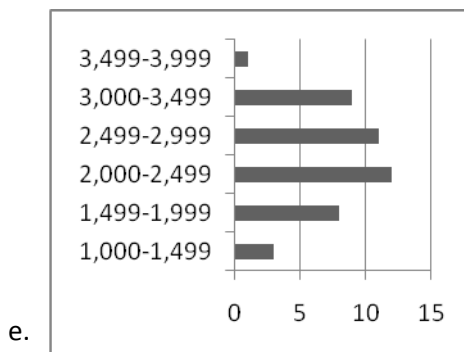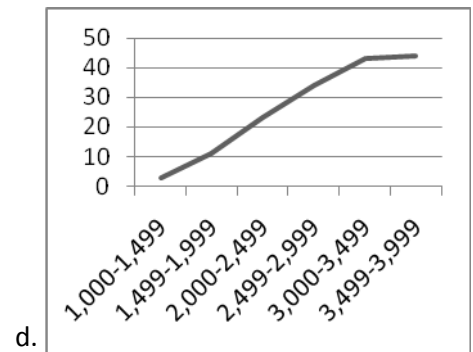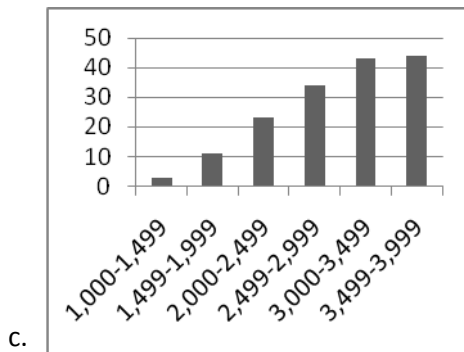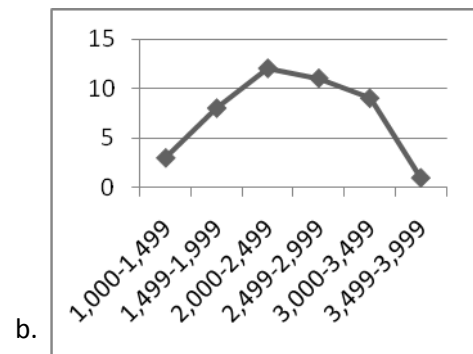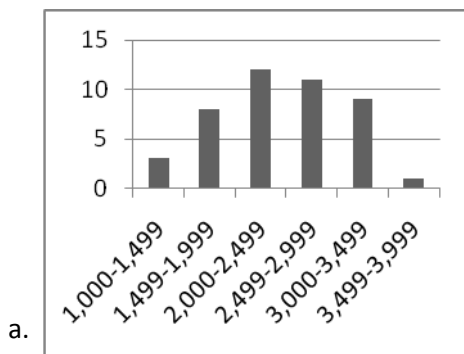
TIE-BREAKER #1

A phone company charges $15 a month for a base package of 300 minutes and 15¢ a minute for each additional minute.

What is an equation for the total monthly cost (y) for service in terms of x minutes when the number of minutes is greater than 300?

If a person receives a phone bill for $46.95, how many minutes did they use?

TIE-BREAKER #2

A gardener has a 30 foot by 20 foot rectangular plot of ground. She wants to build a brick walkway of uniform width on the border of the plot.

Draw a pictorial representation of the garden and walkway with all measurements labeled.

Write an equation to represent the total area of the walkway.

Write the domain of this function in the context of the problem.

If the gardener wants to have 416 square feet of ground left for planting, how wide should she build the walkway? Determine the width of the walkway.

TIE-BREAKER #3

In a standard deck of cards there are 52 cards divided into 4 suits (clubs, spades, diamonds, and hearts), each with 13 different numbers or face cards (2, 3, 4,…,10, Jack, Queen, King, Ace). Annie is trying to understand probability using a deck of cards. Answer each of the following individual scenarios that Annie proposes.

What is the probability she will draw a 2 and then a club with replacement?

What is the probability Annie will draw a Queen or a diamond on the first draw?

What is the probability that Annie will draw a Diamond, then a Heart, and then the Queen of Spades without replacing each card? Express your answer as a fraction in lowest terms.

Answer Key:
1. A
2. C
3. E
4. A
5. D
6. A
7. A
8. C
9. A
10. B
11. B
12. E
13. A
14. C
15. E
16. B
17. D
18. D
19. E
20. B
21. D
22. C
23. D
24. C

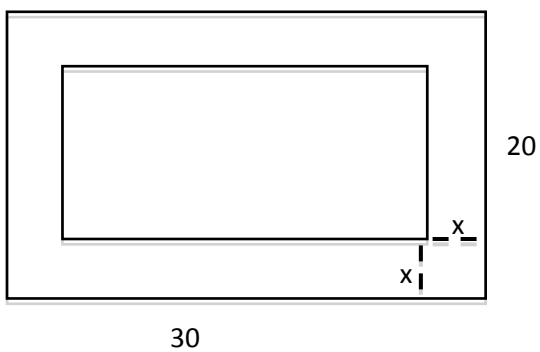**Tie-Breaker 1**

$y = 15 + 0.15(x - 300)$

$x = 513$ minutes

Tie-Breaker 3

$1/52$

$16/52$

$13/52 * 13/51 * 1/50 = 13/10200$

Tie-Breaker 2

$A = 600 - (20 - 2x)(30 - 2x)$ or $A = -4x^2 + 100x$

$0 < x < 10$

$x = 2$ feet