

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2017 MATH CONTEST
FINITE TEST

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

1. Which choice below represents an arithmetic sequence with a common difference of 2?
- A) $4 + 8 + 16 + 32$ B) $12 + 10 + 8 + 6$ C) $5, 10, 20, 40$ D) $-12, -10, -8, -6$ E) none of these
2. Which series is NOT equivalent to the others?
- A) $\sum_{k=1}^6 (3 + 5k)$ B) $\sum_{n=2}^7 (-2 + 5n)$ C) $\sum_{p=0}^5 (8 - 5p)$ D) $\sum_{r=4}^9 (\frac{4r-24}{2} + 3r)$ E) none of these
3. Movie tickets vary depending on the age of the patron. In a particular city, adult tickets cost \$11, student tickets cost \$8, and senior citizens cost \$7. Here is a matrix for the number of people attending the opening of a movie. What is the total revenue for the weekend?

	Adults	Students	Seniors
Friday	125	320	75
Saturday	210	300	80
Sunday	245	180	120

- A) \$14,705 B) \$14, 834 C) \$16,112 D) \$18, 235 E) none of these
4. Given the size of the matrices to the right, which multiplication is NOT possible? [X] 3×4 [Y] 4×2 [Z] 2×2
- A) $X \cdot Y$ B) $Y \cdot Z$ C) $Z \cdot Y$ D) $2 \cdot X$ E) none of these
5. An airline with two types of airplanes, P_1 and P_2 , has contracted with a tour group to provide transportation for a minimum of 400 first class, 750 tourist class, and 1500 economy class passengers. Airplane P_1 can accommodate 20 first class, 50 tourist class, and 110 economy class passengers. Airplane P_2 can accommodate 18 first class, 30 tourist class, and 44 economy class passengers. Which of the following are correct constraints for this situation?
- I. $20x + 18y \geq 400$ IV. $18x + 30y + 44z \geq 8500$
II. $20x + 50y + 110z \geq 10000$ V. $110x + 44y \geq 1500$
III. $50x + 30y \geq 750$ VI. $x \geq 0, y \geq 0$
- A) II, IV, and VI B) I, III, and V C) I, III, V, and VI D) all of these E) none of these
6. For this type of trip, airplane P_1 costs \$10,000 to operate and airplane P_2 costs \$8500 to operate. What is the minimum operating cost for this trip? Round your answer to the nearest hundred dollars. (You will first need to determine how many of each type of airplane should be used to satisfy the appropriate constraints from above.)
- A) \$193,700 B) \$200,000 C) \$200,500 D) \$297,500 E) none of these
7. Mary has 10 test scores, weighted equally, and an average of 87%. She still needs to turn in a project weighted twice as much as each test, and a semester test weighted four times as much as each test. Which combination of scores, indicated in the format (project, sem test), will allow her to earn a 90% for the class?
- A) (89, 95) B) (98, 90) C) (85,100) D) (90, 90) E) none of these
8. A cylinder has a volume of 48 cm^3 . What scale factor would be needed to create a similar cylinder with a volume of 162 cm^3 ?
- A) $k = 2/3$ B) $k = 1.5$ C) $k = 1.837$ D) $k = 3.375$ E) none of these
9. Which of the following is NOT a possible value of the correlation coefficient?
- A) -0.8 B) 0 C) 0.23 D) 1.5 E) all are possible

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10. There are 25 students in a class. How many handshakes will take place if every student shakes hands with everyone else exactly once?

- A) 25 B) 50 C) 300 D) 600 E) none of these

11. During the early basketball season this year Sarah made 76.2% of her free throws. In the next game Sarah is fouled on her first 3-point attempt. Determine the probability of Sarah making 2 of 3 free throws. Round to the nearest tenth.

- A) 12.9% B) 41.5% C) 58.1% D) 76.2% E) none of these

12. Determine the probability of randomly picking a 3-digit number whose tens digit is 5 given that the number is even.

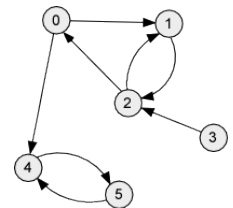
- A) 5% B) 10% C) 15% D) 50% E) none of these

13. In a political gathering of 100 people 37 signed up as Democrats and 41 as Republicans. Of the total people attending 35 were under 30 years of age, including 17 of the Democrats and 13 of the Republicans. Find the probability that a person selected at random is a democrat or is under 30 years of age. Round answer to the nearest percentage.

- A) 55% B) 64% C) 72% D) 89% E) none of these

14. Which of the following is the best name for the graph at right?

- A) directed graph B) directed multigraph C) pseudograph
D) simple graph E) none of these



15. Which of the following is not true if a set of data is best modeled by a quadratic function?

- A) the second differences of the y-values will be equal B) the graph will have a parabolic shape
C) the data will fit a function of the form $f(x) = a(x - h)^2 + k$ D) the function is one-to-one E) none of these

16. In a certain game a fair die is rolled and a player gains 10 points if the die shows a '2'. If the die does not show a '2' the player loses 2 points. If the die were to be rolled 100 times, what would be the expected total gain or loss for the player?

- A) gain of 100 points B) gain of 800 points C) no gain or loss D) loss of 200 points E) none of these

17. Flying with the wind, a plane flew 1200 miles in 5 hours. Flying against the wind the plane could fly only 800 miles in the same amount of time. What is the speed of the wind?

- A) 20 mi/hr B) 40 mi/hr C) 50 mi/hr D) 60 mi/hr E) none of these

18. For a recent job, a plumber earned \$60 per hour and the plumber's apprentice earned \$25 per hour. The plumber worked 6 hours more than the apprentice and together they earned a total of \$1125. How many hours did the apprentice work?

- A) 9 B) 10 C) 12 D) 15 E) none of these

19. Your hourly pay for a job is \$9.90 per hour and your pay is increased 5 cents/hour every day. Your friend's pay starts at \$1.75/hour and his hourly pay is increased 1% every day. After how many days will your friend's daily pay be greater than yours?

- A) 23 B) 110 C) 192 D) 258 E) My pay will always be greater

20. Suppose the mean on this test is 10 and the standard deviation is 1.5 and that the scores are normally distributed. What percent of students would you expect to earn a score between 7 and 13?

- A) 68% B) 76% C) 95% D) 99% E) none of these

FINITE TEST 2017 Answer Key

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