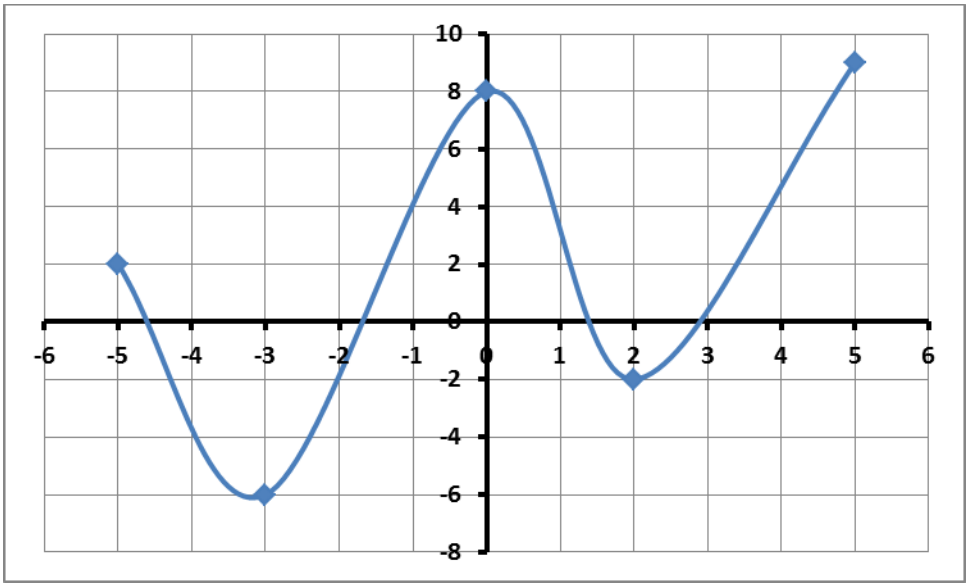
**Arkansas Council of Teachers of Mathematics**

**2013 Regional Exam**

**Algebra I**

**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 then #3 last). Be sure that your name is printed on each of the tiebreaker pages.**

1. A function is defined by the following graph. What are the function's domain and range?




A. Domain = {-5, -3, 0, 2, 5} Range = {2, -6, 8, -2, 9}
B. Domain = $-5 \leq x \leq 5$ Range = $-6 \leq y \leq 9$
C. Domain = {2, -6, 8, -2, 9} Range = {-5, -3, 0, 2, 5}
D. Domain = $x \geq 5$ Range = $y \geq -6$

2. What is the solution for this equation? $|2x - 3| = 5$
   A. $x = -4 \text{ or } x = 4$
   B. $x = -4 \text{ or } x = 3$
   C. $x = -1 \text{ or } x = 4$
   D. $x = -1 \text{ or } x = 3$

3. Charlie needs to simplify the expression below.

$$\frac{x^{18}y^{12} + x^{9}y^{8}}{x^{3}y^{4}}$$

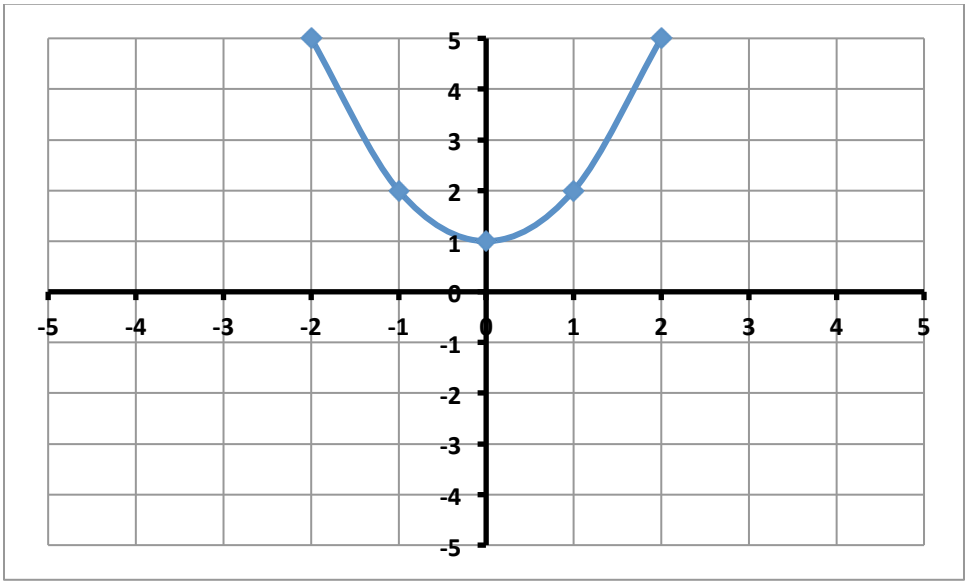
If x and y are not equal to 0, which of the following is a simplified version of the expression above?

   A. $x^9y^5$
   B. $x^{24}y^{16}$
   C. $x^6y^3 + x^3y^2$
   D. $x^{15}y^8 + x^6y^4$

4. The cost of hiring a specific taxi service is $1.25 per 1/4 mile driven plus a base charge of $2.50. Which equation best represents this function of cost per x miles driven?
   A. $f(x) = 1.25x + 2.50$
   B. $f(x) = 2.50x + 1.25$
   C. $f(x) = 0.3125x + 2.50$
   D. $f(x) = 5x + 2.50$

5. The equation of line *A* is $6x + 5y = 3$, and the equation of the line *B* is $5x - 6y = 0$. Which statement about the two lines is true?
   A. Lines *A* and *B* have the same y-intercept.
   B. Lines *A* and *B* are parallel.
   C. Lines *A* and *B* have the same x-intercept.
   D. Lines *A* and *B* are perpendicular.

6. Beth and Jacob are graphing two equations on a coordinate grid. Beth has graphed the equation $y = x^2 + 1$.




   If Jacob graphs $y = x^2 + 3$, where will his graph be in relation to the graph Beth made?
   A. 2 units up
   B. 3 units up
   C. 2 units left
   D. 3 units right

7. Which of the following is equivalent to the expression below?

$$(3x^2 + 2x - 8) - (2x^2 - 4x + 7)$$

   A. $x^2 + 6x - 15$
   B. $x^2 - 2x - 15$
   C. $x^2 + 6x - 1$
   D. $x^2 - 2x - 1$

8. Find the equation of a line that passes through the points (-5, 4) and (2, -1)?
   A. $y = -x + \frac{5}{7}$
   B. $y = -\frac{5}{7}x + \frac{3}{7}$
   C. $y = -x - 1$
   D. $y = \frac{5}{7}x + 1$

9. Simplify $2\sqrt{50} + 3\sqrt{32}$.
   A. $5\sqrt{82}$
   B. $22\sqrt{2}$
   C. $6\sqrt{82}$
   D. $14\sqrt{2}$

10. What are the solutions to the following equation?
$$x^2 + 2x - 15 = 0$$
   A. {-15, 2}
   B. {-10, 6}
   C. {-5, 3}
   D. {-3, 5}

11. Which point lies on the line defined by $3x + 6y = 2$?
   A. (0, 2)
   B. (6, 0)
   C. (1, -1/6)
   D. (-1/3, 1)

12. Jerry's parents bought him a computer for $1500. He promised to pay them $10 each week. When will Jerry owe his parents less than $1000?
   A. Before 50 weeks
   B. After 50 weeks
   C. At exactly 150 weeks
   D. After 150 weeks

13. What is the solution set of the inequality $5 - |x + 4| \leq -3$?
   A. $-2 \leq x \leq 6$
   B. $x \leq -2 \; or \; x \geq 6$
   C. $-12 \leq x \leq 4$
   D. $x \leq -12 \; or \; x \geq 4$

14. Solve: $3(x + 5) = 2x + 35$

    Step 1: $3x + 15 = 2x + 35$

    Step 2: $5x + 15 = 35$

    Step 3: $5x = 20$

    Step 4: $x = 4$

    Which is the first incorrect step in the solution shown above?

    A. Step 1
    B. Step 2
    C. Step 3
    D. Step 4

15. What is the solution to this system of equations?

$$\left\{\begin{matrix} y = -3x - 2 \\ 6x + 2y = -4 \end{matrix}\right\}$$

    A. (6, 2)
    B. (1, -5)
    C. No Solution
    D. Infinitely Many Solutions

16. The area of Alaska is about $6 \times 10^5$ square miles. The area of Rhode Island is about $1.5 \times 10^3$ square miles.

    What is the difference between the area of Alaska and Rhode Island?

    A. $4.5 \times 10^2$ square miles
    B. $4.5 \times 10^5$ square miles
    C. $5.985 \times 10^5$ square miles
    D. $5985 \times 10^5$ square miles

17. Which expression is the greatest common factor of $(125t^3m^5 + 60t^4m^4 + 85t^5m^2)$?

    A. $5t^3m^2$
    B. $5t^3m^5$
    C. $5t^4m^2$
    D. $5t^5m^5$

18. Which of these shows the following expression factored completely?

$$6x^2 + 15x - 36$$

    A. $(2x - 3)(x + 4)$
    B. $(6x + 9)(x - 4)$
    C. $3(2x - 3)(x + 4)$
    D. $3(2x + 3)(x - 4)$

19. Which is one of the solutions to the equation $2x^2 - x - 4 = 0$?

A. $\frac{1}{4} - \sqrt{33}$

B. $-\frac{1}{4} + \sqrt{33}$

C. $\frac{1+\sqrt{33}}{4}$

D. $\frac{-1-\sqrt{33}}{4}$

20. Use the matrices below to answer question 20.

Susie

| B | T |
|---|---|
| 5 | 6 |
| 1 | 7 |
| 2 | 3 |

Sally

| B | T |
|---|---|
| 3 | 1 |
| 8 | 6 |
| 12 | 0 |

B = Baby dolls

T = Teddy bears

Susie and Sally want to combine their toys. Which matrix represents the total?

A. $\begin{bmatrix} 8 & 5 \\ 9 & 1 \\ 14 & 3 \end{bmatrix}$

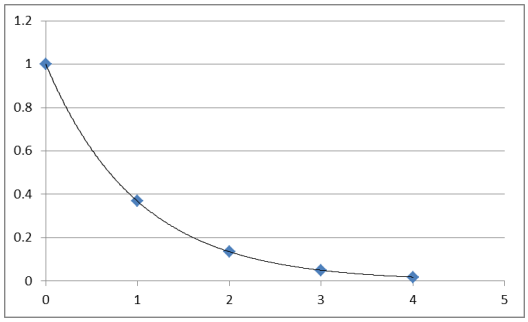
B. $\begin{bmatrix} 8 & 6 \\ 7 & 7 \\ 10 & 3 \end{bmatrix}$

C. $\begin{bmatrix} 8 & 7 \\ 9 & 13 \\ 14 & 3 \end{bmatrix}$

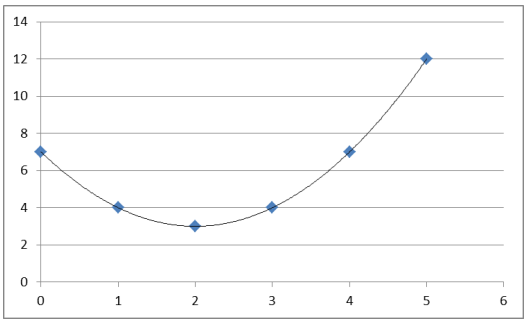
D. $\begin{bmatrix} 2 & 5 \\ -7 & 1 \\ -10 & 3 \end{bmatrix}$

21. Which graph best represents a linear function?

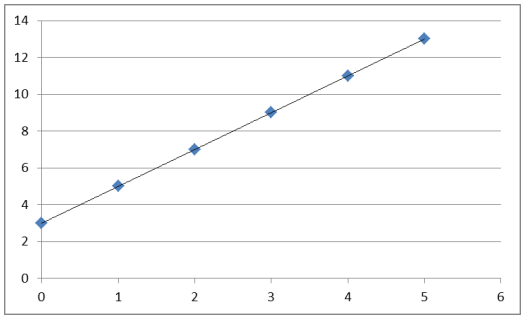
A.



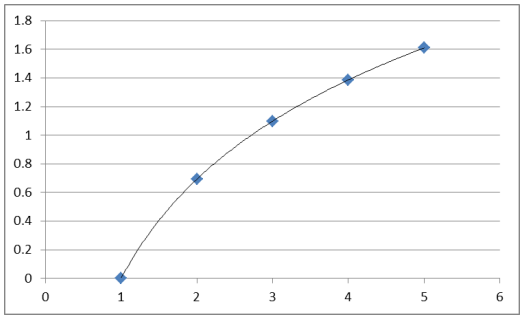

B.




C.




D.




22. A bowl contains pieces of paper, each labeled with a chore. Two read “clean one bathroom,” three read “clean one bedroom,” one reads “clean the living room,” and four read “rake leaves.” If Sam draws one piece of paper what is the probability that it will read “rake leaves”?

A. 1 out of 10
B. 1 out of 4
C. 4 out of 10
D. 4 out of 4

23. Mr. Vang sells guitars, drums, and violins. The matrix below displays the sales for March and April.

$$\begin{array}{c} \\ \textbf{March} \\ \textbf{April} \end{array} \begin{array}{c} \begin{array}{ccc} \textbf{Guitars} & \textbf{Drums} & \textbf{Violins} \end{array} \\ \begin{bmatrix} 27 & 51 & 75 \\ 42 & 93 & 60 \end{bmatrix} \end{array}$$

In May and June his sales are a third of March's sales and April's sales, respectively. Which matrix displays the sales for May and June?

A. $\begin{array}{c} \\ \textbf{May} \\ \textbf{June} \end{array} \begin{array}{c} \begin{array}{ccc} \textbf{Guitars} & \textbf{Drums} & \textbf{Violins} \end{array} \\ \begin{bmatrix} 9 & 17 & 25 \\ 14 & 31 & 20 \end{bmatrix} \end{array}$

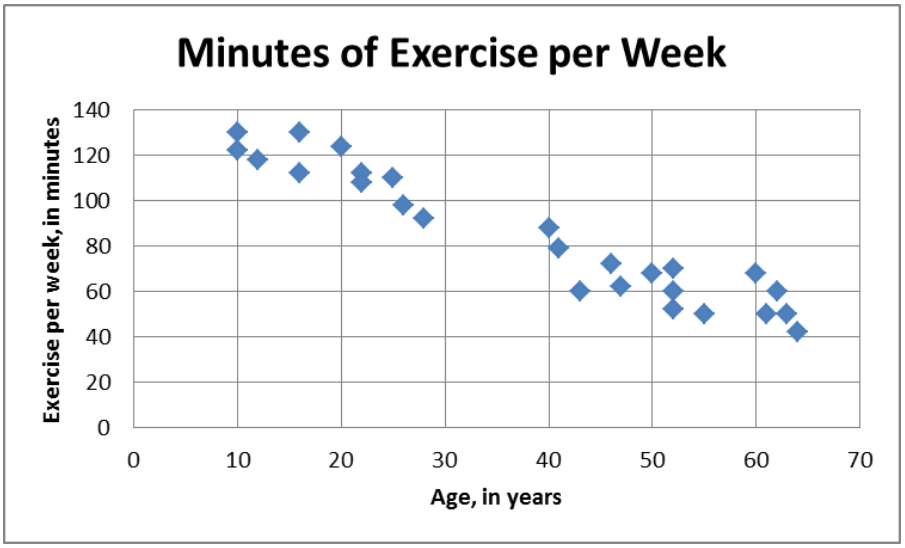
B. $\begin{array}{c} \\ \textbf{May} \\ \textbf{June} \end{array} \begin{array}{c} \begin{array}{ccc} \textbf{Guitars} & \textbf{Drums} & \textbf{Violins} \end{array} \\ \begin{bmatrix} 9 & 51 & 75 \\ 14 & 93 & 60 \end{bmatrix} \end{array}$

C. $\begin{array}{c} \\ \textbf{May} \\ \textbf{June} \end{array} \begin{array}{c} \begin{array}{ccc} \textbf{Guitars} & \textbf{Drums} & \textbf{Violins} \end{array} \\ \begin{bmatrix} 81 & 153 & 225 \\ 126 & 279 & 180 \end{bmatrix} \end{array}$

D. $\begin{array}{c} \\ \textbf{May} \\ \textbf{June} \end{array} \begin{array}{c} \begin{array}{ccc} \textbf{Guitars} & \textbf{Drums} & \textbf{Violins} \end{array} \\ \begin{bmatrix} 81 & 51 & 75 \\ 126 & 93 & 60 \end{bmatrix} \end{array}$

24. When water freezes, its volume increases by approximately 9%? To the nearest ounce, how much water would be needed to completely fill a 32 ounce container when frozen?
    A. 23 ounces
    B. 29 ounces
    C. 35 ounces
    D. 41 ounces

25. A survey was taken asking participants their age and the number of minutes they exercise per week. The results of the survey are shown in the scatter plot below.




The data for people who are 30 to 39 years of age are not displayed. Based on the scatterplot, how many minutes would a 30 to 39 year-old person be expected to exercise?

A. 50 – 70 minutes
B. 70 – 90 minutes
C. 90 – 110 minutes
D. 110 – 130 minutes

Name: _____

Tie-Breaker 1

Groups of students stood in a circle and passed a ball from one student to the next student on the left. Another student recorded the time it took for the ball to go completely around the circle to each student once. The table below shows the recorded times for different numbers of students in the circle.

**TIME NEEDED TO PASS THE BALL COMPLETELY AROUND THE CIRCLE**

| Number of Students (n) | Time, in seconds, (t) |
|---|---|
| 5 | 9.5 |
| 7 | 13.3 |
| 9 | 17.1 |

Write an equation that can be used to approximate the time, t, it will take for any number of students, n, to pass the ball completely around the circle. Then, estimate the amount of time it will take 50 students to pass the ball around the circle.

Name: _____

Tie-Breaker 2

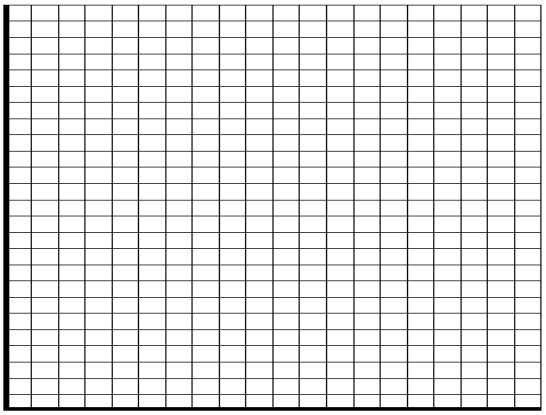
Portland and Seattle are about 180 miles apart. The Da Vinci family leaves Seattle at the same time the Fermat family leaves Portland. The Da Vinci family travels at a constant speed of 55 miles per hour to Portland, and the Fermat family travels to Seattle at a constant speed of 65 miles per hour.

A. How many miles from Seattle or Portland will the two families meet?
B. How long will it take them to meet?

Name: _____

Tie-Breaker 3

Susan and Whitney are participating in a pumpkin tossing event. They have asked you to test their pumpkin tossing device and provide data to them. After testing you found that the flight of the pumpkin is modeled by the equation $h(t) = 5 + 12t - 3t^2$, where h is the height of the pumpkin in feet while in flight and t is the time in seconds.



A) Complete the table below and sketch the function.

| t | h |
|---|---|
| 0 | |
| 1 | |
| 2 | |
| 3 | |
| 4 | |

B) The pumpkin's time in the air is measured from the time it leaves the launching device until it hits the ground. Based on this information, from what height was the pumpkin launched?

C) What is the maximum height the pumpkin reaches? After how much time does the pumpkin reach its maximum height?

D) How much time passes before the pumpkin hits the ground? (Round to the nearest hundredth of a second.)

Multiple Choice Answer Key

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

Tie-Breaker 1 Answer Key

Equation: $t(n) = 1.9n$

Time for 50 students: $t(50) = 95\ seconds$

Tie-Breaker 2 Answer Key

Distance: 97.5 miles from Portland OR 82.5 miles from Seattle

Time: 1.5 hours

Tie-Breaker 3 Answer Key

A) Table:

| t | h |
|---|---|
| 0 | 5 |
| 1 | 14 |
| 2 | 17 |
| 3 | 14 |
| 4 | 5 |

B) 5 feet
C) 17 feet, 2 seconds
D) 4.38 seconds