

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS  
2018 MATH CONTEST  
APPLIED

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

1. Given two parallel lines and a transversal, alternate interior angles are always:

- A) acute                      B) complementary                      C) congruent                      D) supplementary                      E) none of these

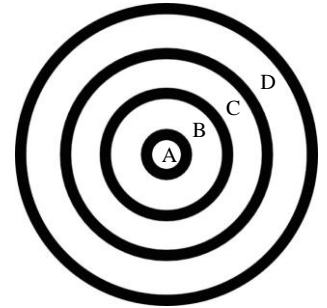
For 2-5, use the dartboard diagram at right. The radius of zone A (the bullseye) is 1 inch. Each ring expands the radius by 2 inches. Leave your answer in terms of  $\pi$  as necessary.

2. Find the area of the entire dartboard.

- A)  $14\pi$  sq in    B)  $16\pi$  sq in    C)  $49\pi$  sq in    D)  $64\pi$  sq in    E) none of these

3. Find the circumference of the outside edge of zone B.

- A)  $3\pi$  in            B)  $6\pi$  in            C)  $9\pi$  in            D)  $12\pi$  in            E) none of these



4. The area of the bullseye (zone A) is what percent of the entire dartboard area? Round to the nearest tenth of a percent.

- A) 1.6%                      B) 2.0%                      C) 6.3%                      D) 7.1%                      E) none of these

5. What is the probability that a dart thrown at random will land in zone C, assuming it hits the dartboard? Round to the nearest tenth of a percent.

- A) 28.6%                      B) 32.7%                      C) 51.0%                      D) 55.6%                      E) none of these

6. Two competing stores offer your favorite breakfast cereal in differently shaped packages. Geno's Groceries offers a 4"x5"x10" box. Serena's SuperSave sells a cube with side measure of 6". If the cost per package is the same, who is offering the better deal on your cereal?

- A) Geno's                      B) Serena's                      C) they are equal

7. X-Sta-Ski Sports is having an end of season clearance sale. For today only, ski boots are on sale for 35% off. How much would you save buying a pair regularly priced at \$397.00. Round your amount to the nearest cent.

- A) \$119.10                      B) \$138.95                      C) \$258.05                      D) \$362.00                      E) none of these

8. X-Sta-Ski Sports is passing along a manufacturers' discount on Burton Snowboards. The manufacturer is giving a 30% discount on all orders, but X-Sta-Ski wants a deposit of 20% to place the order. If the board retails for \$519.00, how much of a deposit is needed?

- A) \$72.66                      B) \$103.80                      C) \$108.99                      D) \$155.70                      E) none of these

9. Two fair dice are rolled. What is the probability of rolling a sum of 7?

- A)  $\frac{1}{12}$                       B)  $\frac{1}{9}$                       C)  $\frac{1}{6}$                       D)  $\frac{7}{12}$                       E) none of these

10. Your new laptop requires an 8 character passcode. The first two characters must be letters, the next four characters are digits, and the last two are any of these seven special characters: !, @, #, \$, %, ?, &. How many passcodes are possible?

- A) 1820                      B) 29,120                      C) 217,326,564                      D) 331,240,000                      E) none of these

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For 11-14, let  $f(x) = 3x^2 + 7x - 9$ ,  $g(x) = 7x^2 - 4x + 13$ , and  $h(x) = x^2 - 7$ .

11. Find  $f(x) + h(x)$ .

- A)  $3x^2 + 7x - 16$     B)  $3x^4 + 7x - 16$     C)  $4x^2 - 9$     D)  $4x^2 + 7x - 16$     E) none of these

12. Find  $g(x) - f(x)$ .

- A)  $4x^2 - 11x + 4$     B)  $4x^2 - 11x + 22$     C)  $4x^2 + 3x + 4$     D)  $10x^2 + 3x + 4$     E) none of these

13. Find  $g(x) \cdot h(x)$ .

- A)  $8x^2 - 4x + 6$     B)  $-4x^3 + 6x^2 + 28x - 20$     C)  $7x^4 - 4x^3 - 36x^2 + 28x - 91$   
 D)  $7x^4 - 4x^3 - 36x^2 - 28x + 91$     E) none of these

14. Evaluate  $g(-3)$ .

- A) -62    B) -38    C) 67    D) 88    E) none of these

For 15-16: A transatlantic flight originates in New York City (approximately  $40^\circ\text{N}$  and  $74^\circ\text{W}$ ) and flies to Glasgow, Scotland (approximately  $56^\circ\text{N}$  and  $4^\circ\text{W}$ ).

15. To combat boredom on a transatlantic flight, a pilot always stretches her legs at the geographic midpoint of the flight. At what latitude and longitude should she plan her stretch?

- A)  $8^\circ\text{N}$ ,  $35^\circ\text{W}$     B)  $34^\circ\text{N}$ ,  $52^\circ\text{W}$     C)  $48^\circ\text{N}$ ,  $39^\circ\text{W}$     D)  $57^\circ\text{N}$ ,  $30^\circ\text{W}$     E) none of these

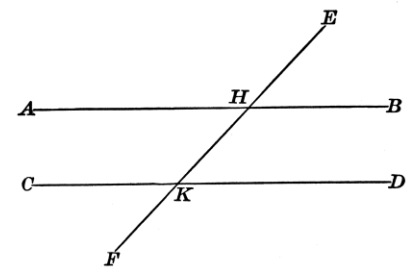
16. If  $1^\circ$  of latitude is approximately 69 miles, and  $1^\circ$  of longitude in this area of the globe is approximately 46 miles, what is the approximate distance between New York and Glasgow? Round your answer to the nearest mile.

- A) 3404 miles    B) 4324 miles    C) 4886 miles    D) 5106 miles    E) none of these

For 17-20, use the diagram at right. Assume  $\overline{AB} \parallel \overline{CD}$ .

17. If  $m\angle EHB = 37^\circ$ , find  $m\angle CKH$ .

- A)  $37^\circ$     B)  $53^\circ$     C)  $143^\circ$     D)  $153^\circ$     E) none of these



18.  $\angle AHE$  and  $\angle BHK$  exemplify which type of angles?

- A) alternate interior    B) corresponding    C) supplementary    D) vertical    E) none of these

19. Given  $H$  at  $(9, 8)$  and  $K$  at  $(7, 3)$ . Find the slope of  $\overline{EF}$ .

- A)  $\frac{1}{4}$     B)  $\frac{2}{5}$     C)  $\frac{5}{2}$     D) 4    E) none of these

20. If the slope of  $\overline{AB}$  is 0, what is the slope of  $\overline{CD}$ ?

- A) 0    B) 1    C) 5    D) undefined    E) none of these

## APPLIED 2018 Answer Key

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