



MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2012 MATH CONTEST
Problem Solving

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

- The following equation, $f(x) = 6(2)^x - 3$, is an example of what type of function?
A) Quadratic B) Exponential C) Power D) Linear
- Given $A = \begin{bmatrix} 4 & 6 \\ -1 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 0 & \frac{1}{2} \end{bmatrix}$, calculate $2B - A$.
A) $\begin{bmatrix} 10 & -4 \\ -1 & 3 \end{bmatrix}$ B) $\begin{bmatrix} 7 & -1 \\ 1 & 2.5 \end{bmatrix}$ C) $\begin{bmatrix} 11 & 7 \\ -2 & -4.5 \end{bmatrix}$ D) $\begin{bmatrix} 10 & 4 \\ 1 & 3 \end{bmatrix}$
- Jacob is preparing for a marathon. He ran 41 miles during three days of training. On the second day he ran three miles more than on the first day. The third day he ran four miles less than the first day. How many miles did he run on the first day?
A) 17 miles B) 14 miles C) 10 miles D) 20 miles
- Joni's allowance as a 7th grader was \$12/month. Her parents are willing to raise the allowance 15% each year. The equation $A = 12(1.15)^t$ models the situation where A is the amount of monthly allowance and t is the time in years since 7th grade. How much will the monthly allowance be Joni's senior year? Round to the nearest dollar.
A) \$25 B) \$24 C) \$28 D) \$30
- Two motorcyclists leave from The Harley Shop at the same time. The first cyclist is going east at 50 mph and the other travels west at 45 mph. How far apart are the motorcycles after 3.5 hours?
A) 157.5 miles B) 300 miles C) 175 miles D) 332.5 miles
- What is the most appropriate way to display the following data: a list of each sophomore student's favorite band.
A) Time Plot B) Pie Chart C) Histogram D) Box & Whisker Plot
- If the consecutive sides of a parallelogram are perpendicular the parallelogram is a rectangle. If a parallelogram is a rectangle, the diagonals bisect each other. If $\overline{JK} \perp \overline{KL}$ in parallelogram JKLM, what **can't** you conclude?
A) JKLM is a rectangle B) \overline{JL} and \overline{KM} bisect each other C) $\overline{JM} \perp \overline{ML}$ D) $\overline{JK} \perp \overline{LM}$
- James buys a pickup for \$12,000. Its value decreases at 12% per year. Approximately how much is the pickup worth after 5 years?
A) \$21,148 B) \$2986 C) \$6333 D) \$7200
- (Refer to problem 8) Assuming its value has been decreasing at the same rate, approximately how much was the pickup worth 4 years before James bought it?
A) \$7196 B) \$20,010 C) \$18,882 D) \$7626

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10. Scientists estimate there are 125 billion stars in the Milky Way. They also estimate there are 100 billion galaxies in the universe. If the Milky Way is an average galaxy, how many stars are there in the universe? Give your answer in scientific notation.
A) 12,500 billion stars B) 1.25×10^{13} stars C) 1.25×10^{18} stars D) 1.25×10^{22} stars
11. Every person at a convention shakes each other person's hand. If there are 30 people at the convention, how many handshakes occur?
A) 30 handshakes B) 900 handshakes C) 870 handshakes D) 435 handshakes
12. If 20 lines are drawn on a plane, what is the **maximum number** of points of intersection?
A) 20 B) 190 C) 400 D) 19
13. If 20 lines are drawn on a plane, what is the **minimum number** of points of intersection?
A) 20 B) 19 C) 1 D) 0
14. The median of a list of numbers can not be the _____.
A) mean B) mode C) maximum D) outlier
15. Write 0.0010112 in scientific notation.
A) 1011.2×10^{-6} B) 1.0112×10^3 C) 1.0112×10^{-3} D) 1.0112×10^{-2}
16. If you need to drive 200 miles in 4 hours, what is the average minimum speed you must drive?
A) 800 mph B) 5 mph C) 50 mph D) 500 mph
17. If your after school job pays \$7 per hour, how many hours must you work to earn at least \$100?
A) 13 hours B) 14 hours C) 15 hours D) 700 hours
18. During tennis intramurals, the 8 players play each other player 3 times. How many total matches are played?
A) 168 matches B) 84 matches C) 75 matches D) 462 matches

Use this information for problems 19-21.

The frequency of cricket chirping can be used to estimate temperature. By counting the number of times a cricket chirps in 25 sec (N) and dividing by 3, then adding 4, one can estimate the temperature in degrees

Celsius (C). This is modeled by the equation $\frac{N}{3} + 4 = C$.

19. Pick the set of numbers that make the most sense for the domain (N).
A) Complex B) Whole C) Integer D) Irrational
20. If a cricket chirps 45 times in 25 seconds, what is the best estimate for the temperature?
A) 19°C B) 16°C C) 123°C D) 15°C
21. If it is 7°C outside, about how many times would you expect a cricket to chirp in 25 seconds?
A) 33 times B) 9 times C) 25 times D) 17 times

Problem Solving 2012 Answer Key

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