

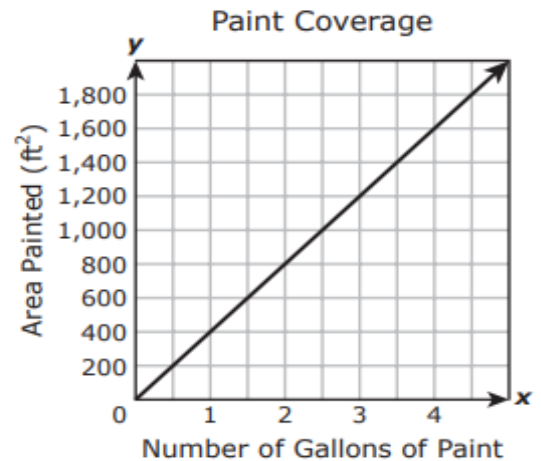
**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

Work the multiple-choice questions first, choosing the single best response from the choices available. Indicate your answer here and on your answer sheet. Then attempt the tie-breaker questions at the end starting with tie breaker #1, then #2, and then #3. Turn in your answer sheet and the tie-breaker pages when you are finished. You may keep the pages with the multiple-choice questions. Figures are not necessarily drawn to scale.

1. Which expression is equivalent to $\sqrt{18x^{16}}$?

- A. $3x^4\sqrt{2}$
- B. $3x^8\sqrt{2}$
- C. $9x^4\sqrt{2}$
- D. $9x^8\sqrt{2}$

2. The graph on the right shows the linear relationship between the maximum area in square feet that can be painted and the number of gallons of paint used.



Which of these best represent the rate of change of the maximum area painted with respect to the number of gallons of paint used?

- A. $200 \frac{ft^2}{gal}$
- B. $\frac{1}{200} \frac{ft^2}{gal}$
- C. $400 \frac{ft^2}{gal}$
- D. $\frac{1}{400} \frac{ft^2}{gal}$

3. Which expression is equivalent to $-28x^2 + 35x$?

- A. $7x(4x + 5)$
- B. $-7x(4x - 5)$
- C. $7x(4x - 5)$
- D. $-7x(4x + 5)$

4. Which values are solutions to $-x^2 + 17x + 60 = 0$?

- A. $x = \{20, -3\}$
- B. $x = \{-20, 3\}$
- C. $x = \{5, 12\}$
- D. $x = \{-5, -12\}$

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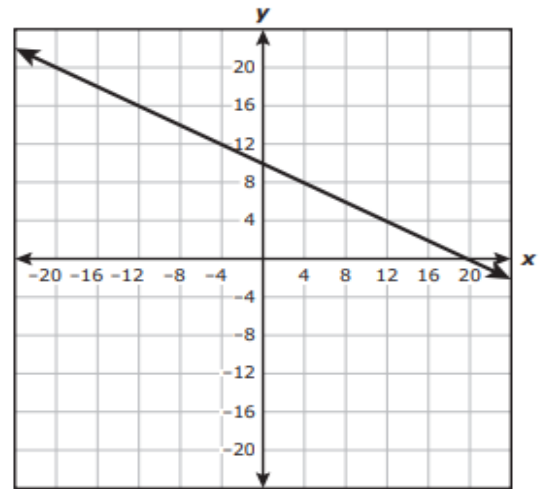
5. Which expression is equivalent to $(h^2 + 9h - 1)(-4h + 3)$?

- A. $-4h^3 - 33h^2 + 31h - 3$
- B. $4h^3 + 39h^2 - 23h - 3$
- C. $-4h^3 - 39h^2 + 23h + 3$
- D. $4h^3 + 33h^2 - 31h + 3$

6. The line graphed on the right represents the first of two equations in a system of linear equations.

If the graph of the second equation in the system passes through the points $(-12, 20)$ and $(4, 12)$, which statement is true?

- A. The only solution to the system is $(10, 5)$.
- B. The only solution to the system is $(0, 14)$.
- C. The system has no solution.
- D. The system has an infinite number of solutions.



7. The zeros of a polynomial are -1 and 4 . Find the polynomial with these zeros.

- A. $f(x) = x^2 + 5x + 4$
- B. $f(x) = x^2 - 3x - 4$
- C. $f(x) = x^2 - 4x - 4$
- D. $f(x) = x^2 - 3x + 4$

8. Factor $x^3 - 25x$.

- A. $x(x - 12)(x + 3)$
- B. $x(x - 5)(x - 5)$
- C. $x(x + 5)^2$
- D. $x(x - 5)(x + 5)$

**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

9. Simplify $\frac{x+3}{6+x} - \frac{7}{x-2}$.

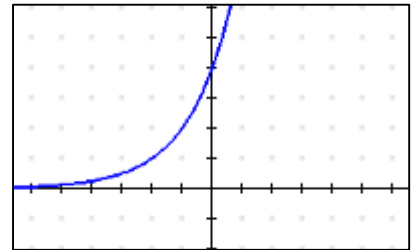
- A. $-\frac{x-4}{4}$
- B. $\frac{x^2+8x+36}{x^2+4x-12}$
- C. $\frac{x-4}{8}$
- D. $\frac{x^2-6x-48}{x^2+4x-12}$

10. In a certain city, the cost of a taxi ride is computed as follows: There is a fixed charge of \$2.65 as soon as you get in the taxi, to which a charge of \$2.30 per mile is added. Find an equation that can be used to determine the cost, $C(x)$, of an x -mile taxi ride, and use this equation to find the cost of a 5-mile taxi ride.

- A. $C(x) = 2.65x + 2.30$; \$15.90
- B. $C(x) = 2.30x + 2.65$; \$14.15
- C. $C(x) = 2.30x$; \$11.50
- D. $C(x) = 2.65x$; \$13.25

11. Which of the following functions best describes the graph to the right?

- A. $f(x) = 2(4^x)$
- B. $f(x) = 1(4^{2x})$
- C. $f(x) = 4(2^{x-1})$
- D. $f(x) = 2(2^{x+1})$



12. Two customers went to a post office to buy postcards and large envelopes. Each postcard costs the same amount, and each large envelope costs the same amount.

- The first customer paid \$12.00 for 14 postcards and 5 large envelopes.
- The second customer paid \$24.80 for 10 postcards and 15 large envelopes.

What was the cost in dollars of each large envelope?

- A. \$1.42
- B. \$0.35
- C. \$1.15
- D. \$0.63

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13. Which statement about $g(x) = x^2 - 576$ is true?
- A. The zeros, -288 and 288 , can be found when $0 = (x + 288)(x - 288)$.
 - B. The only zero, 288 , can be found when $0 = (x - 288)^2$.
 - C. The zeros, -24 and 24 , can be found when $0 = (x + 24)(x - 24)$.
 - D. The only zero, 24 , can be found when $0 = (x - 24)^2$.
14. In the year 1900, the total number of metric tons of copper produced in the world was 495,000. Each year since 1900, the total number of metric tons of copper produced has increased on average by about 3.25% over the amount produced the previous year. Which function models the total number of metric tons of copper produced in the year that is x years since 1900?
- A. $C(x) = 495,000(1.0325)^x$
 - B. $C(x) = 495,000(0.9675)^x$
 - C. $C(x) = 495,000x^{1.0325}$
 - D. $C(x) = 495,000x^{0.9675}$
15. Which statement about the graph of $y = 8 \cdot (0.25)^x$ is true?
- A. The coordinates of the x -intercept are $(0.25, 0)$.
 - B. The coordinates of the y -intercept are $(0, 8)$.
 - C. The equation of the asymptote is $x = 0$.
 - D. None of these are true.
16. During a sale at a shoe store all shoes were 25% off the original price. Which statement best describes the functional relationship between the sale price of a pair of shoes and the original price?
- A. The sale price is dependent on the original price.
 - B. The original price is dependent on the sale price.
 - C. The sale price and the original price are independent on the other
 - D. The sale price is dependent on the number of pairs of shoes purchased.

**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

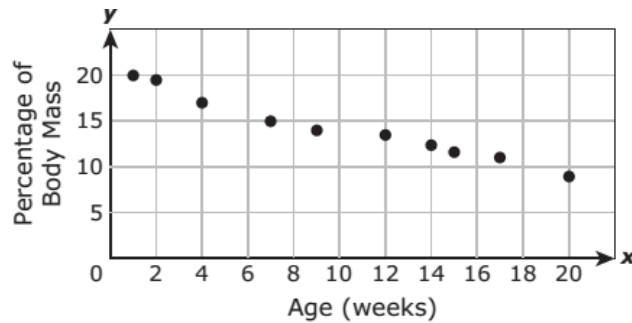
17. If the graph of $y = 19x^2 + 31$ is translated up 15 units, which of the following equations will best describe the resulting graph?
- A. $y = 34x^2 + 31$
 - B. $y = 34x^2 + 46$
 - C. $y = 19x^2 + 46$
 - D. $y = 19x^2 + 16$
18. Several terms of a sequence of numbers are $a_3 = 0$, $a_4 = 6$, $a_5 = 12$, $a_6 = 18$, and $a_7 = 24$. Based on this information, which equation can be used to find the term of the sequence a_n ?
- A. $a_n = -6n + 18$
 - B. $a_n = -18n + 6$
 - C. $a_n = 6n - 18$
 - D. $a_n = 18n - 6$
19. Scientists are studying a bacteria sample. The function $f(x) = 245 \cdot \left(1 + \frac{12}{100}\right)^x$ gives the number of bacteria in the sample at the end of x days. Which statement is the best interpretation of the values in this function?
- A. The initial number of bacteria that was present was 12.
 - B. The initial number of bacteria decreases at a rate of 88% each day.
 - C. The number of bacteria increases at a rate of 12% each day.
 - D. The number of bacteria at the end of one day is 245.
20. What are the integer domains and ranges of the function: $f(x) = (-37)$?
- A. Domain: All integers greater than or equal to (-37) ; Range: All integers.
 - B. Domain: $\{-37\}$; Range: All integers.
 - C. Domain: All integers; Range: All integers greater than or equal to (-37) .
 - D. Domain: All integers; Range: $\{-37\}$.

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2019 Algebra I Regional Exam**

21. A zookeeper recorded the feeding schedule for a baby rhinoceros for 20 weeks. The table and scatter plot show the percentage of the baby rhinoceros's body mass that was used to determine the amount of food given at each feeding as a linear function of its age in weeks.

Baby Rhinoceros Feeding Schedule

Age (weeks)	1	2	4	7	9	12	14	15	17	20
Percent of body mass	20	19.5	17	15	14	13.5	12.4	11.6	11	9



What is the best prediction of the percentage of the baby rhinoceros's body mass that should be used to determine the amount of food given at each feeding when it is 25 weeks old?

- A. 8.5%
- B. 6.1%
- C. 2.5%
- D. 10.0%

22. The table represents some points on the graph of a linear function.

x	y
-20	-268
-14	-196
-8	-124
-1	-40

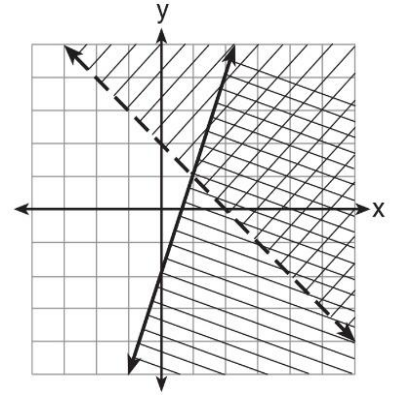
What equation represents the same relationship?

- A. $y + 268 = \frac{1}{12}(x + 20)$
- B. $y + 20 = \frac{1}{12}(x + 268)$
- C. $y + 268 = 12(x + 20)$
- D. $y + 28 = 12(x + 268)$

Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam

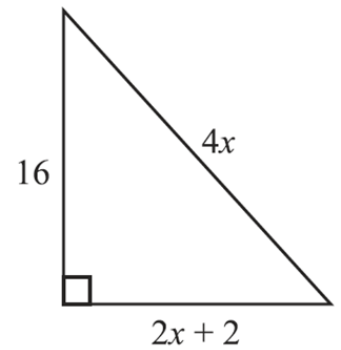
23. Find the system of inequalities that represents the graph.

- A. $x + y > 2$
 $3x - y \leq -2$
- B. $x + y > 2$
 $-3x + y \leq -2$
- C. $x + y < 2$
 $-3x - y \geq -2$
- D. $-x + y > 2$
 $3x - y \leq -2$



24. Use the triangle figure to the right for this question. The area of the right triangle is 96 square inches. What is the perimeter of the triangle?

- A. 5 inches
- B. 12 inches
- C. 20 inches
- D. 48 inches



25. Which value is in the solution set of $|x| - 2 \leq 3$?

- A. $x = -9$
- B. $x = -6$
- C. $x = 0$
- D. $x = 7$

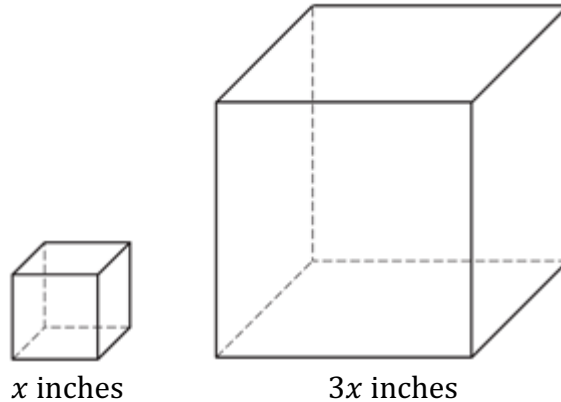
**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

Tie Breaker #1

Name: _____

School: _____

A small cube and a large cube with **edge lengths** given in inches are represented by mathematical expressions which are shown in the diagram. (The diagram may not be drawn to scale).



Given: The small cube has a volume of 64 cubic inches.

- A. What is the value of x ?

- B. What is the surface area, in square inches, of the small cube?

- C. The surface area of the large cube is how many times larger than the surface area of the small cube?

- D. The volume of the large cube is how many times the volume of the small cube?

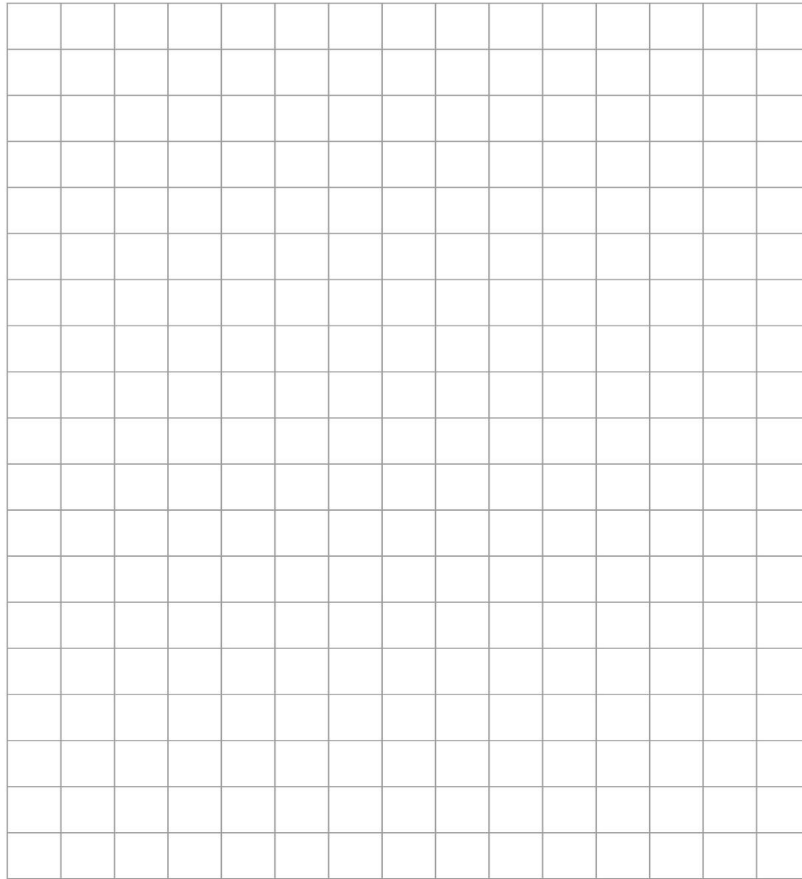
**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

Tie Breaker #2

Name: _____

School: _____

A company is considering building a manufacturing plant. They determined the weekly production cost at site A to be $A(x) = 3x^2$ while the production cost at site B is $B(x) = 8x + 3$, where x represents the number of products, in hundreds, and $A(x)$ and $B(x)$ are the production costs, in hundreds of dollars.



- A. Graph the production cost functions on the set of axes above. Label your axes site A and site B.

- B. State the positive value(s) of x for which the production costs at the two sites are equal.

- C. If the company plans on manufacturing 200 products per week, which site should they use?

**Arkansas Council of Teachers of Mathematics
2019 Algebra I Regional Exam**

Tie Breaker #3

Name: _____

School: _____

Brazil is the most populous country in South America. In 2005, its population was about 186 million people. It was growing at a rate of about 1.1% per year. Nigeria is the most populous country in Africa. Its 2005 population was about 129 million. It was growing at a rate of about 2.4% per year.

- A. Assuming that these growth rates continue, write a function to predict the populations of each country for any number of years x in the future.

Brazil:	Nigeria:

- B. In what year will Brazil's population reach 300 million?

- C. In what year will Nigeria's population reach 200 million?

- D. In what year will Nigeria's population first be greater than Brazil's?

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2019 Algebra I Regional Exam**

Answer Key:

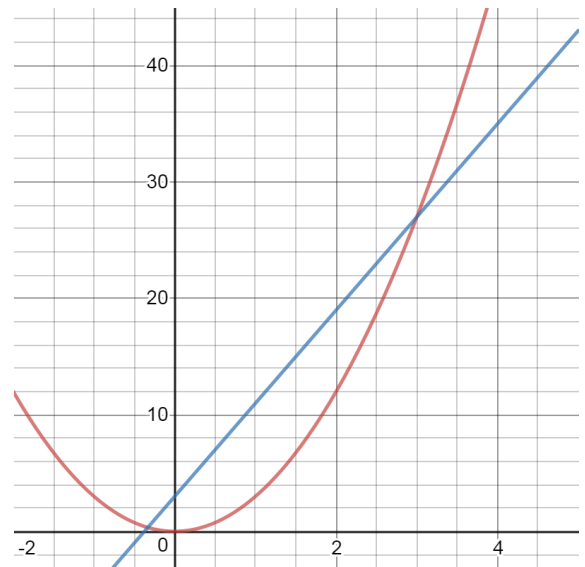
1	B	10	B	19	C
2	C	11	D	20	D
3	B	12	A	21	B
4	A	13	C	22	C
5	A	14	A	23	B
6	C	15	B	24	D
7	B	16	A	25	C
8	D	17	C		
9	D	18	C		

Tie Breaker #1

- A. 4 inches
- B. 96 inches squared
- C. 9
- D. 27

Tie Breaker #2

- A. See graph to the right
- B. 300 products or $x = 3$ (extraneous solution of $x = -\frac{1}{3}$)
- C. Site A (because $A(2) = 12 < B(2) = 19$)



Tie Breaker #3

- A. $y = 186 \cdot (1.011)^x$ and $y = 129 \cdot (1.024)^x$
- B. Year 2049 ($x \approx 43.7$, so $year = 2005 + 43.7 = 2048.7 \approx 2049$)
- C. Year 2024 ($x \approx 18.5$, so $year = 2005 + 18.5 = 2023.5 \approx 2024$)
- D. Year 2034 ($x \approx 28.6$, so $year = 2005 + 28.6 = 2033.6 \approx 2034$)