

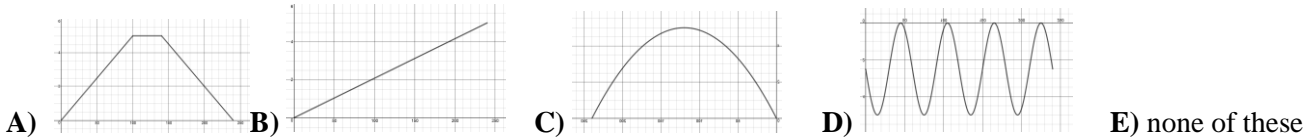
MONTANA COUNCIL OF TEACHERS OF MATHEMATICS  
2017 MATH CONTEST  
INTERMEDIATE

DIRECTIONS: DO NOT WRITE ON THIS TEST. Place the best answer for each question on the separate answer sheet.

1. A water wheel has twelve buckets, each bucket is equally spaced around the wheel. The wheel has a radius of 2.5 feet, and rotates at a rate of 4 revolution per minute. A snail is stuck to one of the buckets on the water wheel. The approximate distance the snail will travel in one minute is :

A) 6.28 ft      B) 15.7 ft      C) 19.6 ft      D) 62.83 ft      E) none of these

2. Consider the snail on the water wheel from problem 1. The graph of the snail's height versus time would be best represented by which graph below?



3. Find the equation of the line that passes through the point (2,5) and is perpendicular to the line  $3x + 4y = 8$

A)  $y = -\frac{3}{4}x + \frac{7}{3}$       B)  $y = \frac{4}{3}x + \frac{7}{3}$       C)  $y = \frac{4}{3}x + \frac{23}{3}$       D)  $y = \frac{4}{3}x - \frac{14}{3}$       E) none of these

4. With two minutes left in the game, Sidney Eagles lead Glendive Red Devils 76 to 69. During the final minutes, Sidney scores 4 points per minute of regulation time. For Glendive to win the game, without going in to overtime by at least one point, what is the minimum number of points per minute of regulation time that they must average?

A) 4      B) 5.5      C) 8      D) 15      E) none of these

5. The Indianapolis 500 is an auto race 500 miles long. The racing oval is 2.5 miles in length. The record speed of 229.4 mph for the fastest qualifying time for 4 laps is from 2002 held by Sarah Fischer. How long did it take her to complete her 4 laps?

A) .04 min.      B) 2.6 min.      C) 22.9 min.      D) 57.4 min.      E) none of these

6. In the problem above, what was Sarah's speed in feet per second?

A) .0007 ft/sec      B) 2.6 ft/sec      C) 336.5 ft/sec      D) 20187.2 ft/sec      E) none of these

7. Find the eleventh term in the sequence  $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \dots$

A)  $\frac{1}{177,147}$       B)  $\frac{1}{59,049}$       C)  $\frac{1}{19,683}$       D)  $\frac{1}{243}$       E) none of these

8. Mr. Taylor's class held an egg launching contest on the football field. Teams of students built catapults that will hurl an egg down the field. The winning team used a high speed camera to capture the flight of their egg. They used regression to determine an equation to represent the distance,  $x$ , from the goal line vs the height,  $y$ , above the ground given :  $y = -1.3x^2 + 39.6x - 195.1$

Based on this equation, how far from the goal line did the team set up their catapult?

A) 0 ft.      B) 6.1 ft.      C) 15.2 ft.      D) 106.5 ft.      E) none of these

9. How high was the egg at its highest point?

A) 0 ft.      B) 6.1 ft.      C) 15.2 ft.      D) 106.5 ft.      E) none of these

10. Evaluate  $1! + 2! + 3! + 4!$

A) 10      B) 24      C) 33      D) 64      E) none of these

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11. Simplify  $\frac{2x^2-35x-18}{x-18}$   
 A)  $2x - 18$       B)  $2x - 35$       C)  $x - 18$       D)  $2x + 1$       E) none of these
12. What is the smallest integer value  $x$  for which  $\sqrt{x^2 - 9}$  is defined?  
 A) -3      B) -2      C) 2      D) 3      E) none of these
13. Factor completely:  $8x^2 - 4x - 12$   
 A)  $(4x + 3)(2x - 4)$     B)  $(2x + 6)(4x - 2)$     C)  $2(4x + 3)(x - 2)$     D)  $(8x + 12)(x - 1)$     E) none of these
14. In your class of 25, all but one student took the last math test on time. The mean score is 72. After the final student takes the test the new mean score is 72.8. What was the score for the last student?  
 A) 65      B) 73      C) 92      D) 100      E) none of these
15. Evaluate the following function when  $x = 5$ :  $f(x) = \begin{cases} x^2 + 7; & x < 0 \\ x & ; 0 \leq x < 5 \\ x + 5; & 5 \leq x \end{cases}$   
 A) 5      B) 10      C) 32      D) -5      E) none of these
16. The equation to represent the  $x$  values a distance of 5 from zero?  
 A)  $0 = |x - 5|$     B)  $0 = x - 5$       C)  $0 = |x - 25|$     D)  $x = 5$       E) none of these
17. Consider all triangles with an area of 25. Write the equation showing that height is inversely proportional to the base of the triangle. What is the constant,  $k$ , of proportionality?  
 A)  $A = \frac{1}{2}bh; k = 25$     B)  $\frac{b}{2} = \frac{25}{h}; k = 2$     C)  $25 = \frac{1}{2}bh; k = 25$     D)  $h = \frac{50}{b}; k = 50$     E) none of these
18. Which of the following points is a solution to the system of equations?  
 $x + 2 \leq y$   
 $2x - 5 \leq y$   
 $-.5x + 7 \leq y$   
 A) (0,0)      B) (3,5)      C) (3,3)      D) (4,11)      E) none of these
19. Consider each of the following functions. Which has the greatest minimum value?  
 A)  $y = \cos x + 2$     B)  $y = 2(x - 3)^2 + 5$     C)  $y = e^{(x-4)} + 3$     D)  $y = \frac{1}{2}|x - 2| + 4$     E) none of these
20. On a dartboard, a circle is inscribed in a 12 inch square. What is the probability that a dart landing on the dartboard, will be outside the circle?  
 A)  $\frac{4-\pi}{4}$       B)  $\frac{1-\pi}{4}$       C)  $\frac{2-3\pi}{2}$       D)  $\frac{\pi}{4}$       E) none of these
21. Cylinder A has diameter 6 and height 10. Cylinder B has radius 4 and height 6. Which of the following is true about their volumes?  
 A) Cylinder B is larger by  $6\pi$     B) Cylinder B is larger by  $24\pi$     C) Cylinder A is larger by  $24\pi$   
 D) The volumes are equal.      E) none of these

**B) INTERMEDIATE 2017 Answer Key**

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