

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2019 MATH CONTEST
FINITE TEST

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

1. Write the first five terms of the geometric sequence. $a_1 = 6$; $r = 3$.

- A) 6, 9, 12, 15, 18 B) 3, 18, 108, 648, 3888 C) 6, 18, 54, 162, 486 D) 3, 9, 15, 21, 27 E) none of these

2. Miles per gallon vs. speed (MPH) for a new automobile has a correlation of $r = -.622$. If the miles in each measurement are converted to feet, how is the correlation changed?

- A) stays the same B) gets closer to -1 C) gets closer to 0 D) becomes positive E) none of these

3. Of the 2,598,960 different five-card hands possible from a deck of 52 playing cards, how many would contain two black cards and three red cards?

- A) 422,500 B) 1,267,500 C) 1,690,000 D) 845,000 E) none of these

4. Suppose that, in a certain part of the world, in any 50-year period the probability of a major plague is .4, the probability of a major famine given a plague has happened is .8, and the probability of neither a plague nor a famine is .42. What is the probability of a plague given that there is a famine?

- A) 0.240 B) 0.288 C) 0.370 D) 0.385 E) none of these

5. Evaluate $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$

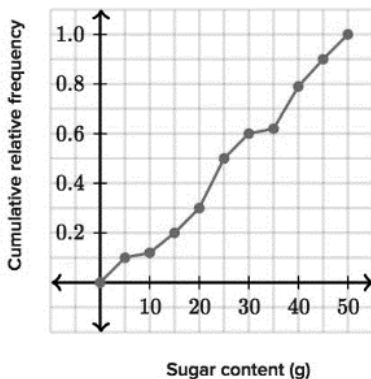
- A) 1 B) 0 C) -.448 D) $\frac{\sqrt{2}}{2}$ E) none of these

6. Solve the system for z:
$$\begin{cases} y = \frac{1}{2}z \\ x + 2y + 5z = 2 \\ 3x + 6y - 3z = 9 \end{cases}$$

- A) $-\frac{1}{6}$ B) $-\frac{1}{12}$ C) 3 D) 6 E) none of these

7. Suppose the regression line for a set for data, $\hat{y} = 3x + b$, passes through the point (2, 5). If \bar{x} and \bar{y} are the sample means of the x- and y-values, respectively, then $\bar{y} =$

- A) \bar{x} B) $\bar{x} - 2$ C) $\bar{x} + 5$ D) $3\bar{x}$ E) none of these



8. Nutritionists measured the sugar content in grams for 32 drinks at Starbucks. A cumulative relative frequency graph is shown at left. Approximately what is the interquartile range for the data?

- A) 16 B) 25 C) 31 D) 50 E) none of these

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9. The 16th percentile of a normally distributed variable has a value of 25 and the 97.5th percentile has a value of 40. Which of the following is the best estimate of the mean and standard deviation of the variable.
 A) $\mu \approx 32.5; \sigma \approx 2.5$ B) $\mu \approx 32.5; \sigma \approx 5$ C) $\mu \approx 30; \sigma \approx 2.5$ D) $\mu \approx 30; \sigma \approx 5$ E) none of these

10. A club has seven members and meets each month for lunch. If the members sit at a round table and decide to sit so that each member has two different neighbors each month, determine how many months this arrangement could last.
 A) 3 B) 14 C) 21 D) 42 E) none of these

11. Two kinds of crated cargo, A and B, are to be shipped by truck. The weight and volume of each are given in the table below. The shipping company charges \$75 per crate for cargo A and \$100 per crate for cargo B. The truck has a maximum load limit of 7200 pounds and 1000 cubic feet. How many of each type of cargo should be shipped to maximize profit for the shipping company.

	A	B
Volume	50 cubic feet	10 cubic feet
Weight	200 pounds	360 pounds

- A) 18 crates of cargo A; 10 crates of cargo B B) 10 crates of cargo A; 18 crates of cargo B
 C) 20 crates of cargo A; 0 crates of cargo B D) 0 crates of cargo A; 20 crates of cargo B E) none of these

12. The average of eight numbers is 30, while that of a different set of seven numbers is 15. Find the average of all the numbers.
 A) 22.5 B) 23 C) 25 D) cannot be computed from the data given E) none of these

13. You can choose one of three boxes. Box A has four \$5 bills and a single \$100 bill, box B has 400 \$5 bills and 100 \$100 bills, and box C has 24 \$1 bills. You can have all of box C or blindly pick one bill out of either box A or box B. Which offers the greatest expected winning?
 A) Box A B) Box B C) Box C D) Box A or B, but not C E) none of these

14. Random samples of size n were selected from a population with a known standard deviation. How is the standard deviation of the sampling distribution of the sample mean affected if the sample size is increased from 50 to 200?
 A) remains the same B) is divided by two C) is divided by four D) is multiplied by four E) none of these

15. What is the matrix product $[x \quad 2x \quad 4x] \begin{bmatrix} -2 \\ 0 \\ 5 \end{bmatrix}$?

- A) $[18x]$ B) $[-2x \quad 0 \quad 20x]$ C) $\begin{bmatrix} -2x \\ 0 \\ 20x \end{bmatrix}$ D) $\begin{bmatrix} x & 2x & 4x \\ -2 & 0 & 5 \end{bmatrix}$ E) none of these

16. According to one poll, 12% of the public favor legalizing all drugs. In a simple random sample of six people, what is the probability that at one least person favors legalization?
 A) 0.380 B) 0.464 C) 0.536 D) 0.620 E) none of these

17. You toss a coin 7 times. Find the number of successful tosses (k) out of the seven such that $P(X \leq k) > 0.75$.
 A) 3 B) 4 C) 5 D) 6 E) none of these

FINITE TEST 2019 Answer Key

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