

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2019 MATH CONTEST
INTERMEDIATE

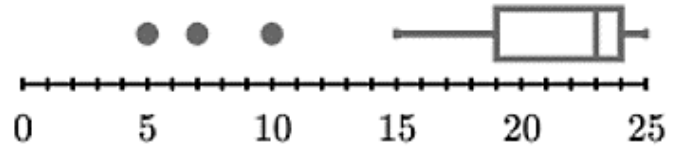
DIRECTIONS: DO NOT WRITE ON THIS TEST. Place the best answer for each question on the separate answer sheet.

1. A car rental agency charges \$250 per week plus \$0.15 per mile to rent a car. What is the maximum number of miles can you travel in one week for \$300? Round your answer to the nearest mile.

- A) 300 B) 333 C) 335 D) 2000 E) none of these

2. The scores on a 25 question quiz are shown on the boxplot on the right. Describe its shape.

- A) Skewed to the left B) Skewed to the right
C) Symmetrical D) Uniform
E) none of these



3. Which statements below are not necessarily true about the boxplot above?

- I. The mean is greater than the median.
II. The median is greater than the mean.
III. The mode is 23.
IV. There are less than 30 scores shown in the plot.

- A) I B) II and III C) I, III and IV D) all of these E) none of these

4. If you travel 6.2 miles in 15 minutes, which is closest to your average speed in feet per second?

- A) 0.005 ft/sec B) 36.4 ft/sec C) 212 ft/sec D) 130944 ft/sec E) none of these

5. Inclusive of a 6.4% sales tax, a diamond ring sold for \$2766.40. Find the price of the ring BEFORE the tax was added.

- A) \$177.05 B) \$2589.35 C) \$2600.00 D) \$2943.45 E) none of these

6. A line has an x -intercept of 8 and a y -intercept of 3. What is the equation of the line that runs perpendicular to it through (5,2)?

- A) $y = \frac{8}{3}x - \frac{1}{3}$ B) $y = -\frac{3}{8}x - \frac{23}{4}$ C) $y = -\frac{3}{8}x - \frac{31}{8}$ D) $y = \frac{8}{3}x - \frac{34}{3}$ E) none of these

7. Describe the nature of the solutions of $x^2 + 12x + 20 = 3$.

- A) 2 real rational solutions B) 2 real irrational solutions C) 2 imaginary solutions
D) 1 real rational solution E) none of these

8. In a junior gym class of 25, all but one student ran the mile on the assigned day. The average time was 9.5 minutes. After the final student ran, the new mean time was 9.4 minutes. What was the mile time for the missing student?

- A) 7 minutes B) 8 minutes C) 9 minutes D) 10 minutes E) none of these

9. Given $f(x) = \frac{1}{x+4}$, $g(x) = \frac{1}{x-4}$, $h(x) = \frac{1}{x^2-16}$ Find all values of x such that the difference between six times $f(x)$ and two times $g(x)$ is eight times $h(x)$.

- A) 10 B) 20 C) 40 D) -10 E) none of these

10. Solve $x < 132 - x^2$.

- A) $(-\infty, 11) \cup (12, \infty)$ B) $(-\infty, -12) \cup (11, \infty)$ C) $(-11, 12)$ D) $(-12, 11)$ E) none of these

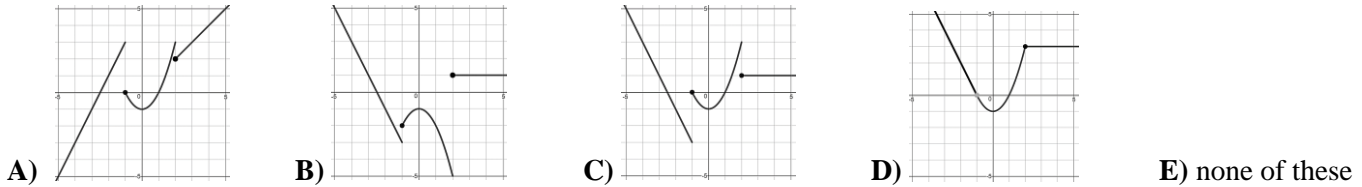
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11. Consider the following function: $f(x) = \begin{cases} -2x - 5; & x < -1 \\ x^2 - 1; & -1 \leq x < 2 \\ 1; & x \geq 2 \end{cases}$

What is $f(3)$?

- A) -11 B) 3 C) 4 D) 8 E) none of these

12. Which is the correct graph for the piecewise function in #11.



13. How many solutions does this system have $\begin{cases} x = 2 - 3y \\ \frac{2}{3}x + 2y = \frac{4}{3} \end{cases}$

- A) 0 B) 1 C) 2 D) Infinite E) none of these

14. Suppose that y is inversely proportional to x , and that $y = 0.4$ and $x = 2.5$. Find y when $x = 4$.

- A) 1 B) 0.25 C) 1.6 D) 6.25 E) none of these

15. If $x - 3y$ is 60% of $9y$, what is the value of $\frac{x}{y}$?

- A) 60 B) 18 C) $\frac{42}{5}$ D) $\frac{18}{5}$ E) none of these

16. Which of the following equations moves the quadratic parent function 3 to the left and five up with a horizontal stretch of 2 with no reflection over the x -axis?

- A) $y = -2(x - 3)^2 + 5$ B) $y = \frac{1}{2}(x - 3)^2 + 5$ C) $y = -\frac{1}{2}(x + 3)^2 - 5$ D) $y = 2(x - 3)^2 + 5$
 E) none of these

17. If $-3 < a < -1$, which has the smallest value?

- A) $-3a^2$ B) $-5a + 7$ C) $\frac{1}{a^3}$ D) $a^2 - a$ E) none of these

18. Find the sixth term of $(x + y)^8$.

- A) $6x^3y^5$ B) $56x^2y^6$ C) $28x^2y^6$ D) $56x^3y^5$ E) none of these

19. Farmer Ed has 350m of fencing and wants to enclose a rectangular plot that borders on a river. If Farmer Ed doesn't fence the side along the river, find the maximum area of the enclosed plot. Round to the nearest tenth.

- A) 7656.3m^2 B) 13611.1m^2 C) 15312.5m^2 D) 30625.0m^2 E) none of these

20. Write the first four terms of the sequence defined by the recursion formula $a_1 = -4$ and $a_n = -4a_{n-1}$ for $n \geq 2$.

- A) -4, 18, -66, 258 B) 4, -16, 64, -256 C) -4, -16, -64, -256 D) -4, 16, -64, 256 E) none of these

21. When the speed limit changed from 70mph to 80mph, how much time did law-abiding Lucy save on a 145 mile trip? Round to the nearest minute.

- A) 10 minutes B) 16 minutes C) 23 minutes D) 1 minutes E) none of these

INTERMEDIATE 2019 Answer Key

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