MONTANA COUNCIL OF TEACHERS OF MATHEMATICS

2019 MATH CONTEST

PROBLEM SOLVING TEST

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

****

1. Determine the area of a rectangle with length 6.4×10^{-3} meters and width 2.5×10^{-2} meters.

A) 1.6×10^{-5} sq.m **B)** 1.6×10^{-4} sq.m **C)** 8.9×10^{-4} sq.m **D)** 1.6×10^{6} sq.m **E)** none of these

2. Georgette, the alien from Venus, who lives next door collects thingamabobs. In her extensive travels throughout the universe she has received 1.5×10^9 thingamabobs from her 3×10^3 friends. If she were to equally divide all her thingamabobs for her friends how many would each friend get?

A) 5×10^3 **B)** 5×10^5 **C)** 4.5×10^6 **D)** 4.5×10^{12} **E)** none of these

3. Each day for a week Carl and his grandson Russell count blue cars that pass by as they eat their ice cream cones. During the week the daily counts were: 12, 15, 3, 23, 17, 12, 11. If the next day they count 8 blue cars which of the following are true?

A) only the mean changes **B)** only the median changes **C)** the mean & median change
D) neither the mean nor the median changes **E)** none of these

4. Awanatu tells her daughter Mallia she can go riding with her friends if she cleans the kitchen. If Mallia rides with her friends she always eats candy. Mallia is eating candy. What can be concluded?

A) Mallia is riding **B)** Mallia cleaned the kitchen **C)** Mallia is not riding
D) Mallia did not clean the kitchen **E)** none of these

5. A line with slope of $-\frac{2}{3}$ goes through the point $(6, -9)$. Write the equation of the line in Standard form.

A) $2x + 3y = 39$ **B)** $2x - 3y = -15$ **C)** $-2x + 3y = 39$ **D)** $2x + 3y = -15$ **E)** none of these

6. The equation $x = \frac{7}{y}$ is an example of what type of variation?.

A) direct variation **B)** combined variation **C)** inverse variation **D)** joint variation **E)** none of these

7. The money you earn at an after school job varies directly with how many hours you work. If the job pays $8.30 an hour (minimum wage), How many hours will it take to earn at least $400?

A) 48 hours **B)** 49 hours **C)** 50 hours **D)** 3320 hours **E)** none of these

8. Simplify the following expression $\frac{(2x^{-2})^3(8x^2yz^3)}{4x^{-2}y^7z}$

A) $\frac{16z^2}{x^2y^6}$ **B)** $\frac{16x^2z^2}{y^6}$ **C)** $\frac{4x^2z^2}{y^6}$ **D)** $\frac{16z^2}{x^6y^2}$ **E)** none of these

9. A triangle has no diagonals. A quadrilateral has two diagonals. A pentagon has five diagonals. A hexagon has nine diagonals. How many diagonals does a decagon have?

A) 14 **B)** 29 **C)** 35 **D)** 41 **E)** none of these

10. Find the next term in the sequence: A, C, F, J, O, …

A) S **B)** U **C)** V **D)** X **E)** none of these

PROBLEM SOLVING 2019 page 2

Data recordings of the Gardner River, in cubic feet per second (cfs), near Mammoth Hot Springs over the summer of 2018 are as follows: 746, 908, 1040, 1080, 1340, 1230, 1110, 993. Use these data for questions 9–11.

11. Find the interquartile range of the water flow for the Gardner River.

A) 219.5 **B)** 280 **C)** 424.5 **D)** 594 **E)** none of these

12. Determine the mean to the nearest tenth of the flow of the Gardner River.

A) 1055 **B)** 1055.8 **C)** 1055.9 **D)** 1056 **E)** none of these

13. What would the next water level recording need to be in order for the average water level to be 1025?

A) 247 **B)** 777 **C)** 778 **D)** 833 **E)** none of these

14. Write a linear function that goes through the two points $(2,4)$ and $(-3,11)$.

A) $y = \frac{-7}{5}x + \frac{34}{5}$ **B)** $y = \frac{-5}{7}x + \frac{38}{7}$ **C)** $y = \frac{7}{5}x + \frac{6}{5}$ **D)** $y = \frac{7}{5}x + \frac{6}{5}$ **E)** none of these

15. If you purchase a cell phone for \$725 and your monthly share of the bill is \$22.50. How much will your total cost be over a four-year period?

A) \$815 **B)** \$1080 **C)** \$1805 **D)** \$2990 **E)** none of these

16. The math club at your school starts the school year with \$423.92. To help the money last throughout the school year, club members agree to spend 15.5% of the remaining balance each month. How much will be left at the end of nine months if no money is added to the account.

A) \$0 **B)** \$65.11 **C)** \$93.11 **D)** \$358.21 **E)** none of these

17. This year to eliminate the rat population at the local dump Garfield extermination services were brought in. All but four rats were eliminated. If the rat population triples every four months, how many rats will be inhabiting the dump after two years?

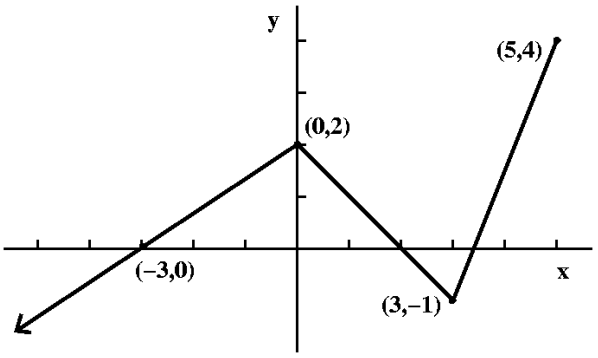
A) 72 **B)** 729 **C)** 2187 **D)** 2916 **E)** none of these

18. What is the domain of the function shown at right?

A) $x < 4$ **B)** $x \leq 4$ **C)** $x < 5$ **D)** $x \leq 5$ **E)** none of these

19. What is the range of the function shown at right?

A) $y < 4$ **B)** $y \leq 4$ **C)** $y < 5$ **D)** $y \leq 5$ **E)** none of these



20. Which is the correct function rule for the continuous function shown at right?

A) $f(x) = \begin{cases} \frac{2}{3}x + 2, x < 0 \\ x + 2, 0 < x < 3 \\ \frac{5}{2}x - \frac{17}{2}, 3 < x < 5 \end{cases}$ **B)** $f(x) = \begin{cases} \frac{3}{2}x + 2, x < 0 \\ -x + 2, 0 \leq x \leq 3 \\ \frac{5}{2}x - \frac{17}{2}, 3 < x < 5 \end{cases}$ **C)** $f(x) = \begin{cases} \frac{2}{3}x + 2, x < 0 \\ -x + 2, 0 \leq x < 3 \\ \frac{5}{2}x - \frac{17}{2}, 3 \leq x \leq 5 \end{cases}$

D) $f(x) = \begin{cases} \frac{2}{3}x + 2, x < 0 \\ -x + 2, 0 \leq x < 3 \\ \frac{5}{2}x - \frac{17}{2}, 3 \leq x < 5 \end{cases}$ **E)** none of these

PROBLEM SOLVING 2019 Answer Key

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