MCTM

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2017 MATH CONTEST
PROBLEM SOLVING TEST

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

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1. A rectangular park is 30 meters by 40 meters, what is the length a diagonal sidewalk in the park?

A) $\sqrt{70}$ meters **B)** 50 meters **C)** 70 meters **D)** 2500 meters **E)** none of these

2. An equilateral triangle has side lengths 50. What is the area of the triangle?

A) 150 **B)** $625\sqrt{2}$ **C)** $625\sqrt{3}$ **D)** 2500 **E)** none of these

3. What is the y-intercept of the equation: $2x + 3y = 12$.

A) 2 **B)** 3 **C)** 4 **D)** 6 **E)** none of these

4. Charlie has $100 in his lunch account and spends $2.50 on lunch each day. Which equation models the amount of money, y, Charlie has after purchasing x lunches?

A) $y = 100 + 2.50x$ **B)** $y = 100 – 2.50x$ **C)** $y = 100x + 2.50$ **D)** $y = 100x – 2.50$ **E)** none of these

5. Charlie has $100 in his lunch account and spends $2.50 on lunch each day. How much money does Charlie have in his account after buying 14 lunches?

A) $57.50 **B)** $62.50 **C)** $70 **D)** $75 **E)** none of these

6. Which equation could represent this pattern? 3, 7, 11, 15, 19, …

A) $y = 3x + 7$ **B)** $y = 3x + 4$ **C)** $y = 4x – 1$ **D)** $y = 7x + 3$ **E)** none of these

7. Which equation could represent this pattern? 64, 32, 16, 8, 4, …

A) $y = 64(2)^x$ **B)** $y = 32(2)^x$ **C)** $y = 128\left(\frac{1}{2}\right)^x$ **D)** $y = 64\left(\frac{1}{2}\right)^x$ **E)** none of these

x	0	1	2	3	4
y	2	6	18	54	162

8. What type of function is represented in the table at right?

A) Linear **B)** Exponential **C)** Quadratic **D)** cubic **E)** none of these

9. Which equation models the data in the previous table?

A) $y = 3x + 2$ **B)** $y = 3x^2 + 2$ **C)** $y = 2(3)^x$ **D)** $y = 2(3)^{x-1}$ **E)** none of these

10. If Savannah, on average, sends 6 texts each minute from 11:50am -12:32pm during lunch. How many texts will be sent in 5 days?

A) 210 **B)** 252 **C)** 540 **D)** 1080 **E)** none of these

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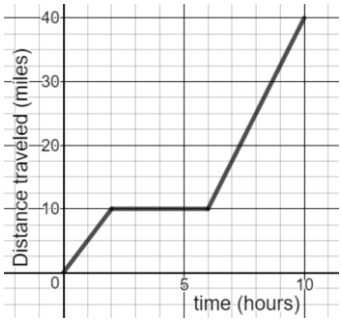
11. Which is a solution to this system: $y < 3x + 2$ and $y \geq \frac{1}{2}x - 4$

A) (5 , -3) **B)** (0 , 2) **C)** (0 , -4) **D)** (-5 , 0) **E)** none of these

12. A wrestling team is moving bricks to make money as a fundraiser. They move 2000 bricks, which weigh 3 pounds each. If 1 kg is approximately 2.2 pounds, approximately how many kilograms did they move?

A) 1333 **B)** 2727 **C)** 3000 **D)** 14520 **E)** none of these

13. Which models the piecewise function to the right



A) $f(x) = \begin{cases} 5x, & 0 \leq x < 2 \\ 10, & 2 \leq x \leq 6 \\ 7.5(x-6)+10, & 6 < x \leq 10 \end{cases}$ **B)** $f(x) = \begin{cases} 2x, & 0 \leq x < 2 \\ 10, & 2 \leq x \leq 6 \\ 7.5x, & 6 < x \leq 10 \end{cases}$

C) $f(x) = \begin{cases} 5x, & 0 \leq x < 2 \\ 4, & 2 \leq x \leq 6 \\ 7.5(x-6)+10, & 6 < x \leq 10 \end{cases}$ **D)** $f(x) = \begin{cases} 5x, & 0 \leq x < 10 \\ 10, & x = 10 \\ 7.5(x-6)+10, & 10 < x \leq 40 \end{cases}$

E) none of these

14. Using the previous graph, what is the rate of change from 2 hours to 6 hours?

A) 0 mph **B)** 7.5 mph **C)** 10 mph **D)** 15 mph **E)** none of these

15. If this represents Donna's bike ride, when is she traveling the fastest?

A) 0 – 2 hours **B)** 2 – 4 hours **C)** 2 – 6 hours **D)** 6 – 10 hours **E)** none of these

$F = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ $G = \begin{bmatrix} 1 & 0 & 2 \\ -3 & 1 & -4 \end{bmatrix}$ $H = \begin{bmatrix} -3 & 6 \\ 5 & -2 \end{bmatrix}$

16. What is the value of the element in row 1, column 2 of $F \cdot G$?

A) 2 **B)** 3 **C)** 4 **D)** 7 **E)** undefined

17. Which matrix operation is undefined?

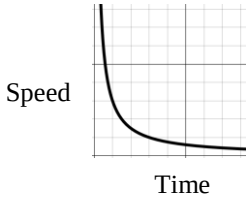
A) $F - H$ **B)** $F + H$ **C)** $G \cdot H$ **D)** H^{-1} **E)** none of these

18. What is matrix is $F - H$?

A) $\begin{bmatrix} 4 & -4 \\ -2 & 6 \end{bmatrix}$ **B)** $\begin{bmatrix} -2 & 8 \\ 8 & 2 \end{bmatrix}$ **C)** $\begin{bmatrix} -2 & -4 \\ -2 & 2 \end{bmatrix}$ **D)** $\begin{bmatrix} 7 & 2 \\ 11 & -10 \end{bmatrix}$ **E)** undefined

19. Which type of function models the pictured graph of a car trip from Billings to Bozeman?

A) Inverse variation **B)** Direct Variation **C)** Linear **D)** Exponential Growth **E)** none of these



20. As time increases, the speed ...

A) increases. **B)** approaches zero. **C)** stays constant **D)** becomes negative **E)** none of these

21. If a car takes 2 hrs to make a trip at 60 mph, how long would it take the car to make the trip at 20 mph?

A) 40 min. **B)** 60 min. **C)** 4 hours **D)** 6 hours **E)** none of these

PROBLEM SOLVING 2017 Answer Key

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