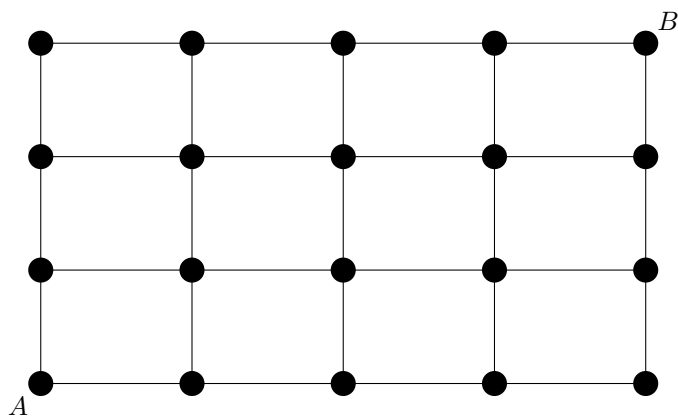


1. A small community consists of 10 women, each of whom has 3 children. If one woman and one of her children are to be chosen as mother and child of the year, how many different choices are possible?  
A) 30                      B) 13                      C) 40                      D) 10
2. How many different batting orders are possible for a baseball team consisting of 9 players? (batting order is the sequence in which the members of the offense take their turns in batting against the pitcher)  
A) 9                      B) 512                      C) 81                      D) 362,880
3. Consider the grid of points shown below.



- Suppose that starting at the point labeled  $A$  you can go one step up or one step to the right at each move. This is continued until the point labeled  $B$  is reached. How many different paths from  $A$  to  $B$  are possible?
- A) 5,040                      B) 840                      C) 35                      D) 210
4. A class consists of 6 men and 4 women. An examination is given and the students are ranked according to their performance. Assume that no two students obtain the same score. If the men are ranked just among themselves and the women among themselves, how many different rankings are possible?  
A) 3,628,800                      B) 17,280                      C) 720                      D) 24
  5. Alex has 10 books that he is going to put on his bookshelf. Of these, 4 are mathematics books, 3 are physics books, 2 are chemistry books, and 1 is a biology book. Alex wants to arrange his books so that all the books dealing with the same subject are together on the shelf. How many different arrangements are possible?  
A) 24                      B) 210                      C) 288                      D) 6912
  6. A 5-card poker hand is said to be a full house if it consists of 3 cards of the same denomination and 2 cards of the same denomination, that is, a full house is three of a kind plus a pair. What is the probability that one is dealt a full house?  
A) 0.0039                      B) 0.0158                      C) 0.0014                      D) 0.0143
  7. A random experiment can result in one of the outcomes  $\{a, b, c, d\}$  with probabilities 0.1, 0.3, 0.5 and 0.1, respectively. Let  $A$  denote the event  $\{a, b\}$ ,  $B$  the event  $\{b, c\}$  and  $C$  the event  $\{d\}$ . Determine the probability  $P((A^C \cup B)^C \cap C^C)$ .

- A) 0.1                      B) 0.2                      C) 0.3                      D) 0.4

8. In the card game bridge the 52 cards are dealt out equally to 4 players, called player A, B, C, and D. If players A and B have a total of 8 clubs among them, what is the probability that player C has 3 of the remaining 5 clubs?

- A) 0.034                      B) 0.339                      C) 0.218                      D) 0.413

9. A box contains 10 red, 5 green, and 10 blue marbles. A marble is chosen at random from the box, and it is noted that it is not one of the blue marbles. What is the probability that it is green?

- A)  $\frac{1}{5}$                       B)  $\frac{3}{5}$                       C)  $\frac{1}{3}$                       D)  $\frac{1}{4}$

10. Suppose that we have 3 cards identical in form except that both sides of the first card are colored red, both sides of the second card are colored black, and one side of the third card is colored red and the other side black. The 3 cards are mixed up in a box, and 1 card is randomly drawn and put down on the ground. If the upper side of the chosen card is colored red, what is the probability that the other side is colored black?

- A) 0                      B)  $\frac{1}{2}$                       C)  $\frac{1}{3}$                       D) 1

11. At a certain stage of a criminal investigation the inspector in charge is 60% convinced of the guilt of a certain suspect. A new piece of evidence shows that the criminal has a certain characteristic is uncovered. If 20% of the population possesses this characteristic, how certain of the guilt of the suspect should the inspector be if it turns out that the suspect has this characteristic?

- A) 0.4                      B) 0.2                      C) 0.6                      D) 0.882

12. A new medical procedure has been shown to be effective in the early detection of an illness. The probability that the test correctly identifies someone with the illness as positive is 0.99, and the probability that the test correctly identifies someone without the illness as negative is 0.95. The incidence of the illness in the general population is 0.0001. If you take the test and the result is positive, what is the probability that you have the illness?

- A) 0.002                      B) 0.05                      C) 0.01                      D) 0.004

13. Given the probability mass function as shown in the table below:

$x$	1.25	1.5	1.75	2	2.25
$f(x)$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{2}{8}$	$\frac{2}{8}$	$\frac{1}{8}$

determine the probability  $P(X < 1.65)$ .

- A)  $\frac{1}{8}$                       B)  $\frac{1}{4}$                       C)  $\frac{3}{8}$                       D)  $\frac{1}{2}$

14. Given the probability mass function

$$f(x) = \frac{3}{4} \left( \frac{1}{4} \right)^x, \quad x = 0, 1, 2, \dots$$

determine the probability  $P(X > 2)$ .

- A) 0.0469                      B) 0.0625                      C) 0.0156                      D) 0.9844

15. If  $X$  is a discrete random variable whose possible values are  $x_1, x_2, x_3, \dots$  where  $x_1 < x_2 < x_3 < \dots$ , then if its cumulative distribution function is given by

$$F(x) = \begin{cases} 0, & x < 1 \\ \frac{1}{4}, & 1 \leq x < 2 \\ \frac{3}{4}, & 2 \leq x < 3 \\ \frac{7}{8}, & 3 \leq x < 4 \\ 1, & 4 \leq x \end{cases}$$

find the probability mass function  $p(3)$ .

A)  $\frac{1}{2}$

B)  $\frac{1}{8}$

C)  $\frac{1}{4}$

D)  $\frac{3}{4}$

16. Suppose a day's production of 850 manufactured parts contains 50 parts that do not conform to customer requirements. Two parts are selected at random without replacement from the batch. Let the random variable  $X$  equal the number of nonconforming parts in the sample. A cumulative distribution function of  $X$  is defined by  $F(x) = P(X \leq x), x \in \mathbb{R}$  and given as follows:

$$F(x) = \begin{cases} 0, & x < 0 \\ 0.886, & 0 \leq x < 1 \\ k, & 1 \leq x < 2 \\ 1, & 2 \leq x \end{cases}$$

Find the value  $k$ .

A)  $k = 0.997$

B)  $k = 0.111$

C)  $k = 0.903$

D)  $k = 0.911$

17. Suppose that the probability of an item produced by a machine will be defective is 0.1. Find the probability that a sample of 10 items will contain at most 1 defective item.

A) 0.7811

B) 0.7732

C) 0.7361

D) 0.7937

18. Contamination is a problem in the manufacture of magnetic storage disks. Assume that the number of contamination that occur on a disk surface has a Poisson distribution, and the average number of particles contamination per square centimeter of media surface is 0.1. The area of a disk is 100 square centimeters. Determine the probability that 12 particles occur in the area of a disk under study.

A) 0.454

B) 0.095

C) 0.792

D) 0.068

19. Suppose that earthquakes occurs in the western of the United States are approximately Poisson at a rate of  $\lambda = 2$  per week. Find the probability that at least 3 earthquakes occur during the next 2 weeks.

A) 0.7619

B) 0.3233

C) 0.1465

D) 0.6767

20. A box contains  $N$  white and  $M$  black balls. Balls are randomly drawn, one at a time, until a black ball is obtained. If we assume that each drawn ball is replaced before the next one is drawn, what is the probability that at least  $k$  draws are needed?

A)  $\frac{MN^{k-1}}{(M+N)^k}$

B)  $\frac{NM^{k-1}}{(M+N)^k}$

C)  $\left(\frac{M}{M+N}\right)^{k-1}$

D)  $\left(\frac{N}{M+N}\right)^{k-1}$