

MONTANA COUNCIL OF TEACHERS OF MATHEMATICS
2016 MATH CONTEST
FINITE TEST

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

1. Which of the following systems of linear equations has more than one solution?
A) $\begin{cases} 12x + 3y = 15 \\ 4x - y = 5 \end{cases}$ B) $\begin{cases} 12x + 3y = 15 \\ -4x - y = -5 \end{cases}$ C) $\begin{cases} 12x + 3y = 15 \\ -4x + y = -5 \end{cases}$ D) $\begin{cases} 12x + 3y = 15 \\ 4x + y = -5 \end{cases}$ E) none of these

2. Determine the solution to the system of linear equations $\begin{cases} 12x + 4y = -24 \\ -2x + 6y = 84 \end{cases}$.
A) $(-6, -12)$ B) $(12, -6)$ C) $(-6, 12)$ D) $(2, -3)$ E) none of these

3. Find the maximum value of the objective function $p = 2x - 3y$ over the feasible region defined by $x \geq 0$, $y \leq 0$, $-2x + y \geq -7$, $-x + 2y \geq -8$
A) 0 B) 7 C) 13 D) -8 E) none of these

4. Suppose that there are 8 sprinters participating in a 100 meter dash qualifying race. In how many different ways could the 8 sprinters finish in 1st, 2nd and 3rd place?
A) 336 B) 56 C) 313,040 D) 512 E) none of these

5. Suppose that there are 8 sprinters participating in a 100 meter dash qualifying race. If the top three sprinters advance to the finals, how many different groups of three sprinters can advance?
A) 336 B) 56 C) 313,040 D) 512 E) none of these

6. Suppose that a subcommittee of 5 people is to be chosen from a group consisting of 30 grizzly fans and 20 bobcat fans. In how many different ways can the committee be chosen if there are no more than 3 of either fan group represented?
A) 1,267,300 B) 495,900 C) 771,400 D) 2,118,760 E) none of these

7. Suppose that a fair coin is tossed 8 times and heads or tails is recorded. Find the probability that 3 or more heads appears in the 8 tosses.
A) $37/256$ B) $28/256$ C) $247/256$ D) $219/256$ E) none of these

8. MSU Lady Bobcat basketball team member Jackie Elliot has a long-run free throw average of 78%. Use this information to estimate the probability that she will make exactly three out of the next four free throws. Round your answer to the nearest hundredth.
A) 0.78 B) 0.42 C) 0.10 D) 0.31 E) none of these

9. Find the 2016th term in the sequence $\{5, 7, 9, 11, 13, \dots\}$.
A) 2021 B) 4031 C) 4035 D) 4033 E) none of these

10. Find the 10th term of the geometric sequence in which the 5th term is -96 and the 8th term is 768.
A) 1344 B) -1536 C) -3072 D) 3072 E) none of these

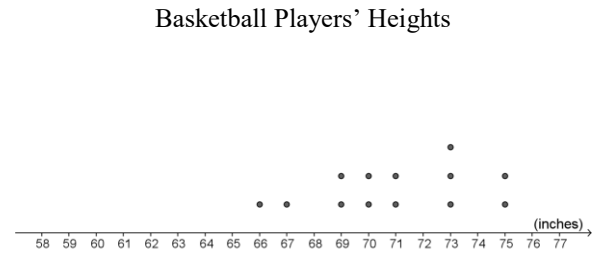
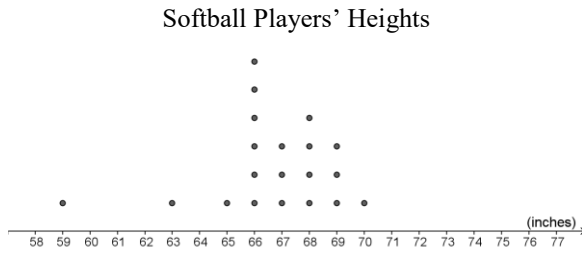
11. Suppose that a mutual fund pays 8% interest compounded annually. How much more does a \$10,000 initial investment make when compared to a \$5,000 initial investment over a 20 year period? Round your answer to the nearest penny.
A) \$5,000.00 B) \$23,304.78 C) \$46,609.57 D) \$23,304.79 E) none of these

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12. On Monday, Al's Service Station sold 1600 gallons of regular and 1000 gallons of regular plus. On Tuesday, the station sold 1500 gallons of regular and 1200 gallons of regular plus. Which of the following matrix expressions computes the total revenue generated over the two days if regular sold for \$2.69 and regular plus for \$2.79?

- A) $\left(\begin{bmatrix} 1600 & 1000 \end{bmatrix} + \begin{bmatrix} 1500 & 1200 \end{bmatrix} \right) \begin{bmatrix} 2.69 \\ 2.79 \end{bmatrix}$ B) $\left(\begin{bmatrix} 1600 & 1500 \end{bmatrix} + \begin{bmatrix} 1000 & 1200 \end{bmatrix} \right) \begin{bmatrix} 2.69 \\ 2.79 \end{bmatrix}$
- C) $\left(\begin{bmatrix} 1600 \\ 1000 \end{bmatrix} + \begin{bmatrix} 1500 \\ 1200 \end{bmatrix} \right) \begin{bmatrix} 2.79 & 2.69 \end{bmatrix}$ D) None of these

Problems 13-16: The dot plots below show the distribution of heights of players on the University of Montana (UM) women's basketball team and the heights of players on the UM women's softball team for the 2014-2015 season.



13. Which ONE of the following statements is true?
 A) The mean softball player height is greater than the mean basketball player height.
 B) The median softball player height is less than the median basketball player height.
 C) The modal softball player height is greater than the modal basketball player height.
 D) The range of basketball player heights is less than the range of softball player heights.
 E) None of the statements above are true
14. Determine the interquartile range (IQR) of the basketball players' heights.
 A) 6 inches B) 4 inches C) 11 inches D) 2 inches E) none of these
15. Which of the following is the closest approximation to the standard deviation of softball players' heights?
 A) 2.4 inches B) 3.4 inches C) 1.8 inches D) 4.2 inches E) none of these
16. Which of the following is the mean absolute deviation of basketball players' heights?
 A) 2.23 inches B) 2.70 inches C) 2.81 inches D) 2.54 inches E) none of these

Problems 17-20: A scatterplot of engine torque (measured in foot-pounds) on the x-axis versus power (measured in horsepower) on the y-axis for the 30 top-selling passenger vehicles in the United States displays a linear association. The computer-generated regression line for the scatterplot has equation $y = 1.06x - 2.36$ and the correlation coefficient is 0.94.

17. Which of the following best characterizes the linear association of torque and horsepower?
 A) weak positive B) strong positive C) weak negative D) strong negative E) none of these
18. Use the regression equation to predict the torque for a passenger vehicle that has an engine with 250 horsepower. Round to the nearest whole foot-pound.
 A) 212 foot-pounds B) 182 foot-pounds C) 262 foot-pounds D) 238 foot-pounds E) none of these
19. One member of the data set is the Honda Civic which has 185 horsepower and 163 foot-pounds of torque. Compared to other members of the data set, which of the following is true.
 A) The Civic has above average horsepower for its torque. B) The Civic has above average torque for its horsepower
 C) The Civic has below average horsepower for its torque. D) none of these
20. Which is the BEST interpretation of the number 1.06 in the regression equation?
 A) The average increase in horsepower per unit increase in torque B) The average increase in torque per unit increase in horsepower
 C) The average increase in horsepower per unit of torque D) The increase in torque per unit of horsepower

FINITE TEST 2016 Answer Key

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