2002 Mu Alpha Theta National Convention

Probability topic Test- Theta Division

1. In a drawer are 24 socks; 10 red, 8 white, and 6 blue. If 3 socks are drawn at random, what is the probability of getting one of each color?

   (A) $\frac{5}{144}$ (B) $\frac{10}{253}$ (C) $\frac{30}{253}$ (D) $\frac{60}{253}$ (E) NOTA

2. In a family of 5 children, what is the probability exactly 3 are girls?

   (A) $\frac{5}{16}$ (B) $\frac{1}{32}$ (C) $\frac{3}{5}$ (D) $\frac{9}{32}$ (E) NOTA

3. In a drawer are 27 socks; 8 blue, 6 black, 4 green, and 9 white. What is the smallest number you must randomly draw to have a probability of 1 that you have a pair of white socks?

   (A) 8 (B) 12 (C) 16 (D) 20 (E) NOTA

4. In order, Anna, Beth, and Carrie take turns flipping the same fair coin. The first one to toss a head wins. What is the probability that Beth wins?

   (A) $\frac{1}{4}$ (B) $\frac{2}{7}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$ (E) NOTA

5. The digits 2,4,6,and 7 are each used once to form a 4-digit number. What is the probability that the number is divisible by 4?

   (A) $\frac{1}{4}$ (B) $\frac{7}{24}$ (C) $\frac{1}{3}$ (D) $\frac{4}{9}$ (E) NOTA

6. The sum of the digits in a positive integer less than one thousand is 4. What is the probability the integer is prime?

(A) $\frac{2}{7}$ (B) $\frac{4}{15}$ (C) $\frac{1}{3}$ (D) $\frac{5}{14}$ (E) NOTA

7. There are an equal number of pennies, nickels, and dimes in a bag. What is the probability that the combined value of 3 coins randomly selected with replacement will be exactly 16 cents?

(A) $\frac{1}{27}$ (B) $\frac{2}{27}$ (C) $\frac{2}{9}$ (D) $\frac{8}{15}$ (E) NOTA

8. Three coins are dropped to the floor. If at least 2 of them are heads, what is the probability all three are heads?

(A) $\frac{1}{8}$ (B) $\frac{3}{4}$ (C) $\frac{1}{4}$ (D) $\frac{1}{2}$ (E) NOTA

9. Two 6-sided dice are rolled. What is the probability the total is prime?

(A) $\frac{5}{12}$ (B) $\frac{13}{36}$ (C) $\frac{1}{3}$ (D) $\frac{5}{11}$ (E) NOTA

10. Three 6-sided dice are rolled. What is the probability that the total is 10?

(A) $\frac{1}{8}$ (B) $\frac{1}{9}$ (C) $\frac{1}{16}$ (D) $\frac{1}{6}$ (E) NOTA

11. In a hopper are 26 ping-pong balls, each labeled with a different letter of the alphabet. If balls are selected randomly without replacement, what is the probability you will get 2 vowels (A,E,I,O,U) before you get 2 consonants?

(A) $\frac{7}{260}$ (B) $\frac{2}{65}$ (C) $\frac{21}{260}$ (D) $\frac{11}{130}$ (E) NOTA

12. If a six- sided die is rolled six times, what is the probability of two or more 5's ?

(A) $\frac{625}{46656}$ (B) $\frac{3125}{15552}$ (C) $\frac{12281}{46656}$ (D) $\frac{1}{3}$ (E) NOTA

13. Find the probability that a random point on the interior of a circle of radius 3 is more than 2 units from the center.

(A) $\frac{1}{3}$ (B) $\frac{4}{9}$ (C) $\frac{1}{2}$ (D) $\frac{5}{9}$ (E) NOTA

14. Kelly tosses 19 fair coins and Jessica tosses 20 fair coins. What is the probability that Jessica gets more heads than Kelly?

(A) $\frac{19}{39}$ (B) $\frac{1}{2}$ (C) $\frac{20}{39}$ (D) $\frac{5}{8}$ (E) NOTA

15. At the start a jar contains only quarters and coins of lesser value. The average value of these coins is 9 cents. Adding a quarter to the jar raises the average value to 11 cents. Find the probability that a coin randomly selected from the jar at the start is a quarter.

(A) $\frac{2}{9}$ (B) $\frac{1}{4}$ (C) $\frac{2}{7}$ (D) $\frac{1}{3}$ (E) NOTA

16. A cube measuring 3 inches on a side is painted and then cut into 27 cubes measuring 1 inch on a side. One of the cubes is randomly selected and tossed. What is the probability all 5 of the faces showing are unpainted?

(A) $\frac{1}{27}$ (B) $\frac{2}{27}$ (C) $\frac{1}{9}$ (D) $\frac{7}{27}$ (E) NOTA

For problems 17-19 use the information that follows. You have 2 hoppers. One has 15 ping pong balls numbered 1-15. The other has 25 ping pong balls numbered 1-25. If one ball is randomly selected from each hopper find the probability of each event.

17. Both are even numbers.

(A) $\frac{104}{375}$ (B) $\frac{28}{125}$ (C) $\frac{19}{80}$ (D) $\frac{1}{4}$ (E) NOTA

18. At least one is a multiple of 3.

(A) $\frac{49}{75}$ (B) $\frac{41}{75}$ (C) $\frac{4}{9}$ (D) $\frac{13}{40}$ (E) NOTA

19. The sum of the two numbers is greater than 20.

(A) $\frac{13}{25}$ (B) $\frac{20}{39}$ (C) $\frac{1}{2}$ (D) $\frac{188}{375}$ (E) NOTA

20. How many people would have to be randomly selected for the probability to be greater than 50% that at least one had a birthday on February 29?

(A) 1013 (B) 731 (C) 366 (D) 730 (E) NOTA

21. Five cards are randomly selected from a standard 52-card deck. What is the probability all are the same suit?

(A) $\frac{66}{54145}$ (B) $\frac{33}{54145}$ (C) $\frac{33}{66640}$ (D) $\frac{33}{16660}$ (E) NOTA

22. You flip a coin until you have 4 heads or 4 tails. What is the probability the game is over after exactly 5 flips?

(A) $\frac{3}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{8}$ (D) $\frac{5}{16}$ (E) NOTA

23. You have 27 coins that have a total value of 79 cents. All the coins are pennies or nickels. What is the probability that a coin selected at random is a penny?

(A) $\frac{4}{27}$ (B) $\frac{1}{3}$ (C) $\frac{14}{27}$ (D) $\frac{19}{27}$ (E) NOTA

24. If a is randomly chosen from K={-2,-1,0,1,2}, b is randomly chosen from L={-2,-1,0,1,2}, and c is randomly chosen from M={-4,-2,0,2,4}, what is the probability that (x,y)=(2,-1) is a solution to ax+by=c?

(A) $\frac{11}{125}$ (B) $\frac{12}{125}$ (C) $\frac{13}{125}$ (D) $\frac{3}{25}$ (E) NOTA

25. Two numbers are selected from the set {1,2,3,4,5,6,7,8,9} without replacement. What is the probability the product of the numbers selected is a multiple of 4?

(A) $\frac{1}{4}$ (B) $\frac{5}{12}$ (C) $\frac{4}{9}$ (D) $\frac{17}{36}$ (E) NOTA

26. Given a 3-digit whole number, what is the probability the hundreds digit is even, the tens digit is odd, and all 3 digits are different?

(A) $\frac{14}{81}$ (B) $\frac{4}{25}$ (C) $\frac{1}{5}$ (D) $\frac{8}{45}$ (E) NOTA

THETA DIVISION—PROBABILITY TOPIC TEST
ANSWER KEY

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