



MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2012 MATH CONTEST
Advanced Math

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

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- Evaluate: $\log_4 9$.
A) 1.58 B) 0.95 C) 1.69 D) 5.42
- An angle lies on the coordinate plane with its vertex on the origin and one side along the positive x-axis. If the other side of the angle passes thru the point (15, 8), what is the sine of the angle?
A) 8/15 B) 8/17 C) 15/17 D) 15/8
- Find the surface area of a cylinder with radius 8 cm and a height of 10 cm.
A) $80\pi \text{ cm}^2$ B) $640\pi \text{ cm}^3$ C) $224\pi \text{ cm}^2$ D) $288\pi \text{ cm}^2$
- Find the volume of a cone with radius x and height $3x$
A) πx^3 B) $192\pi x^3$ C) $3\pi x^3$ D) πx^2
- Solve for x : $2 \ln e^{5x} = 7.2$ (to the nearest hundredth)
A) 0.72 B) 3.60 C) 2.88 D) 1.66
- Find the length of the longer leg of a 30° - 60° - 90° triangle with a hypotenuse of length x .
A) $x\sqrt{3}$ B) $\frac{x}{\sqrt{3}}$ C) $\frac{x}{2}$ D) $\frac{x\sqrt{3}}{2}$
- Find the inverse of the following matrix: $\begin{bmatrix} 3 & 2 \\ 9 & 6 \end{bmatrix}$
A) $\begin{bmatrix} 1/3 & 1/2 \\ 1/4 & 1/6 \end{bmatrix}$ B) $-\begin{bmatrix} 3 & 2 \\ 9 & 6 \end{bmatrix}$ C) $\begin{bmatrix} 6 & -2 \\ -9 & 3 \end{bmatrix}$ D) Does not exist
- Which value is not equal to $64^{\frac{1}{6}}$?
A) $\sqrt[6]{64}$ B) $10\sqrt{6}$ C) $\sqrt[12]{4096}$ D) 2
- If $\sin \Theta = \frac{3}{4}$ and Θ terminates in the first quadrant, find the exact value of $\sin 2\Theta$.
A) 6/8 B) 3/2 C) $\frac{3\sqrt{7}}{8}$ D) $\frac{6\sqrt{2}}{7}$
- What is the maximum number of x-intercepts of a seventh degree polynomial?
A) 0 B) 1 C) 7 D) 10
- What is the minimum number of x-intercepts of a seventh degree polynomial?
A) 0 B) 1 C) 7 D) 10

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12. What is the area of a 45° - 45° - 90° triangle with a hypotenuse of length 8?

- A) 8 B) 16 C) 32 D) 64

13. Approximate the area of a triangle with side lengths of 6 cm, 7 cm and 8 cm.

- A) 20.3 cm^2 B) 21.0 cm^2 C) 42.0 cm^2 D) 239.4 cm^2

$$x - y + z = 3$$

14. Solve the system of equations using matrices: $2y - z = 1$

$$2y - x + 1 = 0$$

- A) (1, 0, -1) B) (2, 2, 3) C) (1, 3, 1) D) (3, 1, 1)

Use this set of data for questions 15-17

{42, 56, 39, 87, 56, 41, 89, 65, 39, 12}

15. Find the 5-number summary (minimum, Q1, med., Q3, maximum).

- A) (42, 39, 48.5, 65, 12) B) (39, 40, 56, 76, 89) C) (12, 39, 49, 65, 89) D) (12, 39, 52.6, 65, 89)

16. What are the outliers?

- A) 12 B) 89 C) 12 and 89 D) none

17. Find the mean and standard deviation.

- A) 52.6, 22.2 B) 52.6, 23.5 C) 49, 22.2 D) 49, 23.5

18. Solve for x: $\frac{1}{8} = 4^{6x+2}$

- A) $-\frac{5}{6}$ B) $-\frac{7}{12}$ C) $-\frac{1}{12}$ D) $-\frac{3}{4}$

19. Suppose z varies directly as the square of x and inversely as y. If $z = 8$, when $x = 4$ and $y = 6$, find z when $x = 6$ and $y = 12$.

- A) $\frac{3}{2}$ B) 6 C) $\frac{64}{9}$ D) 9

20. Find the area of an equilateral triangle with a perimeter of 21.3.

- A) 700.2 square units B) 247.0 square units C) 6.1 square units D) 21.8 square units

21. In $\triangle ABC$, $m\angle B = 73^\circ$, the side opposite $\angle B$ is 40 cm and the side opposite $\angle A$ is 23 cm. What is $m\angle A$?

- A) 33.4° B) 32.4° C) 34.4° D) 35.4°

22. Bob has \$2200 he put in the bank and earns 3.8% compounded quarterly. What will his balance be after 5 years?

- A) \$11,423.99 B) \$2,657.96 C) \$2,875.35 D) \$2618.00

23. What is the domain of $f(x) = e^{\sqrt{x}}$

- A) All Real Numbers B) $x > 0$ C) $x \geq 0$ D) $x \geq 1$

Advanced Math 2012: Answer Key

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