



## MATHS

### NCERT - NCERT MATHEMATICS(ENGLISH)

#### PROBABILITY

##### Exercise 13.3

1. If  $A$  and  $B$  are two events such that  $A \subset B$  and  $P(B) \neq 0$ , then which of the following is correct?

(A)  $P(A | B) = \frac{P(B)}{P(A)}$       (B)  $P(A | B) < P(A)$       (C)

$P(A | B) \geq P(B)$  (D) none of these



Watch Video Solution

2. Probability that A speaks truth is  $\frac{4}{5}$ . A coin is tossed. A reports that a head appears. The probability that actually there was head is (A)  $\frac{4}{5}$  (B)  $\frac{1}{2}$  (C)  $\frac{1}{5}$  (D)  $\frac{2}{5}$



[Watch Video Solution](#)

3. A card from a pack of 52 cards is lost. From the remaining cards of the pack, two cards are drawn and are found to be both diamonds. Find the probability of the lost card being a diamond.

A.  $\frac{11}{50}$

B.  $\frac{13}{50}$

C.  $\frac{17}{50}$

D.  $\frac{19}{50}$

**Answer: A**

 [Watch Video Solution](#)

4. A manufacturer has three machine operators A, B and C. The first operator A produces 1% defective items, where as the other two operators B and C produce 5% and 7% defective items respectively. A is on the job for 50% of the tune, B is on the job for 30% of the time and C is on the job for 20% of the time. A defective item is produced, what is the probability that it was produced by A?

 [Watch Video Solution](#)

5. Suppose a girl throws a die. If she gets a 5 or 6, she tosses a coin three times and notes the number of heads. If she gets 1, 2, 3 or 4, she tosses a coin once and notes whether a head or tail is

obtained. If she obtained exactly one head, what is the probability that she threw 1,2,3 or 4 with the die?



[Watch Video Solution](#)

6. An urn contains 5 red and 5 black balls. A ball is drawn at random, its colour is noted and is returned to the urn. Moreover, 2 additional balls of the colour drawn are put in the urn and then a ball is drawn at random. What is the probability that the second ball is red?



[Watch Video Solution](#)

7. A bag contains 4 red and 4 black balls, another bag contains 2 red and 6 black balls. One of the two bags is selected at random and two balls are drawn at random without replacement from the

bag and are found to be both red. Find the probability that the balls are drawn from the first bag.



[Watch Video Solution](#)

8. Of the students in a college, it is known that 60% reside in a hostel and 40% do not reside in hostel. Previous year results report that 30% of students residing in hostel attain A grade and 20% of ones not residing in hostel attain A grade in their annual examination. At the end of the year, one students is chosen at random from the college and he has an A grade. What is the probability that the selected student is a hosteller?



[Watch Video Solution](#)

9. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let  $\frac{3}{4}$  be the probability that

he knows the answer and  $\frac{1}{4}$  be the probability that he guesses.

Assuming that a student who guesses at the ans

 [Watch Video Solution](#)

**10.** A laboratory blood test is 99% effective in detecting a certain disease when its infection is present. However, the test also yields a false positive result for 0.5% of the healthy person tested (i.e. if a healthy person is tested, then, with probability 0.005, the test will imply he has the disease). If 0.1% of the population actually has the disease, what is the probability that a person has the disease given that his test result is positive?

 [Watch Video Solution](#)

**11.** There are three coins. One is a two headed coin (having head on both faces), another is a biased coin that comes up heads 75%

of the time and third is an unbiased coin. One of the three coins is chosen at random and tossed, it shows heads, what is the probability that it was the two headed coin?

 [Watch Video Solution](#)

**12.** An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accidents are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver?

 [Watch Video Solution](#)

**13.** A factory has two machines A and B. Past record shows that machine A produced 60% of the items of output and machine B produced 40% of the items. Further, 2% of the items produced by

machine A and 1% produced by machine B were defective. All the items are put into one stockpile and then one item is chosen at random from this and is found to be defective. What is the probability that it was produced by machine B?

 [Watch Video Solution](#)

**14.** Two groups are competing for the positions of the board of Directors of a Corporation. The probabilities that the first and the second groups will win are 0.6 and 0.4 respectively. Further if the first group wins the probability of introducing a new product is 0.7 and the corresponding probability is 0.3 if the second group wins. Find the probability that the new product introduced was by the second group.

 [Watch Video Solution](#)



## Exercise 13 1

1. Consider the experiment of throwing a die if a multiple of 3 comes up, throw the die again and if any other number comes, toss a coin. Find the conditional probability of the event the coin shows a tail given that at least one die shows as three.



[Watch Video Solution](#)

2. Given that the two numbers appearing on throwing two dice are different. Find the probability of the event the sum of numbers on the dice is 4.

A.  $\frac{1}{14}$

B.  $\frac{1}{15}$

C.  $\frac{1}{16}$

D.  $\frac{1}{17}$

**Answer: B**

 [Watch Video Solution](#)

3. In each of the Exercises choose the correct answer: If A and B are events such that  $P(A|B) = P(B|A)$ , then

- (a)  $A \subset B$  but  $A \neq B$  (b)  $A = B$  (c)  $A \cap B = \varnothing$  (d)  $P(A) = P(B)$

 [Watch Video Solution](#)

4. In each of the Exercises choose the correct answer: If  $P(A) = \frac{1}{2}$ ,  $P(B) = 0$ , then  $P(A | B)$  is (a) 0 (b)  $\frac{1}{2}$  (c) not defined (d) 1

 [View Text Solution](#)

5. A fair die is rolled. Consider events  $E = \{1, 3, 5\}$ ,  $F = \{2, 3\}$  and  $G = \{2, 3, 4, 5\}$  Find (i)  $P(E | F)$  and  $P(F | E)$  (ii)  $P(E | G)$  and  $P(G | E)$  (iii)  $P((E \cup F) | G)$  and  $P((E \cap F) | G)$

[Watch Video Solution](#)

6. A black and a red dice are rolled. (a) Find the conditional probability of obtaining a sum greater than 9. Given that the black die resulted in a 5. (b) Find the conditional probability of obtaining the sum 8? given that the red die resulted in a

[Watch Video Solution](#)

7. An instructor has a test bank consisting of 300 easy True/False questions, 200 difficult True/False questions, 500 easy multiple

choice questions (MCQ) and 400 difficult multiple choice questions. If a question is selected at random from the test bank, what is the probability that it will be an easy question given that it is a multiple choice question.

 [Watch Video Solution](#)

8. Assume that each child born is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that i. the youngest is a girl, ii. at least one is a girl?

 [Watch Video Solution](#)

9. Evaluate  $P(A \cup B)$ , if  $2P(A) = P(B) = \frac{5}{13}$  and  $P(A | B) = \frac{2}{5}$

 [Watch Video Solution](#)

Watch Video Solution

10. If  $P(A) = \frac{6}{11}$ ,  $P(B) = \frac{5}{11}$  and  $P(A \cup B) = \frac{7}{11}$ , find (i)  $P(A \cap B)$  (ii)  $P(A | B)$  (iii)  $P(B | A)$

 Watch Video Solution

11. Compute  $P(A | B)$ . if  $P(B) = 0.5$  and  $P(A \cap B) = 0.32$

 Watch Video Solution

12. If  $P(A) = 0.8$ ,  $P(B) = 0.5$  and  $P(B | A) = 0.4$ , find (i)  $P(A \cap B)$  (ii)  $P(A | B)$  (iii)  $P(A \cup B)$

 Watch Video Solution

13. Given that E and F are events such that  $P(E) = 0.6$ ,  $P(F) = 0.6$ ,  $P(F) = 0.3$  and  $P(E \cap F) = 0.2$ , find  $P(E | F)$  and  $P(F | E)$ .

 [Watch Video Solution](#)

14. A die is thrown three times. Find  $P(A/B)$  and  $P(B/A)$ , if  $A = 4$  appears on the third toss,  $B=6$  and 5 appear respectively on first two tosses.

 [Watch Video Solution](#)

15. Mother father and son line up at random for a family picture. If A and B are two events given by  $A =$  Son on one end,  $B=$ Father in the middle, find  $P(A/B)$  and  $P(B/A)$ .

 [Watch Video Solution](#)

16. A coin is tossed three times. Find  $P(A/B)$  in each of the following:  $A =$  Heads on third toss,  $B =$  Heads on first two tosses  
 $A =$  At least two heads,  $B =$  At most two heads  $A =$  At most two tails,  $B =$  At least one tail.

 [Watch Video Solution](#)

17. Two coins are tossed once.  $P(E/F)$  in each of the following:  
 $E =$  Tail appears on one coin,  $F =$  one coin shows head  $E =$   
No tail appears,  $F =$  No head appears,

 [Watch Video Solution](#)

Solved Examples

1. Let a pair of dice be thrown and the random variable  $X$  be the sum of the numbers that appear on the two dice. Find the mean or expectation of  $X$ .

 [Watch Video Solution](#)

2. Let  $X$  denote the number of hours you study during a randomly selected school day. The probability that  $X$  can take the values  $x$  has the following form, where  $k$  is some unknown constant.

$$P(X=x) = \begin{cases} 0.1, & \text{if } x=0 \\ k, & \text{if } x=1 \text{ or } 2 \\ 2k(5-x), & \text{if } x=3, 4, 5 \end{cases}$$

 [Watch Video Solution](#)

3. Find the probability distribution of number of doublets in three throws of a pair of dice.

 [Watch Video Solution](#)



4. Two cards are drawn successively with replacement from a well shuffled pack of 52 cards. Find the probability distribution of the number of aces.

 [Watch Video Solution](#)

5. A bag contains 2 white and 1 red balls. One ball is drawn at random and then put back in the box after noting its colour. The process is repeated again. If  $X$  denotes the number of red balls recorded in the two draws, describe  $X$ .

 [Watch Video Solution](#)

6. A person plays a game of tossing a coin thrice. For each head, he is given Rs 2 by the organiser of the game and for each tail, he

has to give Rs 1.50 to the organiser. Let  $X$  denotes the amount gained or lost by the person. Show that  $X$  is a random variable and exhibit it as a function on the sample space of the experiment.

 [Watch Video Solution](#)

7. A man is known to speak truth 3 out of 4 times. He throws a die and reports that it is a six. Find the probability that it is actually a six.

 [Watch Video Solution](#)

8. A doctor is to visit a patient. Form the past experience, it is known that the probabilities that he will come by train, bus, scooter or by other means of transport are respectively  $\frac{3}{10}$ ,  $\frac{1}{5}$ ,  $\frac{1}{10}$  and  $\frac{2}{5}$ . The probability that he will be late are  $\frac{1}{4}$ ,  $\frac{1}{3}$  and  $\frac{1}{12}$  if he comes by train, bus and scooter respectively,

but if he comes by other means of transport, then he will not be late. When he arrives he is late. What is the probability that he comes by train?

 [Watch Video Solution](#)

9. Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

 [Watch Video Solution](#)

10. Six balls are drawn successively from an urn containing 7 red and 9 black balls. Tell whether or not the trials of drawing balls are Bernoulli trials when after each draw the ball drawn is (i) replaced (ii) not replaced in the urn.

 [Watch Video Solution](#)

11. If a fair coin is tossed 10 times, find the probability of(i)

exactly six heads      (ii)      at least six heads(iii)      at most six

heads



Watch Video Solution

12. Ten eggs are drawn successively with replacement from a lot containing 10% defective eggs. Find the probability that there is at least one defective egg.



Watch Video Solution

13. Coloured balls are distributed in four boxes as shown in the following table: Box Colour Black White Red Blue I II III IV 3 2 1 4 4 2 2 3 5 2 3 1 6 2 1 3 A box is selected at random and then a ball is

randomly drawn from the selected box. The colour of the ball is black, what is the probability that ball drawn is from the box III.

 [Watch Video Solution](#)

14. The mean of binomial distribution  $B\left(4, \frac{1}{3}\right)$  is

 [Watch Video Solution](#)

15. The probability of a shooter hitting a target is  $\frac{3}{4}$ . How many minimum number of times must he/she fire so that the probability of hitting the target at least once is more than 0.99?

 [Watch Video Solution](#)

**16.** A and B throw a die alternatively till one of them gets a 6 and wins the game. Find their respective probabilities of winning, if A starts first.

 [Watch Video Solution](#)

**17.** If a machine is correctly set up, it produces 90% acceptable items. If it is incorrectly set up, it produces only 40% acceptable items. Past experience shows that 80% of the set ups are correctly done. If after a certain set up, the machine produces 2 acceptable items, find the probability that the machine is correctly setup.

 [Watch Video Solution](#)

**18.** Prove that if E and F are independent events, then so are the events  $\bar{E}$  and  $\bar{F}$ .



[Watch Video Solution](#)

19. A die is thrown. If  $E$  is the event the number appearing is a multiple of 3' and  $F$  be the event the number appearing is even then



[Watch Video Solution](#)

20. An unbiased die is thrown twice. Let the event  $A$  be "odd number on the first throw" and  $B$  the event "odd number on the second throw". Check the independence of the events  $A$  and  $B$ .



[Watch Video Solution](#)

21. Bag I contains 3 red and 4 black balls while another Bag II contains 5 red and 6 black balls. One ball is drawn at random from

one of the bags and it is found to be red. Find the probability that it was drawn from Bag II.



[Watch Video Solution](#)

**22.** If A and B are two independent events, then the probability of occurrence of at least one of A and B is given by  $1 - P'(A)P'(B)$



[Watch Video Solution](#)

**23.** A person has undertaken a construction job. The probabilities are 0.65 that there will be strike, 0.80 that construction job will be completed on time if there is no strike, and 0.32 that the construction job will be completed on time if there is a strike. Determine the probability that the construction job will be completed on time.





[Watch Video Solution](#)

24. Three cards are drawn successively, without replacement from a pack of 52 shuffled cards. What is the probability that first two cards are kings and third card drawn is an ace?



[Watch Video Solution](#)

25. An urn contains 10 black and 5 white balls. Two balls are drawn from the urn one after the other without replacement. What is the probability that both drawn balls are black?



[Watch Video Solution](#)

26. If A and B are two events such that:  $P(A) = \frac{7}{13}$ ,  $P(B) = \frac{9}{13}$  and  $P(A \cap B) = \frac{4}{13}$ , find  $P(A/B)$ .



[Watch Video Solution](#)

27. Ten cards numbered 1 through 10 are placed in a box, mixed up thoroughly and then one card is drawn randomly. If it is known that the number on the drawn card is more than 3, what is the probability that it is an even number?



[Watch Video Solution](#)

28. A family has two children, what is the probability that both of the children are boys, given that at least one of them is a boy?



[Watch Video Solution](#)

29. A die is thrown three times. Events A and B are defined as follows: A:4 on the third throw, B:6 on the first and 5 on the

second throw. Find the probability of A given that B has already occurred.

 [Watch Video Solution](#)

**30.** In a school, there are 1000 students, out of which 430 are girls. It is known that out of 430, 10% of the girls study in class XII. What is the probability that a student chosen randomly studies in class XII given that the chosen student is a girl?

 [Watch Video Solution](#)

**31.** A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once?

 [Watch Video Solution](#)

**32.** Consider the experiment of tossing a coin. If the coin shows head toss it again if it shows tail then throw a die. Find the conditional probability of the event the die shows a number greater than 4 given that there at least one tail.

 [Watch Video Solution](#)

**33.** Suppose that the reliability of a HIV test is specified as follows: Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV, 99% of the test are judged HIV-free but 1% are diagnosed as showing HIV+ive. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test, and the pathologist reports him/her as HIV+ive. What is the probability that the person actually has HIV?

 [Watch Video Solution](#)

**34.** In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their outputs, 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probability that it is manufactured by the machine B?

 [Watch Video Solution](#)

**35.** Three coins are tossed. Consider the events:  $E$ =three heads or three tails,  $F$ =At least two heads and  $G$ = At most two heads of the pairs  $(E, F)$ ,  $(E, G)$  and  $(F, G)$  which are independent? Which are dependent?

 [Watch Video Solution](#)

**36.** Given three identical boxes I, II and III, each containing two coins. In box I both coins are gold coins, in box II both are silver coins and in box III there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the first coin is gold, what is the probability that the other coin in the box is gold.



[Watch Video Solution](#)

## Miscellaneous Exercise

1. If  $A$  and  $B$  are any two events such that  $P(A) + P(B) - P(A \text{ and } B) = P(A)$ ? then (A)  $P(B | A) = 1$   
(B)  $P(A | B) = 1$  (C)  $P(B | A) = 0$  (D)  $P(A | B) = 0$



[Watch Video Solution](#)

2. If  $P(A | B) > P(A)$ , then which of the following is correct: (A)

$P(B | A) < P(B)$  (B)  $P(A \cap B) < P(A) \cdot P(B)$  (C)

$P(B | A) > P(B)$  (D)  $P(B | A) = P(B)$



[Watch Video Solution](#)

3. A couple has two children. Find the probability that both the children are (i) males, if it is known that at least one of the children is male. (ii) females, if it is known that the elder child is a female.



[Watch Video Solution](#)

4. Suppose that 5% of men and 0.25% of women have grey hair. A grey haired person is selected at random. What is the probability

of these person being male? Assume that there are equal number of males and females.



[Watch Video Solution](#)

5. Suppose that 90 % of people are right-handed. What is the probability that at most 6 of a random sample of 10 people are right-handed ?



[Watch Video Solution](#)

6. An urn contains 25 balls of which 10 balls are red and the remaining green. A ball is drawn at random from the urn the colour is noted and the ball is replaced. If 6 balls are drawn in this way, find the probability that :

(i) All the balls are red.

(ii) Number of red balls and green balls are equal.





[Watch Video Solution](#)

7. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is  $\frac{5}{6}$ . What is the probability that he will knock down fewer than 2 hurdles?



[Watch Video Solution](#)

8. A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of the die.



[Watch Video Solution](#)

9. An experiment succeeds twice as often as it fails. Then find the probability that in the next 6 trials, there will be at least 4

successes.



[Watch Video Solution](#)

10. If a leap year is selected at random, what is the change that it will contain 53 Tuesday?



[Watch Video Solution](#)

11. In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins / loses.



[Watch Video Solution](#)

12. A and B are two events such that  $P(A) \neq 0$ . Find  $P(B | A)$ ,  
if (i) A is a subset of B (ii)  $A \cap B = \varnothing$

 [Watch Video Solution](#)

13. How many times must a man toss a fair coin so that the probability of having at least one head is more than 90%?

 [Watch Video Solution](#)

14. If A and B are two events such that  $P(A) \neq 0$  and  $P(B | A) = 1$ ; then (A)  $A \subset B$  (B)  $B \subset A$  (C)  $B = \varnothing$  (D)  $A = \varnothing$

 [Watch Video Solution](#)

15. Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.



[Watch Video Solution](#)

16. An electronic assembly consists of two sub-systems say A and B. From previous testing procedures, the following probabilities are assumed to be known.

$$P(A \text{ fails}) = 0.2, P(B \text{ fails alone}) = 0.15, P(A \text{ and } B \text{ fail}) = 0.15.$$

Evaluate the following probabilities:  $P(A \text{ fails} / B \text{ has failed})$  (ii)

$$P(A \text{ fails alone})$$



[Watch Video Solution](#)

17. If each element of a second order determinant is either zero or one, what is the probability that the value of the determinant is positive? (Assuming that the individual entries of the determinant are chosen independently, each value being assumed with probability  $1/2$ ).



[Watch Video Solution](#)

18. Assume that the chances of a patient having a heart attack is 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug reduces its chances by 25%. At a time a patient can ch



[Watch Video Solution](#)

19. Suppose we have four boxes A,B,C and D containing coloured marbles as given below :One of the boxes has been selected at random and a single marble is drawn from it. If the marble is red, what is the probability that it was drawn from box A? box B?, box C?



[Watch Video Solution](#)

### Exercise 13 5

1. Find the probability of getting 5 exactly twice in 7 throws of a die.



[Watch Video Solution](#)

2. A person buys a lottery ticket in 50 lotteries, in each of which his chance of winning a prize is  $\frac{1}{100}$ . What is the probability that he will win a prize (a) at least once (b) exactly once (c) at least twice?



[Watch Video Solution](#)

3. It is known that 10% of certain articles manufactured are defective. What is the probability that in a random sample of 12 such articles, 9 are defective?



[Watch Video Solution](#)

4. Find the probability of throwing at most 2 sixes in 6 throws of a single die.



[Watch Video Solution](#)

5. The probability that a student is not a swimmer is  $\frac{1}{5}$ . Then find the probability that out of 5 students exactly 4 are swimmer.

 [Watch Video Solution](#)

6. In a box containing 100 bulbs, 10 bulbs are defective. Probability that out of a sample of 5 bulbs, none is defective, is

 [Watch Video Solution](#)

7. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of two successes.

 [Watch Video Solution](#)



8. There are 5% defective items in a large bulk of items. What is the probability that a sample of 10 items will include not more than one defective item?

 [Watch Video Solution](#)

9. A die is thrown 6 times. If getting an odd number is a success, what is the probability of (i) 5 successes? (ii) at least 5 successes? (iii) at most 5 successes?

 [Watch Video Solution](#)

10. A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag, what is the probability that none is marked with the digit 0?



[Watch Video Solution](#)

**11.** In an examination, 20 questions of true-false type are asked. Suppose a student tosses a fair coin to determine his answer to each question. If the coin falls heads, he answers true; if it falls tails, he answers false. Find the probability that he answers at least 12 questions correctly.



[Watch Video Solution](#)

**12.** Five cards are drawn successively with replacement from a well-shuffled deck of 52 cards. What is the probability that (i) all the five cards are spades? (ii) only 3 cards are spades? (iii) none is a spade?



[Watch Video Solution](#)

**13.** The probability that a bulb produced by a factory will fuse after 150 days of use is 0.05. Find the probability that out of 5 such bulbs (i) none (ii) not more than one (iii) more than one (iv) at least one will fuse after 150 days of use.



[Watch Video Solution](#)

**14.** Suppose  $X$  has a binomial distribution  $B\left(6, \frac{1}{2}\right)$ . Show that  $X = 3$  is the most likely outcome. (Hint:  $P(x = 3)$  is the maximum among all  $P(x_i)$ ,  $x_i = 0, 1, 2, 3, 4, 5, 6$ )



[Watch Video Solution](#)

**15.** Oil a multiple choice examination with three possible answers for each of the five questions, what is the probability that a

candidate would get four or more correct answers just by guessing?

 [Watch Video Solution](#)

### Exercise 13.4

1. The random variable  $X$  has a probability distribution  $P(X)$  of the following form, where  $k$  is some number :  $P(X) = \begin{cases} k, & \text{if } x = 0 \\ 2k, & \text{if } x = 1 \\ 3k, & \text{if } x = 2 \\ 0, & \text{otherwise} \end{cases}$  (a)

Determine the value of  $k$ . (b) Find

 [Watch Video Solution](#)

2. A random variable  $X$  has the following probability distribution: Determine (i)  $k$  (ii)  $P(X < 3)$  (iii)  $P(X > 6)$  (iv)  $P(0$

 [View Text Solution](#)

 [View Text Solution](#)

3. State which of the following are not the probability distributions of a random variable. Give reasons for your answer.

 [Watch Video Solution](#)

4. Let  $X$  represent the difference between the number of heads and the number of tails obtained when a coin is tossed 6 times. What are possible values of  $X$ ?

 [Watch Video Solution](#)

5. An urn contains 5 red and 2 black balls. Two balls are randomly drawn. Let  $X$  represent the number of black balls. What are the possible values of  $X$ ? Is  $X$  a random variable?



 [Watch Video Solution](#)

6. Find the probability distribution of the number of successes in two tosses of a die, where a success is defined as (i) number greater than 4 (ii) six appears on at least one die

 [Watch Video Solution](#)

7. Find the probability distribution of (i) number of heads in two tosses of a coin. (ii) number of tails in the simultaneous tosses of three coins. (iii) number of heads in four tosses of a coin.

 [Watch Video Solution](#)

8. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of

number of tails.

 [Watch Video Solution](#)

**9.** From a lot of 30 bulbs which include 6 defectives, a sample of 4 bulbs is drawn at random with replacement. Find the probability distribution of the number of defective bulbs.

 [Watch Video Solution](#)

**10.** Two numbers are selected at random (without replacement) from the first six positive integers. Let  $X$  denote the larger of the two numbers obtained. Find  $E(X)$ .

 [Watch Video Solution](#)

11. Let  $X$  denote the sum of the numbers obtained when two fair dice are rolled. Find the variance and standard deviation of  $X$ .

 [Watch Video Solution](#)

12. Find the mean number of heads in three tosses of a fair coin.

 [Watch Video Solution](#)

13. Two dice are thrown simultaneously. If  $X$  denotes the number of sixes, find the expectation of  $X$ .

 [Watch Video Solution](#)

14. The mean of the numbers obtained on throwing a die having written 1 on three faces, 2 on two faces and 5 on one face is (A) 1



(B) 2 (C) 5 (D)  $\frac{8}{3}$



[Watch Video Solution](#)

15. Suppose that two cards are drawn at random from a deck of cards. Let  $X$  be the number of aces obtained. Then the value of  $E(X)$  is (A)  $\frac{37}{221}$  (B)  $\frac{5}{13}$  (C)  $\frac{1}{13}$  (D)  $\frac{2}{13}$



[Watch Video Solution](#)

16. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age  $X$  of the selected student is recorded.



[Watch Video Solution](#)

17. In a meeting, 70% of the members favour and 30% oppose a certain proposal. A member is selected at random and we take  $X = 0$  if he opposed, and  $X = 1$  if he is in favour. Find  $E(X)$  and  $\text{Var}(X)$ .

 [Watch Video Solution](#)

## Exercise 13 2

1. Events A and B are such that  $P(A) = 1/2$ ,  $P(B) = 7/12$ , and  $P(\text{not } A \text{ or not } B) = 1/4$ . State whether A and B are independent ?

 [Watch Video Solution](#)

2. One card is drawn at random from a well shuffled deck of 52 cards. In which of the following cases are the events E and F

independent? (i)  $E$  : the card drawn is a spade  $F$  : the card drawn is an ace (ii)  $E$  : the card drawn is black  $F$  : the card drawn is a king



[Watch Video Solution](#)

3. Given that the events  $E$  and  $F$  are such that  $P(E) = \frac{1}{2}$ ,  $P(E \cup F) = \frac{3}{5}$  and  $P(F) = p$ . Find the  $p$ , if  $E$  and  $F$  are independent events.



[Watch Video Solution](#)

4. A die marked 1, 2, 3 in red and 4, 5, 6 in green is tossed. Let  $A$  be the event, the number is even, and  $B$  be the event, the number is red. Are  $A$  and  $B$  independent?



[Watch Video Solution](#)

5. If A and B are two events such that  $P(A) = \frac{1}{4}$ ,  $P(B) = \frac{1}{2}$  and  $P(A \cap B) = \frac{1}{8}$ , find  $P(\text{not A and not B})$ .

 [Watch Video Solution](#)

6. Let A and B be independent events with  $P(A) = 0.3$  and  $P(B) = 0.4$ . Find (i)  $P(A \cap B)$  (ii)  $P(A \cup B)$  (iii)  $P(A | B)$  (iv)  $P(B | A)$

 [Watch Video Solution](#)

7. Let E and F be events with  $P(E) = \frac{3}{5}$ ,  $P(F) = \frac{3}{10}$  and  $P(E \cap F) = \frac{1}{5}$ . Are E and F independent?

 [Watch Video Solution](#)

8. If  $P(A) = \frac{3}{5}$  and  $P(B) = \frac{1}{5}$ , find  $P(A \cap B)$  if A and B are independent events.

 [Watch Video Solution](#)

9. A fair coin and an in biased die are tossed. Let A be the event head appears on the coin and B be the event 3 one the die. Check whether A and B are independent event or not.

 [Watch Video Solution](#)

10. A box of oranges is inspected by examining g three randomly selected oranges drawn without replacement. If all three oranges are good, the box is approved for sale 12 are good and 3 are bad ones will be approved for sale.

 [Watch Video Solution](#)

11. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both the cards are black.



Watch Video Solution

12. Two events A and B will be independent, if(A) A and B are mutually exclusive(B)  $P(A' \cap B') = [1 - P(A)][1 - P(B)]$ (C)  $P(A) = P(B)$  (D)  $P(A) + P(B) = 1$



Watch Video Solution

13. Given two independent events A and B such that  $P(A) = 0.3$ ,  $P(B) = 0.6$ . Find(i)  $P(A \text{ and } B)$  (ii)  $P(A \text{ and not } B)$ (iii)  $P(A \text{ or } B)$  (iv)  $P(\text{neither } A \text{ nor } B)$



 [Watch Video Solution](#)

14. A die is thrown thrice. Find the probability of getting an odd number at least once.

 [Watch Video Solution](#)

15. Two balls are drawn at a random with replacement from a box containing 10 black and 8 red balls. Find the probability that i. both the balls are red. ii. first ball is black and second is are. iii. One of them is black and other is red.

 [Watch Video Solution](#)

16. Probability of solving specific problem independently by A and B are  $\frac{1}{2}$  and  $\frac{1}{3}$  respectively. If both try to solve the problem

independently, find the probability that (i) the problem is solved  
(ii) exactly one of them solves the problem.

 [Watch Video Solution](#)

17. In a hostel 60% of the students read Hindi news paper, 40% read English news paper and 20% read both Hindi and English news papers. A student is selected at random.

(a) Find the probability that she reads neither Hindi nor English news papers.

(b) If she reads Hindi news paper, find the probability that she reads English news paper.

(c) If she reads English news paper, find the probability that she reads Hindi news paper.

 [Watch Video Solution](#)



18. The probability of obtaining an even prime number on each die, when a pair of dice is rolled is (A) 0 (B)  $\frac{1}{3}$  (C)  $\frac{1}{12}$  (D)  $\frac{1}{36}$



[Watch Video Solution](#)