



**MONTANA COUNCIL OF TEACHERS OF MATHEMATICS**  
**2011 MATH CONTEST**  
**FINITE 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 supermarket chain sells oranges, apples, peaches, and bananas in three stores located throughout a large metropolitan area. The average number of pounds sold per day in each store is summarized in matrix M. "In season" and "out of season" prices, per pound, of each fruit are given in matrix N. What is the total, for the three stores, of "in season" daily revenue for the four fruits? To the nearest whole percent, what percentage of the daily total "out of season" revenues for store 3 does the "out of season" peach sales represent?

				Fruit				Price			
				Oranges	Apples	Peaches	Bananas	"In Season"	"Out of Season"		
$M =$	$\begin{bmatrix} 25 & 50 & 20 & 45 \\ 50 & 30 & 65 & 40 \\ 50 & 40 & 40 & 45 \end{bmatrix}$	$\begin{matrix} \text{Store 1} \\ \text{Store 2} \\ \text{Store 3} \end{matrix}$							$N =$	$\begin{bmatrix} \$1.10 & \$1.26 \\ \$1.20 & \$1.50 \\ \$1.20 & \$1.30 \\ \$1.20 & \$1.62 \end{bmatrix}$	$\begin{matrix} \text{Oranges} \\ \text{Apples} \\ \text{Peaches} \\ \text{Bananas} \end{matrix}$

- (A) \$711.23; 21%      (B) \$711.23; 34%      (C) \$587.50; 21%      (D) \$654.10; 65%

2. We need to create serial numbers that start with one of the letters  $a, b, c, d,$  or  $e$  followed by a three-digit number (with no repeated digits). How many serial numbers can be created?  
 (A) 32      (B) 725      (C) 2520      (D) 3600
3. The Knicks and the Lakers are playing games this weekend (but not each other). The probability that the Knicks will win their game is 0.6; the probability that the Lakers will win their game is 0.7; and the probability that at least one of these teams will win is 0.8. What is the probability both teams will win?  
 (A) 0.1      (B) 0.2      (C) 0.42      (D) 0.5
4. At which point does the graph of  $15x - 6y - 3z = 30$  cross the  $y$ -axis?  
 (A)  $(0, -5, 0)$       (B)  $(2, 0, 0)$       (C)  $(0, -3, 0)$       (D)  $(0, 0, -10)$

5. Find the partial fraction decomposition for the rational expression.  $\frac{5x^2 + 88x + 308}{(x+7)(x+4)(x+10)}$
- (A)  $-\frac{7}{x+7} + \frac{2}{x+4} - \frac{4}{x+10}$       (B)  $\frac{7}{x+7} + \frac{2}{x+4} + \frac{4}{x+10}$       (C)  $\frac{7}{x+7} + \frac{2}{x+4} - \frac{4}{x+10}$       (D)  $-\frac{7}{x+7} - \frac{2}{x+4} + \frac{4}{x+10}$

6. From a group of 3 men and 7 women, how many committees of 2 men and 2 women can be formed?  
 (A) 252      (B) 21      (C) 63      (D) 210
7. In a set of 60 pieces of data, the first (lower) quartile is 80. How many pieces of data are numerically less than or equal to 80?  
 (A) 15      (B) 20      (C) 45      (D) 60

8. Find the sum of the infinite series:  $\sum_{k=1}^{\infty} 3\left(\frac{1}{6}\right)^k$
- (A)  $\frac{18}{7}$       (B)  $\frac{3}{7}$       (C) 12      (D)  $\frac{3}{5}$

9. A high school athletic director reports on the participation in girls' volleyball, basketball, and track as follows: 57 girls participated in at least one sport, 4 played all 3 sports, 11 played basketball and ran track, 13 played basketball and volleyball, 35 ran track, 24 played volleyball, and 24 played basketball. How many girls played volleyball as their only sport?  
 (A) 24      (B) 13      (C) 11      (D) 9

10. The frequency table shows the family size of the students in an algebra class.

# of Family Members	3	4	5	6	8	10	13
Frequency	2	3	10	6	2	1	1

What happens to the mean family size of the class if two students of family sizes 9 and 3 enrol in the class?

- (A) will become larger (B) will stay the same (C) will become smaller (D) not enough information

11. A game of chance has a probability of 0.3 of paying off \$400 and a probability of 0.7 of paying off \$200. There is a charge for playing the game. What should the charge be if we wanted to make this a fair game?

- (A) \$225 (B) \$260 (C) \$310 (D) \$350

12. Three pipes A, B, and C are connected to a swimming pool. When all 3 are running, the pool can be filled in 3 hours. When only A and B are running, the pool can be filled in 4 hours. When only B and C are running, the pool can be filled in 3.75 hours. How many hours would it take pipe A to fill the pool by itself?

- (A) 12 (B) 6 (C) 15 (D) 10.75

13. A nut company has 125 kilograms of peanuts and 100 kilograms of cashews to be sold as two different mixes. The deluxe mix will contain half peanuts and half cashews and will sell for \$6 per kilogram. The economy mix will contain  $\frac{2}{3}$  peanuts and  $\frac{1}{3}$  cashews and will sell for \$4.80 per kilogram. What is the maximum revenue?

- (A) \$1170 (B) \$1260 (C) \$1200 (D) \$1350

14. In which one of the following problems can the binomial probability distribution function be applied to find the requested probability?

- (A) A die is rolled 5 times. What is the probability of getting exactly two “ones”?  
 (B) A die is rolled until a “three” appears. What is the probability of getting a “two” before a “three” appears?  
 (C) Four draws are randomly made from a deck of cards without replacement. What is the probability of drawing two hearts?  
 (D) A box contains 3 red marbles and 5 white marbles. Three draws are made without replacement. What is the probability of getting 3 white marbles?

15. A cup of hot chocolate is set outside on a winter day to cool. The chart below shows the temperature of the water,  $t$ , in degrees Fahrenheit after  $m$  minutes have elapsed.

Minutes	0	1	2	3	4	5	6	7	8
Temp.	150	140	130	121	112	104	97	90	84

Which of the following is the best-fitting model for the data?

- (A) linear (B) logarithmic (C) exponential growth (D) exponential decay

16. The vertices of a triangle are given below. Use a determinant and the vertices of the triangle to find the area of the triangle.  $(8, -2), (-4, -6), (1, 5)$

- (A) 56 (B)  $\frac{109}{2}$  (C) 55 (D)  $\frac{113}{2}$

17. Solve the equation for  $n$ :  $3\binom{n}{6} = \binom{n+1}{6}$

- (A) 6 (B) 7 (C) 8 (D) 11

18. On January 2, 2001, Alice invested \$1000 at 8% compounded quarterly. What is the future value of her investment on September 30, 2001?

- (A) \$1060 (B) \$1259.71 (C) \$1080 (D) \$1061.21

19. On a hard-surfaced basketball court, a very bouncy “superball” bounces 90% of the height from the previous bounce. If a superball is dropped from a height of 10 feet, what is the limit of the total distance travelled (both up & down) by the ball?

- (A) 190 ft (B) 180 ft (C) 100 ft (D) 90 ft

**FINITE TEST 2011 Answer Key**

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