



MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2010 MATH CONTEST
TEAM 11-12

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

- The equation $2x^2 + 8x + 5y^2 - 10y = 7$ is that of a(n)
(A) parabola (B) ellipse (C) circle (D) hyperbola
- If x varies directly as y^2 and inversely as z , what is the effect on x if y is tripled and z is halved?
(A) It remains the same (B) It is 4.5 times as large
(C) It is cut in half (D) It is 18 times as large
- If a hen and a half can lay an egg and a half in a day and a half, how many eggs can two dozen hens lay in two dozen days?
(A) 384 eggs (B) 8 eggs (C) 24 eggs (D) 576 eggs
- An airplane flies south for 2 hours at 320 mph. It then travels east at 300 mph for 3 hours. How far and at what bearing is the plane from the starting point? (round to the nearest degree and nearest mile)
(A) 1104 mi, 125° (B) 1104 mi, 145°
(C) 1540 mi, 125° (D) 1540 mi, 145°
- A freshman class of 605 students took a math test. The test scores followed an approximate normal distribution. Their mean score was 76% with a standard deviation of 3%. What percent of students scored between 70% and 79%?
(A) 50% (B) 81.5% (C) 95% (D) 68%
- In a game of Poker, each player is dealt five cards. What is the probability to the nearest thousandth that a player's hand consists of exactly four diamonds?
(A) 0.011 (B) 0.009 (C) 0.006 (D) 0.004
- One of two statements is "All items on the shelf are expensive." Suppose that the conclusion, using deductive reasoning, is "This vase is expensive." Which one of the following could represent the second statement?
(A) This vase is not on the shelf. (B) This vase is on the shelf.
(C) All expensive items are on the shelf. (D) The shelf contains items other than vases.
- In a certain arithmetic sequence, the tenth term is -2 and the 30th term is 26. What is the fourth term?
(A) -10.4 (B) -7.2 (C) -3.8 (D) -0.6
- Which one of the following is a requirement for the graph of an even function?
(A) It intersects the x-axis. (B) It intersects the y-axis.
(C) It is symmetric about the x-axis. (D) It is symmetric about the y-axis.
- What is the sum of all the terms of the following infinite sequence? 12, 9.6, 7.68, 6.144,
(A) 60 (B) 58 (C) 56 (D) 53
- Solve $1000(1.08)^x - 21 = 2979$ for x . Round to the nearest tenth.
(A) 14.3 (B) 1.9 (C) 98.8 (D) 35.3

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12. A polynomial function is of degree 8. Which one of the following situations cannot exist regarding the nature of the zeros of this function?
- (A) Eight distinct real zeros.
(B) Five distinct real zeros and three distinct complex zeros.
(C) Four distinct real zeros, a double zero, and two distinct complex zeros.
(D) Eight distinct complex zeros.
13. A radioactive substance has a half-life of 12 hours. Initially, there are 60 grams of this substance. How many grams (to the nearest gram) have decayed after nine hours?
- (A) 36 (B) 30 (C) 24 (D) 18
14. Two displacement vectors are given as (50 ft, 35°) and (80 ft, 30°). Find their sum and express it as a distance and direction. All angles are expressed in standard position.
- (A) (70.0 ft, 26.6°) (B) (90.6 ft, 26.6°) (C) (70.0 ft, 333.4°) (D) (90.6 ft, 333.4°)
15. A closed box (has a lid, but no tabs) is to be made from a rectangular piece of material. Find the approximate height of the box of maximum volume if the material has dimensions of 10 feet by 18 feet.
- (A) 7 inches (B) 1 inch (C) 5 inches (D) 2 inches
16. In a jar of 12 marbles, three are red and nine are blue. Six marbles are drawn, one at a time, with replacement. What is the probability to the nearest hundredth that fewer than three of them are red?
- (A) 0.96 (B) 0.89 (C) 0.83 (D) 0.76
17. A study has shown that the measure of a person's reaction time is a function of his or her age. Carmine's age is 35 and his reaction time is 2.3 seconds. Carol's age is 30 and her reaction time is 1.9 seconds. Based on this data, a linear model is constructed. If Julia's age is 48 and her reaction time is 3.2 seconds, what is the percent error to the nearest tenth of one percent for her reaction time, based on the linear model?
- (A) 2.7% (B) 3.2% (C) 3.7% (D) 4.2%
18. The height h in meters at time t of a first aid package dropped out of a helicopter at 250 m is given by $h = -4.9t^2 + 250$. When will the package hit the ground?
- (A) 7.14 sec (B) 6.91 sec (C) 2.5 sec (D) 51.02 sec
19. A function $g(x)$ is created by using these steps.
- Step 1: Multiply 2 by a number x .
Step 2: Subtract 5.
Step 3: Take the square root.
Step 4: Add one half.
- Which one of the following numbers belongs to the range of $g(x)$?
- (A) $3/4$ (B) $2/5$ (C) $-1/3$ (D) -1
20. A square prism is inscribed in a cylinder with radius 6 and height 10. What is the volume of the prism?
- (A) 1080 (B) 720 (C) 360 (D) 240
21. Tonya claims that any decimal number that shows a pattern must be rational. Which one of the following numbers illustrates an exception to her claim?
- (A) π (B) 2.13888... (C) 0.656565... (D) 0.13113111311113...
22. From a room of 22 people with a mean weight of 125 pounds, Sam and Lisa leave. The mean weight of the remaining people is 121 pounds. If Lisa weighs two-thirds as much as Sam, what is Lisa's weight?
- (A) 134 pounds (B) 132 pounds (C) 130 pounds (D) 128 pounds
23. Alpha and Omega start at opposite ends of town, 4.5 miles apart, bicycling toward each other. Alpha bikes at an average speed of 10 mi/hr. What was Omega's average speed if they met in 10 minutes?
- (A) 11 mi/hr (B) 13 mi/hr (C) 15 mi/hr (D) 17 mi/hr

TEAM 11-12 2010 Answer Key

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