

**MONTANA COUNCIL OF TEACHERS OF MATHEMATICS**  
**2016 MATH CONTEST**  
**PROBLEM SOLVING TEST**

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

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1. Which of the following functions represent exponential growth?

- I.  $f(x) = 0.83(1 + 0.23)^x$
- II.  $g(x) = 1500(0.98)^x$
- III.  $h(x) = 237(11)^x$

- A) I only                      B) II only                      C) I and III                      D) II and III                      E) none of these

2. Which of the following is synonymous with “range value”?

- A) y-coordinate              B) dependent variable      C) output value              D) A, B, and C              E) none of these

3. Carbon-14 is a radioactive isotope of carbon and is used to determine the age of an object containing organic material. The half-life of Carbon-14 is about 5730 years. While excavating for a new housing development, workers discover what might be a Clovis (ancient North American) burial site. Scientists determine that 21% of the Carbon-14 remains in the skeleton. To the nearest year, how old is the skeleton?

- A) 2865                      B) 12,901                      C) 1203                      D) 4527                      E) none of these

4. Jess wants to make a playlist with 25 songs. Her iTunes currently has 342 songs. For her playlist, order does not matter. Approximately how many different playlists are possible?

- A)  $5.88 \times 10^{37}$               B)  $9.13 \times 10^{62}$               C)  $5.88 \times 10^{38}$               D)  $9.13 \times 10^{63}$               E) none of these

5. Determine the 97<sup>th</sup> term in the following sequence: 3, 6, 9, 12, ...

- A)  $1.91 \times 10^{46}$               B)  $6.36 \times 10^{45}$               C) 291                      D) 288                      E) none of these

6. Determine the 97<sup>th</sup> term in the following sequence: 2, 6, 18, 54, ...

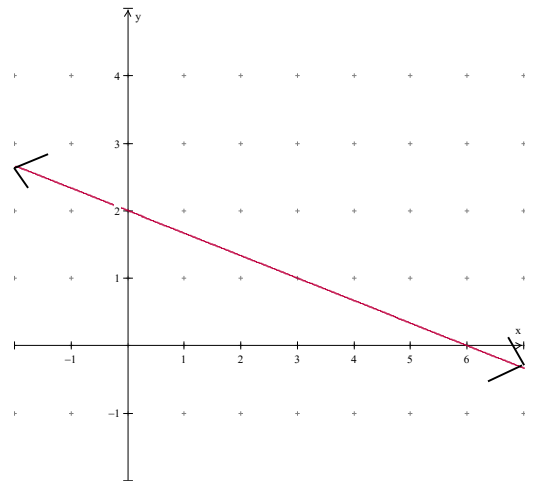
- A)  $1.27 \times 10^{46}$               B)  $6.36 \times 10^{45}$               C) 290                      D) 288                      E) none of these

7. Select the standard form linear equation that best represents the line shown at right.

- A)  $y = -\frac{1}{3}x + 2$               B)  $y - 1 = -\frac{1}{3}(x - 3)$               C)  $x + 3y = 6$   
D)  $y = -\frac{1}{3}(x + 3) + 3$               E) none of these

8. Select the point-slope form linear equation that best represents the line shown at right.

- A)  $y = -\frac{1}{3}x + 2$               B)  $y - 1 = -\frac{1}{3}(x - 3)$               C)  $x + 3y = 6$   
D)  $y = -\frac{1}{3}(x + 3) + 3$               E) none of these



9. The IQ of a Martian varies directly with the square of the number of tentacles it has. If a Martian with 5 tentacles has an IQ of 75, what is the IQ of a Martian with 8 tentacles, to the nearest whole number?

- A) 21                      B) 120                      C) 192                      D) 960                      E) none of these

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10. You are ordering sushi rolls for a work party. You order 6 yellowfish rolls, 8 spicy tuna rolls, 4 rainbow rolls, and 5 dragon rolls. If you reach in the to-go bag of sushi rolls without looking, what is the probability that the sushi roll you select will be a rainbow or a dragon roll?

- A)  $\frac{4}{23}$                       B)  $\frac{9}{14}$                       C)  $\frac{9}{23}$                       D)  $\frac{4}{14}$                       E) none of these

11. The 4<sup>th</sup> term of a sequence is 4 and the 6<sup>th</sup> term is 6. Every term after the 2<sup>nd</sup> is the sum of the 2 preceding terms. What is the 8<sup>th</sup> term of the sequence?

- A) 8                      B) -2                      C) 2                      D) 14                      E) none of these

12. If Shari earns \$178 working 8 hours as a Godiva chocolate taster, how much will she earn working 12 hours?

- A) \$22.25                      B) \$267.00                      C) \$118.67                      D) \$248.65                      E) none of these

13. Which of the following is equivalent to  $3(a - b) + 3ab + (-3a)$ ?

- A)  $6a - 3b + 3ab$                       B)  $-3c$                       C)  $3ab$                       D)  $-3b + 3ab$                       E) none of these

14. The local photographer charges \$250 for the first hour and \$65 for each additional hour. How much does a  $3\frac{1}{2}$  hour session cost?

- A) \$227.50                      B) \$477.50                      C) \$162.50                      D) \$412.50                      E) none of these

15. At the College of Hard Knocks, 99% of the 100 students are girls, but only 98% of the students living on campus are girls. If some girls live on campus, how many students live off campus?

- A) 50                      B) 98                      C) 43                      D) 2                      E) none of these

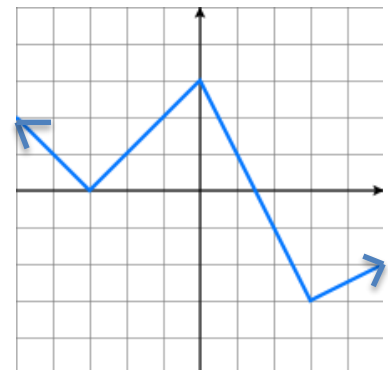
16. If I have 2 more brothers than sisters, and each of my brothers also has 2 more brothers than sisters, how many more brothers than sisters does my oldest sister have?

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

17. Select the equation that best represents the piecewise function shown at right. Assume each grid line represents 1 unit.

- A)  $f(x) = \begin{cases} |x + 3|, x \leq 0 \\ -2x + 3, 0 < x \leq 3 \\ \frac{1}{2}x - \frac{9}{2}, x > 3 \end{cases}$                       B)  $f(x) = \begin{cases} |x + 3|, x \leq 3 \\ -2x + 3, -3 < x \leq 3 \\ \frac{1}{2}x - \frac{9}{2}, x > -3 \end{cases}$   
 C)  $f(x) = \begin{cases} |x - 3|, x \leq 0 \\ -2x + 3, 0 < x \leq 3 \\ \frac{1}{2}x - \frac{9}{2}, x > 3 \end{cases}$                       D)  $f(x) = \begin{cases} |x - 3|, x \leq 3 \\ -2x + 3, -3 < x \leq 3 \\ \frac{1}{2}x - \frac{9}{2}, x > -3 \end{cases}$

E) none of these



18. The number of Smartphone Apps used by a sample of U.S. citizens in 2013 were as follows:

28, 30, 30, 37, 35, 21, 25, 22, 25, 33

Find the interquartile range of the average App data.

- A) 8                      B) 9                      C) 10                      D) 11                      E) none of these

## **PROBLEM SOLVING 2016 Answer Key**

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