



MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2015 MATH CONTEST
FINITE TEST

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

1. Maria has an average score of 88 on the first four tests in math class. The final grade is a weighted average in which the final exam counts as double the value of each of the other four tests. She needs to raise her average to 90 to get an A in the class. What is the minimum score Maria can get on the final and still get an A in the class?
A) 90 B) 92 C) 94 D) 96 E) none of these
2. A license plate can have a 3 letters followed by 4 digits. If letters can be repeated but digits cannot, how many license plates are possible?
A) 78,624,000 B) 88,583,040 C) 53,149,824 D) 175,760,000 E) none of these
3. Solve the linear programming problem to find the maximum value when $p = 3x + 4y$, subject to $x \geq 0$, $y \geq 0$, $3x + 2y \geq 6$, $x + y \leq 8$.
A) 12 B) 36 C) 24 D) 32 E) none of these
4. In a group of 100 students, 32 are taking AP Calculus, 29 are taking AP History, and 28 are taking AP Statistics. In addition, 12 are taking both Calculus and Statistics, 11 are taking History and Statistics, and 9 are taking Calculus and History. Further, 5 students are taking all three subjects. How many students are not taking any AP classes?
A) 74 B) 38 C) 52 D) 62 E) none of these
5. Thirteen couples attended a party. Each of the guys shook hands with everyone except his own date. No handshakes took place among the ladies. How many handshakes were there among these 26 people?
A) 234 B) 325 C) 338 D) 312 E) none of these
6. From a group of 12 students, a teacher must select 5 students to accompany her to a math test. How many different combinations of 5 students can the teacher create?
A) 95,040 B) 60 C) 248,832 D) 120 E) 792
7. At Lucky Lil's, you draw one card from a standard deck of 52 cards. If the card is black, you win \$2.00. If the card is a diamond, you win \$3.00. If the card is a heart, you lose \$4.00. If you play this game for an extended period of time, what is your expected gain or loss per play.
A) Win \$1.00 B) Win \$0.75 C) Lose \$0.75 D) Lose \$1.00 E) Break even
8. The Chicago Bulls and the LA Lakers are playing games this weekend, but not each other. The probability that the Bulls will win is 0.6 and the probability that the Lakers will win is 0.7. The probability that at least one of these teams will win is 0.8. What is the probability that both teams win?
A) 0.1 B) 0.2 C) 0.42 D) 0.5 E) 0.38
9. Suppose $\{a_n\}$ is a geometric series such that $a_{10} = 100$ and $a_{20} = 160,000$. What is a_{25} ?
A) 320,000 B) 6,400,000 C) 12,600,000 D) 12,800,000 E) none of these
10. A palindrome between 1000 and 10,000 is chosen at random. What is the probability that it is divisible by 7?
A) $\frac{1}{10}$ B) $\frac{1}{9}$ C) $\frac{1}{7}$ D) $\frac{1}{6}$ E) $\frac{1}{5}$
11. The mean of a set of 10 numbers is 12. Adding one number changes the mean to 13. What is the number?
A) 13 B) 14 C) 20 D) 23 E) none of these

FINITE TEST 2015 page 2

12. Given parametric equations $x = 3t^2$ and $y = t + 1$ where $-\infty < t < \infty$, write the equivalent rectangular equation.

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

For questions 13 – 15, use the information below.

A caterer ordered a case of raspberries. From a sample of 10 cartons, the weights (in ounces) are given below.

ounces	frequency
17	2
19	1
20	1
22	3
27	3

13. Calculate the mean weight of the cartons in the table above.

- A) 21 ounces B) 22 ounces C) 20 ounces D) 23 ounces E) none of these

14. Calculate the interquartile range of the weights of the cartons above.

- A) 5 B) 10 C) 3 D) 8 E) none of these

15. To the nearest tenth, calculate the standard deviation for the weights of the cartons above.

- A) 15.2 B) 13.7 C) 6.8 D) 3.9 E) none of these

16. Jessie bought 3 angel fish (A) and 5 tetras (T) for \$16.92. Hanna bought 5 angel fish and 2 tetras for \$20.03 from the same pet store. Which of the following matrix equations can be used to solve for the price of each type of fish?

A) $\begin{bmatrix} 3 & 5 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} A \\ T \end{bmatrix} = \begin{bmatrix} 20.03 \\ 16.92 \end{bmatrix}$ B) $\begin{bmatrix} 3 & 5 \\ 5 & 2 \end{bmatrix} \begin{bmatrix} A \\ T \end{bmatrix} = \begin{bmatrix} 16.92 \\ 20.03 \end{bmatrix}$ C) $\begin{bmatrix} 2 & 5 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 16.92 \\ 20.04 \end{bmatrix} = \begin{bmatrix} A \\ T \end{bmatrix}$

D) $\begin{bmatrix} 5 & 3 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} T \\ A \end{bmatrix} = \begin{bmatrix} 20.03 \\ 16.92 \end{bmatrix}$

E) none of these

17. A certain radioactive isotope is known to decay 1% per year. If there are 20 grams of the isotope to start with, about how much is left at the end of 10 years? If necessary, round to the nearest half of a gram.

- A) 19.5 grams B) 20 grams C) 19 grams D) 18 grams E) none of these

18. For which pair of variables would one expect to find a negative correlation?

- A) number of hours studied and the test score B) distance a car is driven and amount of gas used
 C) length of a person's foot and height of person D) weight of a block of ice and hours exposed to sun
 E) a person's shoe size and their ACT score

19. A histogram would be an appropriate graph for:

- A) colors of cars in the school parking lot B) monthly household budget
 C) heights of college basketball players D) gasoline prices from 2000 to 2015
 E) years of education vs annual salary

20. A child's grandparents wish to purchase a bond that matures in 18 years to be used for college education. The bond pays 5% interest, compounded monthly. How much should they invest so the bond will be worth \$86,000 at maturity?

- A) \$95,556 B) \$211,000 C) \$35,735 D) \$77,400 E) \$35,030

FINITE TEST 2015 Answer Key

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