

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2018 MATH CONTEST
PROBLEM SOLVING TEST

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

1. The population of the world is approximately 7 billion and the population of the USA 350 million. How many times larger is the world's population than the USA's population?

- A) 2.45×10^{18} B) 2.0×10^1 C) 2.0×10^3 D) 2.0×10^{13} E) none of these

2. Casa Bonita sells a large combo with 2 burritos and 3 tacos for \$9.10. They also have a small combo with 1 burrito and 2 tacos for \$5.15. Using these prices, what should a single burrito cost?

- A) \$1.20 B) \$1.35 C) \$2.75 D) \$3.95 E) none of these

3. You have one question remaining on a 25 question test and there are 6 minutes left out of the 30 minutes you are allowed. What percent of the total test time did you spend on the other 24 questions?

- A) 20% B) 24% C) 75% D) 80% E) none of these

For 4-6, use the double stem and leaf plot (at right) showing student heights.

4. What is the difference in height between the tallest boy and the shortest girl?

- A) 1'5" B) 1'7" C) 1'9" D) 2'3" E) none of these

5. What is the median boy height?

- A) 65" B) 66" C) 67" D) 68" E) none of these

6. What is the mean girl height? Round your answer to the nearest tenth.

- A) 56.7" B) 62.1" C) 64.0" D) 65.8" E) none of these

7. The evil science teacher at your high school has an agar dish that closely represents the chemical makeup of human skin. He infects the dish with a strain of flesh-eating bacteria that doubles every three hours. If he started with 4 milligrams of the bacteria, how much bacteria would be in the dish after 24 hours?

- A) 1024 mg B) 65,536 mg C) 16,777,216 mg D) 67,108,864 mg E) none of these

8. Determine the fractional area of the rectangle that is shaded (at right).

- A) $\frac{5}{21}$ B) $\frac{1}{3}$ C) $\frac{16}{21}$ D) $\frac{21}{25}$ E) none of these

9. What is the sixth term in the pattern 1, 4, 9, 16...?

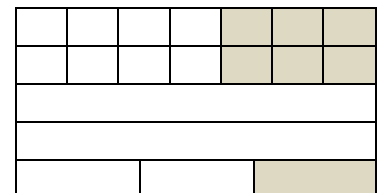
- A) 23 B) 25 C) 32 D) 36 E) none of these

10. What is the seventh term in the pattern 4, 5, 9, 14, 23...?

- A) 37 B) 50 C) 60 D) 97 E) none of these

Girls					Boys				
		4		5					
		9	8	5					
	4	3	0	6	0	1	2		
7	6	5	5	6	5	5	7	8	9
				7	0	1			

Key: 3|6|1 = 63 inches, 61 inches



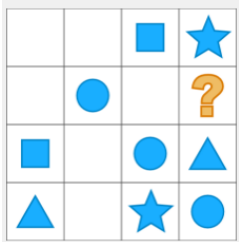
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11. The cost of a pizza varies directly as the square of its radius. If a pizza with a 6 inch radius costs \$8.00, how much should a pizza with an 11 inch radius cost? Round to the nearest penny.

- A) \$4.36 B) \$14.67 C) \$26.18 D) \$26.89 E) none of these

12. The frequency of a vibrating guitar string varies inversely as its length. Suppose a guitar string 0.65 meters long vibrates 4.3 times per second. What frequency would a string 0.5 meters long have?

- A) 0.08 times/second B) 0.50 times/second C) 3.31 times/second D) 5.59 times/second E) none of these



13. Which of the following should replace the question mark?

- A) B) C) D) E) none of these

Name	Double Eagle	Eagle	Birdie	Par	Bogey	Double Bogey
Score	-3	-2	-1	0	1	2

For 14, use the table at right.

14. In golf, the best total score is the lowest score. In four holes, Colton scores a birdie, a par, a double eagle, and a double bogey. Emma scores an eagle, a double eagle, a bogey, and a par. Who has the better total score, and by how much?

- A) Colton, 2 B) Emma, 2 C) Colton, 4 D) Emma, 4 E) none of these

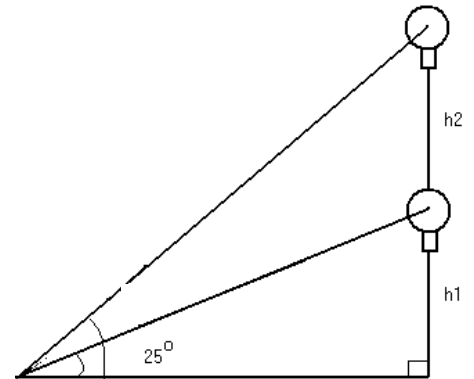
For 15-17, use the diagram at right. On June 3, 2017, Alex Honnold set a new record with his 3 hour and 56 minute free solo climb of the “Freerider” route on El Capitan, in Yosemite National Park.

15. A photographer was standing 500 feet away from the base of the route. He looked up at an angle of 25° to take his first picture. How far had Honnold climbed at this point? Round your answer to the nearest tenth of a foot.

- A) 66.8 ft B) 211.3 ft C) 233.2 ft D) 453.2 ft E) none of these

16. El Capitan rises approximately 3000 ft above the Yosemite Valley floor. When Honnold arrives at the top, what is the angle of elevation from the photographer’s point of view? Round to the nearest tenth of a degree.

- A) 9.5° B) 72.3° C) 80.5° D) 140.6° E) none of these



17. What is the line of sight distance between the photographer and Honnold when he reaches the summit? Round your answer to the nearest tenth of a foot.

- A) 583.1 ft B) 2958.0 ft C) 3041.4 ft D) 3500 ft E) none of these

18. Simplify the following expression using only positive exponents. $\frac{(x^3y^2)^2}{7x^{-4}} \cdot \frac{(x^{-5}y^3)^3}{(2y)^{-1}}$

- A) $\frac{y^{14}}{14x^5}$ B) $\frac{2y^{11}}{7x^4}$ C) $\frac{7y^{14}}{2x^5}$ D) $\frac{2y^{14}}{7x^5}$ E) none of these

PROBLEM SOLVING 2018 Answer Key

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