MCTM

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS

2015 MATH CONTEST

TEAM 11-12

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 scientist with metric mania has designed a clock with 10 hours in a day and 100 minutes in an hour. When the clock reads 5:00, it's really noon. What is the standard time when the clock reads 6:75?

A) 6:30 pm B) 4:12 pm C) 3:45 pm D) 4:20 pm E) none of these

2. A woman selling pizza pies sold her stock in the following order: ½ of her supply and ½ of a pizza pie to Store A; 1/3 of the remainder and 1/3 of a pizza pie to Store B; ¼ of the remainder plus ¾ of a pizza pie to Store C, and 1/5 of the remainder plus 1/5 of a pizza pie to Store D. She then had 19 uncut pizza pies. How many did she start with?

A) 101 B) 105 C) 95 D) 99 E) none of these

For questions 3 and 4, let $f(x)=x^2-4,\ g(x)=x^2+4,\ and\ h(x)=x+5$**.**

3.What combination of these three functions will yield a function which has two zeros, no vertical asymptotes, and a horizontal asymptote at $y=1$?

A) $y=\dfrac{h(x)}{f(x)}$ B) $y=\dfrac{f(x)}{g(x)}$ C) $y=\dfrac{f(x)g(x)}{h(x)}$ D) $y=\dfrac{g(x)}{h(x)}$ E) $y=f(x)h(x)$

4. What combination of these three functions will yield a function which has no zeros, a vertical asymptote at $x=-5$, and no horizontal asymptotes?

A) $y=\dfrac{h(x)}{f(x)}$ B) $y=\dfrac{f(x)}{g(x)}$ C) $y=\dfrac{f(x)g(x)}{h(x)}$ D) $y=\dfrac{g(x)}{h(x)}$ E) $y=f(x)h(x)$

5. If 55% of the lambs born are male and 90% of them survive the first year, what is the fewest number of lambs that must be born to have 100 male lambs living at the end of the first year?

A) 200 B) 204 C) 202 D) 205 E) none of these

6. A rock attached to a toy parachute is dropped into a well and hits the bottom 4.9 seconds after it was dropped. Assume the stone with the parachute falls $6.53t^2$ feet in *t* seconds. If sound travels at 1120 feet per second, how long will it take for the sound to travel back up to the top of the well?

A) 1.57 sec B) 0.03 sec C) 0.14 sec D) 0.91 sec E) none of these

7. What is the equation of a line through the point (0, -16) that is tangent to the circle with equation $(x-6)^2+(y+8)^2=100$?

A) $4x-3y-48=0$ B) $4x+3y+16=0$ C) $3x+4y+64=0$
D) $3x+4y=0$ E) none of these

8. Two forces at on an object with an angle of 40 degrees between them. If one of the forces is 25 pounds and the other force is 50 pounds, what is the approximate resultant force?

A) 71 pounds B) 360 pounds C) 75 pounds D) 60 pounds E) none of these

9. Given the rectangular coordinates (0, 3), find the polar coordinates.

A) (0, 3) B) (3, 0) C) $(3,\ \pi)$ D) $(3,\ \dfrac{\pi}{2})$ E) none of these

10. A junior class of 605 students took a math test. The test scores followed an approximately 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% E) none of these

11. A sealed cylindrical can is to contain 1000 ml of liquid. What is the smallest possible surface area of the can?

A) 553.6 sq cm B) 5.4 sq cm C) 184.5 sq cm D) 102.1 sq cm E) none of these

12. A trucker is planning a coast-to-coast trip with his 18-wheeler. The tires have a reliability rating of 0.975 of making the trip without a blow-out. What is the probability that at least one of the 18 tires will have a blow-out on the trip?

A) 0.176 B) 0.366 C) 0.634 D) 0.824 E) 1.000

13. The amount remaining of a radioactive element is given by the equation $y = Ce^{kt}$ where C is the original amount, k is the constant, and t is the time in years. If Carbon-14 has a half-life of 5730 years, about how much of a 10-gram sample would remain after 1000 years?

A) 6.86 grams B) 7.74 grams C) 8.06 grams D) 8.86 grams E) none of these

14. If $\frac{2x+10}{x^2+6x+8} = \frac{A}{x+2} + \frac{B}{x+4}$ then A and B are equal to:

A) 3 and -1 B) -3 and 1 C) 4 and -2 D) -4 and 2 E) none of these

15. A softball team has 14 players. How many 10-member teams can you put on the field if positions are not important?

A) 210 B) over 3 trillion C) 2002 D) 1001 E) none of these

16. Which of the following is a cube root of the complex number $0 + i$?

A) $\frac{-\sqrt{3}}{2} + \frac{1}{2}i$ B) $\frac{1}{2} + \frac{-\sqrt{3}}{2}i$ C) 1 D) $\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$ E) none of thee

17. A helicopter leaves the air force base in Great Falls and flies due south for 24 km to deliver a crew. It then flies another 40 km on a compass bearing of 110 degrees before it crashes. To the nearest degree, on what compass bearing must a rescue helicopter fly from the same base to reach the crash site?

A) 45 degrees B) 25 degrees C) 155 degrees D) 135 degrees E none of these

18. Find the sum of the infinite series $1 + \frac{1}{3} + \frac{1}{9} + \ldots$

A) $1\frac{4}{9}$ B) $\frac{3}{2}$ C) $1\frac{2}{3}$ D) 2 E) none of these

19. Solve: $1000(1.08)^x - 21 = 2979$ to the nearest tenth.

A) 14.3 B) 1.9 C) 98.8 D) 35.3 E) none of these

20. What is x if $\log_x 9 = \frac{1}{2}$?

A) 3 B) 81 C) 4.5 D) 9 E) none of these

TEAM 11-12 2015 Answer Key

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