MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2018 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. Which of the following examples best defines the term "complex fraction"?

A) $\frac{x+17}{\sqrt{-5x}}$ **B)** $\frac{\frac{2x}{3}}{x+17}$ **C)** $\frac{x+17i}{4x-3i}$ **D)** $\frac{\frac{x+17}{3}}{\frac{2}{x}}$ **E)** none of these

2. Find the area of the triangle with side lengths 7, 13, and 4. Round your answer to the nearest whole unit.

A) 14 **B)** 22 **C)** 26 **D)** 46 **E)** none of these

3. Find the area of the triangle with the following measurements: B = 62°, a = 12 cm, c = 19 cm. Round your answer to the nearest whole unit.

A) 54 sq cm **B)** 84 sq cm **C)** 101 sq cm **D)** 114 sq cm **E)** none of these

4. Solve for *x*: $\log(2+x) - \log(x-5) = \log 2.$

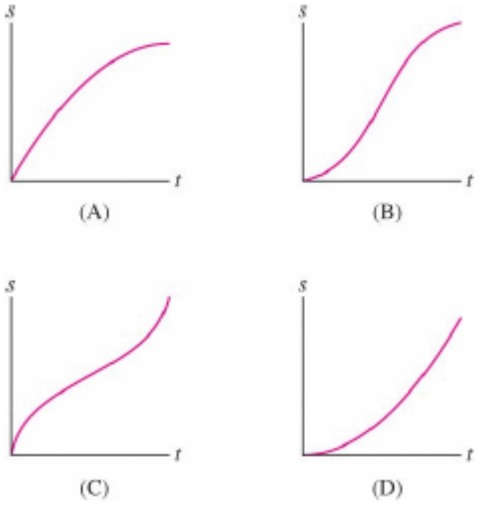
A) no solution, $-3 \neq 2$ **B)** no solution, $7 \neq 2$ **C)** $x = \frac{10}{9}$ **D)** $x = 12$ **E)** none of these

5. Find all solutions to the equation in the interval $[0, 2\pi)$.

$$2\cos x + \sin 2x = 0$$

A) $x = \frac{\pi}{4}$ **B)** $x = \frac{\pi}{2}$ **C)** $x = \frac{\pi}{4}, \frac{3\pi}{4}$ **D)** $x = \frac{\pi}{2}, \frac{3\pi}{2}$ **E)** none of these

For questions 6-9, use the graphs at right that represent the positions, *s*, of a moving alien as functions of time *t*.



6. Which graph represents the alien speeding up?

A) graph A **B)** graph B **C)** graph C **D)** graph D **E)** none of these

7. Which graph represents the alien speeding up and then slowing down?

A) graph A **B)** graph B **C)** graph C **D)** graph D **E)** none of these

8. Which graph represents the alien slowing down?

A) graph A **B)** graph B **C)** graph C **D)** graph D **E)** none of these

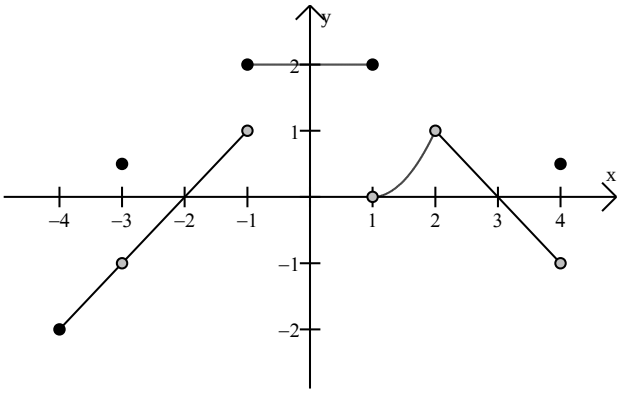
9. Which graph represents the alien slowing down and then speeding up?

A) graph A **B)** graph B **C)** graph C **D)** graph D **E)** none of these

10. Find the area of a regular decagon inscribed in a circle with diameter of 14 inches. Round your answer to the nearest whole unit.

A) 144 sq in **B)** 198 sq in **C)** 576 sq in **D)** 793 sq in **E)** none of these

For questions 11-13, use the graph of function *f* at right.



11. $f(1) =$

A) 0 **B)** 1 **C)** 2 **D)** does not exist **E)** none of these

12. $\lim_{x\to 1^-} f(x) =$

A) 0 **B)** 1 **C)** 2 **D)** does not exist **E)** none of these

13. $\lim_{x\to 1} f(x) =$

A) 0 **B)** 1 **C)** 2 **D)** does not exist **E)** none of these

14. If $\lim_{x\to 3} g(x) = 2$ and $\lim_{x\to 3} h(x) = 9$, then determine $\lim_{x\to 3} \frac{g(x)h(x)}{x}$.

A) 3 **B)** 6 **C)** 18 **D)** 27 **E)** none of these

15. A recent study suggests that 61% of the population swallow at least one spider per year in their sleep. Based on this study, what is the probability that exactly 7 of 10 randomly selected people have swallowed at least one spider in their sleep in the past year? Round your answer to the nearest percent.

A) 22% **B)** 43% **C)** 61% **D)** 70% **E)** none of these

16. Find the coefficient of the $\_\_x^5y^8$ term in the binomial expansion $(x + y)^{13}$.

A) 40 **B)** 56 **C)** 520 **D)** 1287 **E)** none of these

17. A cable news show host asks his viewers to visit his website and respond to an online poll. What type of sampling is this?

A) convenience **B)** random **C)** voluntary response **D)** systematic **E)** none of these

18. A coach wants to select 3 of her 15 basketball players at random to lead warmups before practice each week. The coach assigns each player a number from 01 to 15. Use the line of random numbers to choose the three players.

16910 38010 80649 31122 09279 81776

A) 01, 06, 09 **B)** 01, 09, 12 **C)** 01, 06, 10 **D)** 03, 10, 11 **E)** none of these

19. The probability that a dessert sold at a certain café contains chocolate is 86%. The probability that a dessert containing chocolate also contains nuts is 30%. Find the probability that a dessert chosen at random contains nuts given that it contains chocolate. Round your answer to the nearest percent.

A) 29% **B)** 30% **C)** 35% **D)** 86% **E)** none of these

TEAM 11-12 2018 Answer Key

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