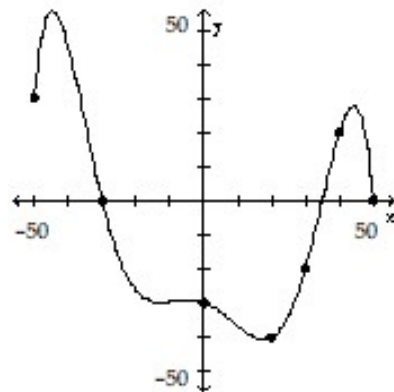Arkansas Council of Teachers of Mathematics
2015 Algebra I Regional Exam

For questions 1 through 25, mark your answer choice on the answer sheet provided. After completing items 1 through 25, answer each of the tiebreaker items in sequential order (do #1 first, followed by #2, and #3 last). Be sure that your name is printed on each of the tiebreakers.

1. Keith has $500 in his savings account at the beginning of the summer. He wants to have at least $200 remaining in his account by the end of the summer. He withdraws $25 each week for food, clothes, and movie tickets. How many weeks can Keith withdraw money from his account?

    a. $\{x| x \leq 8\}$
    b. $\{x| x \leq 12\}$
    c. $\{x| x \geq 12\}$
    d. $\{x| x \geq 20\}$
    e. $\{x| x \leq 20\}$

2. The length of one side of a rectangular banner in inches is 3 more than 4 times the width. The perimeter is 486 inches. Find the length and width of the banner.

    a. length = 123 inches, width = 30 inches
    b. length = 195 inches, width = 48 inches
    c. length = 200 inches, width = 50 inches
    d. length = 400 inches, width = 86 inches

3. In recent years, the number of tons of plastic bags that are recycled has grown exponentially from approximately 80,000 tons in 1996 to 380,000 tons in 2007. Create the exponential function that models the amount recycled, in tons, where x is the number of years since 1996.

    a. $R(x) = 380,000(1.1522)^x$
    b. $R(x) = 380,000(1.555)^x$
    c. $R(x) = 80,000(1.1522)^x$
    d. $R(x) = 80,000(1.555)^x$

4. Use the graph of the function f shown to find $f(20)$.

    a. 0
    b. -40
    c. 40
    d. 50
    e. Not enough information

5. Solve the following equation for x, $3(2x - 5) + 4 = 2(4x + 3)$

 a. $-\dfrac{17}{2}$

 b. $-\dfrac{9}{2}$

 c. -2

 d. $\dfrac{33}{8}$

6. A group of students is trying to determine the diameter of the world's largest ice cream cone. If the volume and height are known, how can the following formula be used to find the diameter of the cone?

$$V = \frac{\pi r^2 h}{3}$$

 a. $d = \dfrac{3V}{\pi r}$

 b. $d = \sqrt{\dfrac{3V}{\pi h}}$

 c. $d = 2\sqrt{\dfrac{3V}{\pi h}}$

 d. $d = \dfrac{6V}{\pi h}$

7. The debate team plans to make and sell trail mix. They can spend $34. The table below has the cost per pound of each ingredient. If r is the number of pounds of raisins and s is the number of pounds of sunflower seeds, which equation can be used to determine the total cost?

Item	Cost per Pound
Sunflower Seeds	$4.00
Raisins	$1.50

 a. $4s + 1.5r = 34$
 b. $4r + 1.5s = 34$
 c. $s + 4.5r = 34$
 d. none of the above

8. Solve the following inequality:
 $5c + 4 (c - 1) \geq 2 + 5 (2 + c)$

 a. $c \leq 1.625$
 b. $c \geq 1.625$
 c. $c \leq 4$
 d. $c \geq 4$

9. Kayle is going camping in the Ozark Mountains. She is packing bottled sports drinks to stay hydrated. The graph to the right shows her sports drink supply during her 14 day camping trip. Assuming she consumes an equal amount of the beverage each day, how many bottles should she pack for a 26 day camping trip?
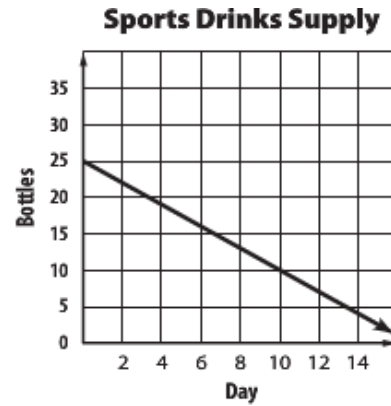
   a. 36
   b. 39
   c. 42
   d. 45

10. Which of the following ordered pairs is not in the solution set of
$y > -\frac{1}{2}x + 5$ and $y \le 3x - 2$?

   a. (5,3)
   b. (4,3)
   c. (3,4)
   d. (4,4)

11. The data shows the speed in mph and gas mileage in miles per gallon for a jet ski.   Which type of function would best model the data?

speed	22	31	39	42	47	51
mpg	19	22	25	23	20	18

   a. Linear
   b. Exponential
   c. Quadratic
   d. Radical

12. Calculate the average rate of change of the function represented in the following table.

x	0	2	4	6	8
y	5	8	11	14	17

   a. 3
   b. 2
   c. $\frac{2}{3}$
   d. $\frac{3}{2}$
   e. None of the above

13. A sequence is defined recursively by: $f(1) = 4; f(n) = f(n-1) + 3n$. Find $f(5)$.

    a. 16
    b. 24
    c. 33
    d. 46

14. Carlos and Mia are selling cookies for a school fundraiser. Carlos sold 4 package of chocolate chip cookies and 12 packages of sugar cookies for a total of $88. Mia sold 8 packages of chocolate chip cookies and 3 packages of sugar cookies for a total of $50. How much does one package of chocolate chip cookies and one package of sugar cookies cost?

    a. 1 package of chocolate chip cookies $2; 1 package of sugar cookies $5.50
    b. 1 package of chocolate chip cookies $4; 1 package of sugar cookies $6
    c. 1 package of chocolate chip cookies $6; 1 package of sugar cookies $6
    d. 1 package of chocolate chip cookies $8; 1 package of sugar cookies $9

15. The following set is listed in order from least to greatest:
    $\{2, 2, 7, x, y, 14\}$
The given mean of this set is 7. The only mode is 2. What is the value of y?

    a. 7
    b. 8
    c. 9
    d. 13

16. A class of ten students recently took a 100-point test. Classroom policy says any student who misses a test receives a 0 for that grade. Assuming the class average for the test is 83.4, what is the highest possible number of students who missed the test? Assume no extra credit.

    a. 1
    b. 2
    c. 3
    d. Not enough information

17. What is the mean of the following set in terms of x?
    $\{1, 1, x, 2x, 3x, x+1, x+2, 3\}$

    a. $x + 1$
    b. $x + 8$
    c. $8x + 8$
    d. $8x$

18. What is twice the interquartile range of the following set?
    {12, 19, 25, 28, 28, 31, 37, 41, 43}

   a. 17
   b. 22
   c. 28
   d. 34

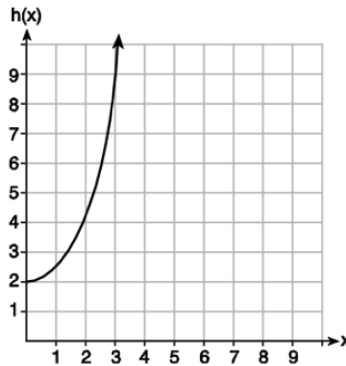19. Given the following box and whisker plot, which of the following correctly describes the 5 number summary?
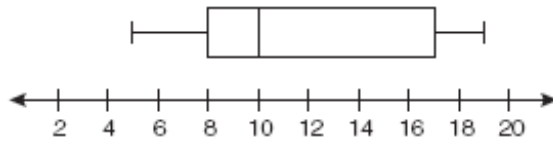
	Minimum	Q_1	Median	Q_3	Maximum
a.	5	8	10	17	19
b.	2	8	9	17	20
c.	5	7	11.8	18	19
d.	5	5	10	15	19

20. Given the functions $g(x)$, $f(x)$, and $h(x)$ shown below:

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

x	0	1	2	3
$f(x)$	1	2	5	7

The correct list of functions, ordered greatest to least, by average rate of change over the interval $0 \le x \le 3$ is given by:

   a. $f(x), g(x), h(x)$
   b. $h(x), g(x), f(x)$
   c. $g(x), f(x), h(x)$
   d. $h(x), f(x), g(x)$

21. The freezing points of water in degrees Fahrenheit and Celsius are 32 and 0 respectively. The boiling points of water in degrees Fahrenheit and Celsius are 212 and 100 respectively. Find the linear function for converting degrees Fahrenheit to degrees Celsius, C, using degrees in Fahrenheit, F, as the independent variable.

   a. $F(C) = 1.8C + 32$
   b. $C(F) = 1.8F + 32$
   c. $C(F) = \frac{5}{9}(F - 32)$
   d. $F(C) = \frac{5}{9}(C - 32)$

22. During a snowstorm, a meteorologist tracks the amount of accumulated snow. For the first three hours of the storm, the snow fell at a constant rate of one inch per hour. The storm then stopped for two hours and then started again at a constant rate of one-half inch per hour for the next four hours. If the snowstorm started at 6 p.m., how much snow had accumulated by midnight?

   a. 2 inches
   b. 3.5 inches
   c. 4 inches
   d. 5.5 inches

23. A picture is to be enlarged to have an area of 192 square inches. The picture's length is $\frac{4}{3}$ its width. What will be the dimensions of the picture after the enlargement?

   a. 12 inches by 16 inches
   b. 12 inches by 18 inches
   c. 14 inches by 16 inches
   d. 13 inches by 15 inches

24. A ball is thrown into the air with an upward velocity of 36 ft/sec. Its height h in feet after t seconds is given by the function $h = -16t^2 + 36t + 9$. In how many seconds does the ball reaches its maximum height? (Round to the nearest hundredth)

   a. 1.05 seconds
   b. 1.13 seconds
   c. 1.14 seconds
   d. 1.125 seconds

25. One leg of a right triangle is seven inches longer than the other leg. The hypotenuse is eight inches longer than the shorter leg. Find the length of the three sides of the triangle.

   a. 3in, 4in, and 5in
   b. 5in, 12in, and 13in
   c. 6in, 13in, and 14in
   d. 7in, 24in, and 25in

Name: _____

Tie – Breaker 1

Describe the area of the shaded region in the circle below as a function of x. What percentage of the circle's area does the shaded region represent? Express your answer in terms of π.
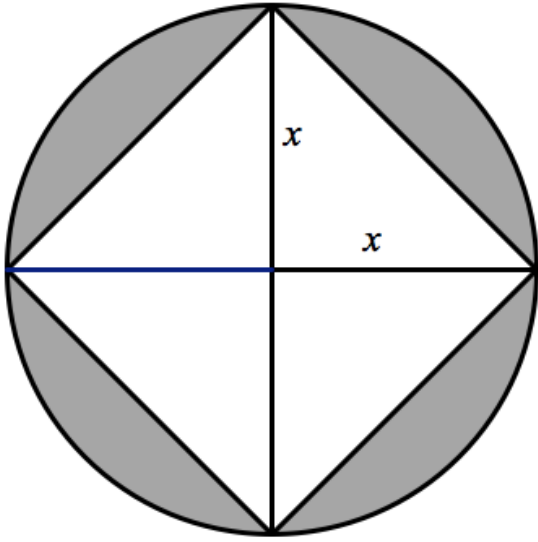
Name: _____

Tie – Breaker 2

Consider a triangle in the Cartesian plane with vertices (0,0), (3,4), and (4,2). Write the equations for the sides of the triangle in slope-intercept form.

Name: _____

Tie – Breaker 3

Janet is observing a culture of yeast cells. She begins observing the cells at 10:00 am on Saturday morning. When she was given the culture there was 1 yeast cell and she observed that the number of yeast cells doubled after 30 minutes. The population of the yeast cells continues to double every 30 minutes. Janet created the table below to keep track of the population of yeast cells.

Time	10:00	10:30	11:00	11:30	12:00	12:30	1:00	1:30	2:00
Number of hours (t) that have passed	0	.5	1						
Population of yeast	1	2	4						
Exponential form	2^0	2^1							

A. Complete the table assuming that the cell population continues to double every 30 minutes.

B. How many yeast cells will there be at 3:30 pm? Explain

C. Create a model to determine the number of cells, *n,* at any time, *t.*

Multiple Choice Answers
1. B
2. B
3. C
4. B
5. A
6. C
7. A
8. D
9. B
10. B
11. C
12. D
13. D
14. B
15. C
16. A
17. A
18. D
19. A
20. D
21. C
22. B
23. A
24. D
25. B

Tie Breakers
1.   A. $A(x) = \pi x^2 - 2x^2$ or $A(x) = x^2(\pi\text{-}2)$
      B. $100 - \frac{200}{\pi}$ or 36.34%.

2. $y = \frac{4}{3}x$; $y = \frac{1}{2}x$; $y = -2x + 10$

3.   A.

Time	10:00	10:30	11:00	11:30	12:00	12:30	1:00	1:30	2:00
Number of hours (t) that have passed	**0**	**.5**	**1**	1.5	2	2.5	3	3.5	4
Population of yeast	**1**	**2**	4	8	16	32	64	128	256
Exponential form	**2^0**	**2^1**	2^2	2^3	2^4	2^5	2^6	2^7	2^8

   B. There will be 2^{11} or 2048
   C. $n = 2^{2t}$