

MU ALPHA THETA CONVENTION 1991

PROBABILITY TOPIC TEST

1. If you randomly guess the answer to the next question on this test, what is the probability you will answer it correctly?
A. $\frac{1}{5}$ B. $\frac{1}{4}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$ E. 1

2. In how many different ways can a bowler knock down 7 of 10 (distinguishable) pins in one roll of a bowling ball?
A. $7!$ B. $3!$ C. $\frac{10!}{3!}$ D. $\frac{10!}{7!}$ E. $\frac{10!}{7!3!}$

3. $\binom{7}{5} + {}_{10}P_4 =$
A. 75 B. 321 C. 2730 D. 5061 E. 5460

4. How many distinguishable ways can you arrange all of the letters in the word "ALABAMA"?
A. 24 B. 120 C. 210 D. 720 E. 50400

5. A golfer plays 18 holes of golf. On each hole he scores at least two, but no more than five, strokes. How many possible scores are there for the golfer's 18-hole total?
A. 55 B. 72 C. 90 D. 4^{18} E. 5^{18}

6. How many 4 digit numbers can be formed if each digit used is a prime number? (Repetition of digits is allowed.)
A. 128 B. 192 C. 512 D. 768 E. none of these

7. The probability that a baseball player gets a hit is $\frac{3}{10}$. Find the probability that he gets 2 hits in 4 at bats in his next game.
- A. 0.0441 B. 0.0900 C. 0.2646 D. 0.5000 E. 0.5292
8. On a certain five-dimensional planet, fair three-sided coins are minted. The possible outcomes of a coin "flip" are called heads, tails, and legs (all equiprobable). What is the probability that three coin flips will yield a head, a tail, and a leg (not necessarily in that order)?
- A. $\frac{1}{27}$ B. $\frac{2}{27}$ C. $\frac{1}{9}$ D. $\frac{2}{9}$ E. $\frac{1}{3}$
9. The probability that horse A wins a race is $\frac{5}{9}$. The probability that horse B wins the same race is $\frac{1}{3}$. What are the odds in favor of any other horse winning the race?
- A. 1:9 B. 1:8 C. 1:7 D. 5:22 E. 1:3
10. A pair of fair twenty sided dice are each numbered from 6 to 25 and when the dice are rolled each of the numbers from 6 to 25 are equally likely to turn up. Find the probability of rolling a sum of 32 in a single toss of this pair of dice.
- A. $\frac{57}{4000}$ B. $\frac{9}{400}$ C. $\frac{1}{40}$ D. $\frac{3}{80}$ E. $\frac{19}{400}$
11. Two distinct integers are selected on the closed interval $[1,100]$. The probability their sum is odd is
- A. $\frac{1}{2}$ B. $\frac{50}{99}$ C. $\frac{49}{99}$ D. $\frac{1}{3}$ E. $\frac{2}{3}$

12. Find $P((A \cap B) \cup C)$ if $P(A) = \frac{1}{4}$, $P(B) = \frac{3}{11}$, and $P(C) = \frac{2}{5}$. A,

B, and C are independent events and $P(A \cup B) = \frac{1}{2}P(A \cap B \cap C) = \frac{1}{10}$.

A. $\frac{1}{495}$ B. $\frac{59}{495}$ C. $\frac{71}{220}$ D. $\frac{15}{144}$ E. $\frac{137}{220}$

13. In how many ways can 3 Americans, 4 Germans, 2 Frenchmen, and 3 Russians sit around a circular table if those of the same country sit together?

A. 1728 B. 3456 C. 5184 D. 10368 E. 41472

14. Three points A, B, and C are selected at random from the circumference of a circle. Find the probability that the points lie on a semicircle.

A. $\frac{1}{2}$ B. $\frac{2}{3}$ C. $\frac{3}{4}$ D. $\frac{7}{8}$ E. $\frac{9}{10}$

15. A player tosses two fair coins. He wins \$10 if 2 tails occur, \$5 if 1 tail occurs, and \$1 if no tails occur. Find his expected earnings.

A. \$5.00 B. \$5.13 C. \$5.25 D. \$7.50 E. \$7.75

16. Six students take a quiz. The teacher collects them and redistributes them randomly among the students to be graded. What is the probability that no student checks his/her own paper?

A. $\frac{1}{720}$ B. $\frac{53}{144}$ C. $\frac{53}{124}$ D. $\frac{91}{144}$

E. none of these

17. Annie, Betty, and Cathy stand in a triangular arrangement as shown and pass a ball around. The probabilities that a player throws clockwise or counter clockwise, on any pass are respectively, Annie $(\frac{1}{3}, \frac{2}{3})$, Betty $(\frac{3}{4}, \frac{1}{4})$, and Cathy $(\frac{1}{2}, \frac{1}{2})$. If Annie starts with the ball, find the probability she possesses it after three passes. Note: Annie $(\frac{1}{3}, \frac{2}{3})$ means that when Annie passes the ball there is a $\frac{1}{3}$ probability she passes clockwise and a $\frac{2}{3}$ probability she passes counter clockwise.



- A. $\frac{5}{24}$ B. $\frac{1}{4}$ C. $\frac{7}{24}$ D. $\frac{1}{3}$ E. $\frac{5}{9}$

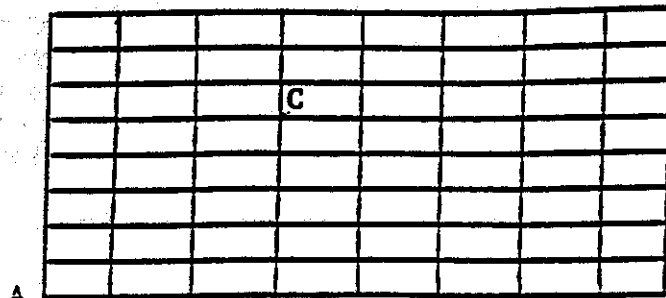
18. What is the probability of obtaining 9 as the sum of the face values if 4 dice are thrown?

- A. $\frac{5}{324}$ B. $\frac{35}{1296}$ C. $\frac{7}{162}$ D. $\frac{41}{648}$
 E. none of these

19. A boy has a box of fruit containing 2 apples, 3 oranges, and 4 peaches. He decides to pull out a piece of fruit at random, twice. If there is a 50% chance that he replaces his first selection before making his second drawing, what is the probability he chooses an orange both times?

- A. $\frac{1}{18}$ B. $\frac{7}{72}$ C. $\frac{7}{36}$ D. $\frac{2}{9}$ E. $\frac{1}{3}$

20. A thief, fleeing from the scene of the crime, A, to his hide-away, B, travels the minimum distance from A to B by driving only north and east from A to B. A cop positions himself at the intersection C in hopes of catching the thief. Find the probability he is successful if any path through C from A to B results in the thief's arrest.



- A. $\frac{({}_8C_3)}{({}_{15}C_8)}$ B. $\frac{1}{9}$ C. $\frac{{}_8C_5}{{}_{16}C_8}$ D. $\frac{15}{64}$
 E. $\frac{1}{2}$

21. Which of the following is a probability vector?

- A. $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$ B. $(\frac{1}{3}, \frac{1}{3}, \frac{1}{3})$ C. $\frac{1}{\sqrt{3}}(1, 1, 1)$
 D. $(\frac{1}{2}, \frac{1}{3}, \frac{1}{4})$ E. none of these

22. Cage A contains 1 hamster, 2 gerbils, and 3 chipmunks. Cage B contains 3 hamsters, 4 chipmunks, and 1 gerbil. Cage C contains 5 hamsters, 2 chipmunks, and 3 gerbils. A cage is selected at random, and a rodent removed from it. If this rodent is a chipmunk, what is the probability it came from cage B?

- A. $\frac{1}{6}$ B. $\frac{1}{3}$ C. $\frac{4}{9}$ D. $\frac{5}{12}$ E. none of these

23. Urn A contains 2 red balls and 1 green ball and urn B contains 3 red balls and 2 green balls. Two balls are drawn from urn A and placed in urn B without noting their color. Then two balls are drawn from urn B. What is the probability that one is red and the other green?

- A. $\frac{1}{3}$ B. $\frac{3}{7}$ C. $\frac{1}{2}$ D. $\frac{11}{21}$ E. $\frac{34}{63}$

24. Find the probability that the ace of spades lies next to the jack of diamonds in an ordinary deck of 52 playing cards.

- A. $\frac{1}{52}$ B. $\frac{1}{26}$ C. $\frac{1}{13}$ D. $\frac{2}{13}$

E. none of these

25. A box contains a variable number of ping pong balls, each of which is colored pink or chartreuse. The probability of pulling a chartreuse ball from the box on the n th try is

$\frac{\binom{n}{n+2}}$. Find the probability of pulling 3 chartreuse and 1 pink ping pong balls (in any order) in 4 consecutive draws from the box.

- A. $\frac{2}{9}$ B. $\frac{5}{18}$ C. $\frac{3}{10}$ D. $\frac{29}{90}$ E. $\frac{1}{3}$