

1999 Mu Alpha Theta National Convention  
Probability & Statistics  
Open Division

1. The heights of the basketball players at Mt. Abram High School are 76", 73", 69", 70", 73", 72", 71", 70", 70", 69", 68". What is the mean height?

- A. 69"
- B. 70"
- C. 71"
- D. 72"
- E. none of the above

2. What is the median height of the players in problem 1?

- A. 69"
- B. 70"
- C. 71"
- D. 72"
- E. none of the above

3. What is the modal height of the players in problem 1?

- A. 67"
- B. 69"
- C. 71"
- D. 73"
- E. none of the above

4. Compute the mean deviation to the nearest hundredth for the heights in problem 1.

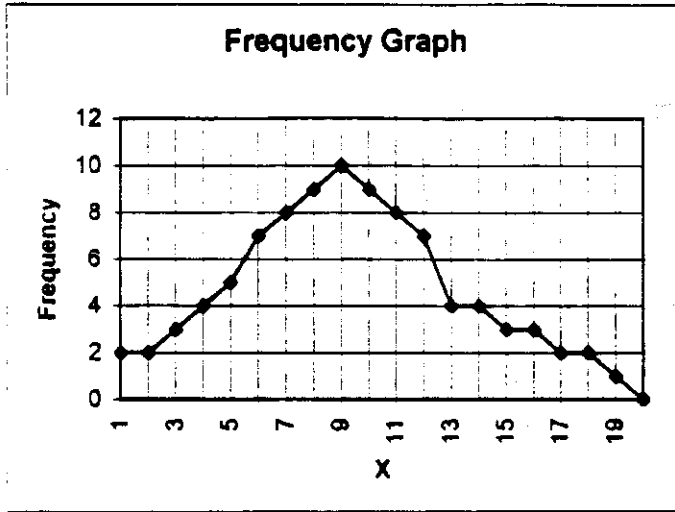
- A. -1.81
- B. 0.00
- C. 1.81
- D. -1.82
- E. none of the above

5. If a student in problem 1 is selected at random, what is the probability that he is taller than the mean height?

- A. 3/11
- B. 4/11
- C. 5/11
- D. 6/11
- E. none of the above

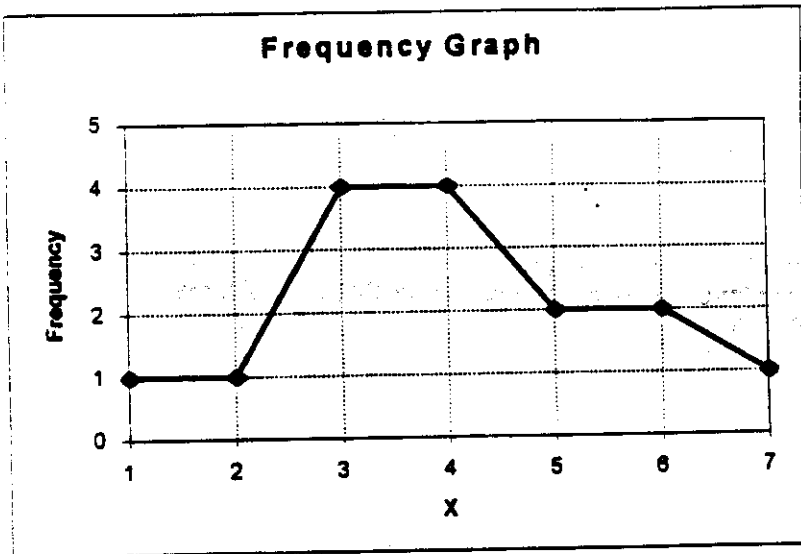
6. What is the probability that a student selected at random in problem 1 has a height in inches that is a prime number?
- A.  $0/11$
  - B.  $1/11$
  - C.  $2/11$
  - D.  $3/11$
  - E. none of the above
7. The Mt. Abram High School Math Team raised money during the school year. Colin raised \$12.00, Lindsay raised \$10.00, Maggie raised \$16.00, Joe raised \$8.00, Beth raised \$7.00, Morgan raised \$9.00, Erik raised \$8.00, Rebecca raised \$6.00, Tiffany raised \$10.00, and Monica raised \$14.00. What is the standard deviation for these monetary amounts?
- A. 1.5
  - B. 2.0
  - C. 2.5
  - D. 3.0
  - E. none of the above
8. The probability that a student at Mt. Abram High School is on the math team is .03. The probability that a student at Mt. Abram High School is on the ski team is .10. If a student is chosen at random, what is the probability that he or she is on both the math team and the ski team?
- A. 0
  - B. .003
  - C. .03
  - D. .3
  - E. none of the above
9. The SAT math scores for all students in the state of Maine form a normal distribution, where the mean, median, and mode are all equal to 500, and a standard deviation equal to 100. What is the z-score corresponding to an SAT score of 650?
- A. -1.5
  - B. -1.0
  - C. 1.0
  - D. 1.5
  - E. none of the above
10. In a distribution of 10,000 data points that is negatively skewed, which one of the following is true?
- A. Out of mode, median, and mean, the mode is the largest
  - B. Out of mode, median, and mean, the mean is the largest
  - C. Out of mode, median, and mean, the median is the largest
  - D. The mode, median, and mean are all equal
  - E. none of the above

11. Based on the frequency graph below, what is the mode of the underlying data that creates the graph?



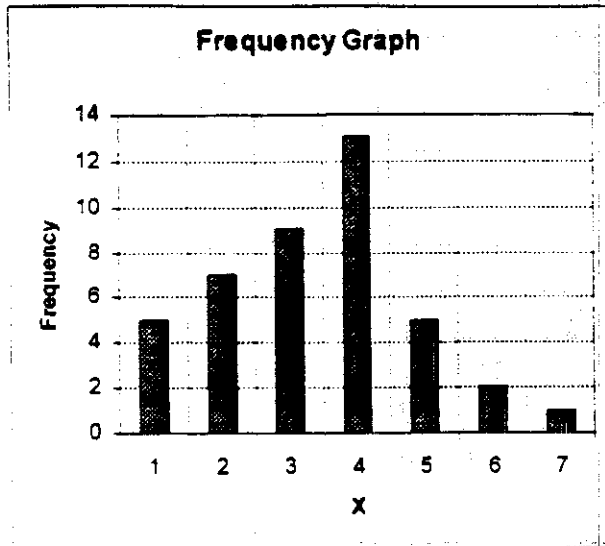
- A. 2  
 B. 9  
 C. 10  
 D. 20  
 E. none of the above

12. Based on the frequency graph below, what is the mean of the underlying data that creates the graph?



- A. 3  
 B. 4  
 C. 7  
 D.  $8\frac{4}{7}$   
 E. none of the above

13. Based on the histogram shown below, what is the median of the underlying data that creates the histogram?



- A. 3.0  
B. 3.5  
C. 4.0  
D. 4.5  
E. none of the above
14. A four-sided die has the letters A, B, C, and D on the sides. If the die is tossed 4 times, what is the probability that all four tosses will result in different letters?
- A.  $\frac{3}{32}$   
B.  $\frac{7}{31}$   
C.  $\frac{1}{4}$   
D. 1  
E. none of the above
15. A hat contains 100 slips of papers with a different, random number on each piece. Two numbers are chosen at random. What is the probability that one of these numbers is the largest out of the 100, and the other is the smallest?
- A.  $\frac{1}{10000}$   
B.  $\frac{1}{5000}$   
C.  $\frac{1}{4950}$   
D.  $\frac{1}{50}$   
E. none of the above
16. A rocket ship has 3 computers on board, each performing identical functions. Thus, if any computer fails, there are still two others that continue to perform the necessary tasks. If all three computers fail, then the rocket ship will crash. If the probability that all three computers fail on a given mission is .001, what is the probability that exactly 1 computer out of the three will fail on a mission?
- A. .027  
B. .100  
C. .243  
D. .500  
E. none of the above

17. An urn contains 4 red marbles, 3 blue marbles, and 5 white marbles. A second urn contains 5 blue marbles, 2 white marbles, and 8 red marbles. An urn is chosen at random, and then a marble is chosen at random from that urn. What is the probability that the marble chosen is red?
- A.  $1/6$
  - B.  $13/30$
  - C.  $4/9$
  - D.  $17/30$
  - E. none of the above
18. A family consists of four children at least 3 of which are boys. What is the probability that the other child is also a boy?
- A.  $1/5$
  - B.  $1/4$
  - C.  $1/3$
  - D.  $1/2$
  - E. none of the above
19. The Twitchell brothers' names are Arnold, Brian, Doug, and Jonathan. Their respective wives (or significant others) are Debbie, Kathy, Christie, and Melody. If they all sit down to eat together at a round table, and are randomly seated, what is the probability that each brother will be sitting next to his respective wife (or significant other)?
- A.  $1/10$
  - B.  $1/8$
  - C.  $1/4$
  - D.  $1/2$
  - E. none of the above
20. The probability that Brian's wife will make him bacon as part of his breakfast is  $1/7$ . The probability that she will make him waffles is  $1/14$ . What is the probability that Brian will be having bacon and waffles tomorrow morning for breakfast?
- A.  $1/98$
  - B.  $2/21$
  - C.  $3/14$
  - D.  $4/7$
  - E. none of the above
21. Pete lives on an island off the coast of Maine. The mail is delivered by either canoe or by carrier pigeon. (The carrier pigeon is used only if the water is too rough for the canoe to navigate safely). The probability that the canoe can be used on any given day is  $3/4$ . The probability that the carrier pigeon can fly far enough to deliver the mail is  $2/3$ . Find the probability that Pete will get his mail tomorrow.
- A. 0
  - B.  $1/12$
  - C.  $5/12$
  - D.  $11/12$
  - E. none of the above

22. Two toothpicks of equal size are placed on a table so that they are touching at one end. What is the probability that the distance between the other two ends is more than the length of the toothpick?

- A.  $1/4$
- B.  $1/3$
- C.  $1/2$
- D.  $2/3$
- E. none of the above

23. A six-sided die is rolled twice. What is the probability that the second value is higher than the first?

- A.  $1/4$
- B.  $1/3$
- C.  $5/12$
- D.  $7/12$
- E. none of the above

24. Let A be a randomly selected integer between 1 and 5, inclusive. Let B be a randomly selected integer between 1 and A, inclusive. Let C be a randomly selected integer between 1 and B, inclusive. What is the probability that  $C=3$ ?

- A.  $\frac{745}{9000}$
- B.  $\frac{1489}{18000}$
- C.  $\frac{5}{18}$
- D.  $\frac{1}{2}$
- E. none of the above

25. The probability of getting heads when you toss a magic penny changes each time you toss it. For the  $n^{\text{th}}$  toss, the probability of getting heads is  $\frac{n}{2n+2}$ . If the coin is tossed  $x$  times, the probability of never tossing heads is  $\frac{13}{4096}$ . What is the value of  $x$ ?

- A. 10
- B. 11
- C. 12
- D. 13
- E. none of the above

26. Two six-sided dice are rolled. Given that their sum is a prime number, what is the probability that the sum is 11?

- A.  $2/15$
- B.  $1/5$
- C.  $4/15$
- D.  $1/3$
- E. none of the above

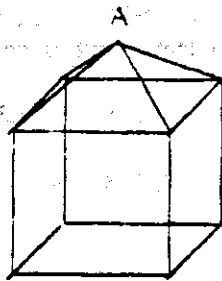
27. If  $f(x) = x + \frac{1}{2}$  and  $g(x) = x - \frac{1}{2}$ , and  $x$  is a randomly selected real number between -1 and 2, what is the probability that the product of  $f(x)$  and  $g(x)$  is a negative number?

- A.  $\frac{1}{6}$
- B.  $\frac{1}{4}$
- C.  $\frac{1}{3}$
- D.  $\frac{1}{2}$
- E. none of the above

28. The letters of the word MISSISSIPPI are arranged in that order in a circle, and three consecutive letters are selected. What is the probability that two of those three letters are the same?

- A.  $\frac{8}{11}$
- B.  $\frac{7}{9}$
- C.  $\frac{9}{11}$
- D.  $\frac{8}{9}$
- E. none of the above

29



An inchworm starts at point A on the roof of the building pictured above. He randomly chooses an edge along which to crawl. When he reaches another vertex, he stops and randomly chooses another edge (he may retrace his steps). He continues on in this manner indefinitely. Let  $P(n)$  be the probability that he will be on vertex A after  $n$  'moves'. As the inchworm continues on, the probability  $P(n)$  changes, approaching a certain value. What is that value?

- A.  $\frac{1}{9}$
- B.  $\frac{1}{8}$
- C.  $\frac{1}{5}$
- D.  $\frac{1}{2}$
- E. none of the above

30. The probability that one of Brian's children will wake up in the middle of the night is the reciprocal of that child's age. Brian's children are 9, 7, 4, and 2. What is the probability that Brian will get to sleep through the night two out of three consecutive nights?

- A.  $\frac{60}{343}$
- B.  $\frac{30}{219}$
- C.  $\frac{80}{343}$
- D.  $\frac{4}{21}$
- E. none of the above