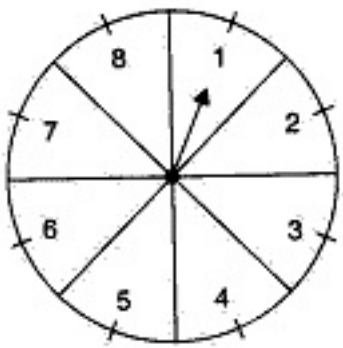
CBSE Test Paper 02

Chapter 15 Probability

1. A card is drawn at random from a well shuffled deck of 52 cards. The probability that it will be a spade or a king is **(1)**
   a. $\frac{4}{13}$
   b. $\frac{6}{13}$
   c. $\frac{8}{13}$
   d. $\frac{10}{13}$
2. The probability of an impossible event is **(1)**
   a. 0.01
   b. 100
   c. zero
   d. 1
3. The probability that a leap year will have 53 Sundays or 53 Mondays is **(1)**
   a. $\frac{4}{7}$
   b. $\frac{2}{7}$
   c. $\frac{1}{7}$
   d. $\frac{3}{7}$
4. A box contains 3 blue balls, 2 white balls and 4 red balls. If a ball is drawn at random from the box, the probability of getting a white ball is **(1)**
   a. $\frac{2}{9}$
   b. $\frac{4}{9}$
   c. 1
   d. $\frac{3}{9}$
5. A card is drawn at random from a pack of 52 cards. Find the probability that the card is drawn is (i) a black king (ii) a jack, a queen or a king (iii) neither an ace nor a king. **(1)**
   a. $(i)\frac{11}{13}(ii)\frac{1}{26}(iii)\frac{3}{13}$
   b. $(i)\frac{3}{13}(ii)\frac{1}{26}(iii)\frac{11}{13}$
   c. $(i)\frac{1}{26}(ii)\frac{3}{13}(iii)\frac{11}{13}$
   d. $(i)\frac{11}{13}(ii)\frac{3}{13}(iii)\frac{1}{26}$
6. A bag contains cards numbered from 1 to 25. A card is drawn at random from the bag.

Find the probability that number is divisible by both 2 and 3. **(1)**

7. What is the probability that an ordinary year has 53 Sundays? **(1)**
8. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag. **(1)**
9. A card is drawn at random from a well-shuffled pack of 52 cards. Find the probability that the drawn card is neither a king nor a queen. **(1)**
10. Two unbiased dice are thrown. Find the probability that the total of the numbers on the dice is greater than 10. **(1)**
11. Two dice, one blue and one grey, are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is 8? **(2)**
12. A Box contains cards numbered 3,5,7,9,..,35,37. A card is drawn at random from the box. Find the probability that the number on the card is a prime number. **(2)**
13. In a class, there are 18 girls and 16 boys. The class teacher wants to choose one pupil for class monitor. What she does, she writes the name of each pupil on a card and puts them into a basket and mixes thoroughly. A child is asked to pick one card from the basket. What is the probability that the name written on the card is: **(2)**
    i. the name of a girl
    ii. the name of a boy?
14. From a pack of 52 playing cards, Jacks, Queens, and Kings of red color are removed. From the remaining, a card is drawn at random. Find the probability that drawn card is :(i) a black king, (ii) a card of red color, (iii) a card of black color. **(3)**
15. A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 (see figure), and these are equally likely out-comes. What is the probability that it will point at **(3)**



    i. 8?
    ii. an odd number?
    iii. a number greater than 2?

iv. a number less than 9?

16. Cards numbered 1 to 30 are put in a bag. A card is drawn at random. Find the probability that the drawn card is **(3)**
    i. prime number > 7
    ii. not a perfect square
17. Two customers are visiting a particular shop in the same week (Monday to Saturday). Each is equally likely to visit the shop on any one day as on another. What is the probability that both will visit the shop on: **(3)**
    i. the same day?
    ii. different days?
    iii. consecutive days?
18. Find the mean marks of the students for the following distribution **(4)**

Marks	Number of Students	Marks	Number of Students
0 and above	80	60 and above	28
10 and above	77	70 and above	16
20 and above	72	80 and above	10
30 and above	65	90 and above	8
40 and above	55	100 and above	0
50 and above	43		

19. A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is : **(4)**
    i. a card of a spade or an ace.
    ii. a black king.
    iii. neither a jack nor a king.
    iv. either a king or a queen
20. A bag contains 4 white balls, 6 red balls, 7 black balls and 3 blue balls. One ball is drawn at random from the bag. Find the probability that the ball drawn is **(4)**
    i. white
    ii. not black
    iii. neither white nor black
    iv. red or white.

CBSE Test Paper 02

Chapter 15 Probability

Solution

1. a. $\frac{4}{13}$

   Explanation: Number of spades = 13

   Number of kings = 3 (one spade king is counted in No. of spades)

   Number of possible outcomes = 13 + 3 = 16

   Number of Total outcomes = 52

   Required Probability = $\frac{16}{52} = \frac{4}{13}$

2. c. zero

   Explanation: An event which has no chance of occurrence is called an impossible event.

   for example: The probability of getting more than 6 when a die is thrown is an impossible event because the highest number in a die is 6

   The probability of an impossible event is always zero.(0)

3. d. $\frac{3}{7}$

   Explanation: Leap year contains 366 days = 52 weeks + 2 days

   52 weeks contain 52 Sundays and 52 weeks contain 52 Mondays

   We will get 53 Sundays or 53 Mondays if one of the remaining two days is a Sunday or Monday Total possibilities for two days are:

   (Sunday, Monday), (Monday, Tuesday), (Tuesday, Wednesday), (Wednesday, Thursday), (Thursday, Friday), (Friday, Saturday), (Saturday, Sunday)

   Number of Total possible outcomes = 7

   Number of possible outcomes either Sunday or Monday or Both = 3

   Required Probability = $\frac{3}{7}$

4. a. $\frac{2}{9}$

   Explanation: Number of outcomes = 2

   Number of total outcomes = 3 + 2 + 4 = 9

   $\therefore$ Required Probability = $\frac{2}{9}$

5. c. $(i)\frac{1}{26}(ii)\frac{3}{13}(iii)\frac{11}{13}$

Explanation: Total number of outcomes = 52

i. Favourable outcomes in this case = 2 {2 black kings}

∴ P (black king) $= \frac{Favourable\ outcomes}{Total\ outcomes} = \frac{2}{52} = \frac{1}{26}$

ii. Favourable outcomes in this case = 4 + 4 + 4 = 12 {4 jacks, 4 queens, 4 kings}

∴ P (a jack, a queen or a king) $= \frac{Favourable\ outcomes}{Total\ outcomes} = \frac{12}{52} = \frac{3}{13}$

iii. Favourable outcomes in this case = 52 – {4 + 4} = 44 [52 – {4 aces + 4 kings}]

∴ P (neither an ace nor a king) $= \frac{Favourable\ outcomes}{Total\ outcomes} = \frac{44}{52} = \frac{11}{13}$

Alternatively: P (neither an ace nor a king) = 1 – P {an ace or a king}

P (an ace or a king) = $\frac{4+4}{52} = \frac{8}{52}$

∴ P (neither an ace nor a king) = $1 - \frac{8}{52} = \frac{44}{52} = \frac{11}{13}$

6. The numbers divisible by 2 and 3 both = 6, 12, 18, 24,

   Number of favourable outcomes = 4

   Total outcomes = 25

   Probablity of event happen P(E)= $\frac{Number\ of\ favourable\ outcomes}{Total\ number\ of\ outcomes}$

   ∴.P(number divisible by 2 and 3) = $\frac{4}{25}$

7. We have to find the probability that an ordinary year has 53 Sundays.

   An ordinary year has 365 days which means 52 complete weeks and one day.

   If 52 weeks ends in Mon, then next day will be = Tue

   If 52 weeks ends in Tue, then next day will be = Wed

   If 52 weeks ends in Wed, then next day will be = Thu

   If 52 weeks ends in Fri, then next day will be = Sat

   If 52 weeks ends in Sat, then next day will be = Sun

   If 52 weeks ends in Sun, then next day will be = Mon

   Therefore,total number of outcomes = 7

   Also,we have ,number of cases favourable to the event = 1

   Therefore, probability that an ordinary year has 53 Sundays = $\frac{number\ of\ cases\ favourable\ to\ the\ event}{total\ number\ of\ outcomes}$ = $\frac{1}{7}$.

8. Let the number of blue balls in the bag be x.

   Then, total number of balls = (5 + x).

Given, P(a blue ball) $= 3 \times P(a \text{ red ball })$

$\therefore \frac{x}{(5+x)} = 3 \times \frac{5}{(5+x)} \Rightarrow x = 15$

9. Total number of cards = 52.

   Total number of kings and queens = 4+4 = 8.

   Remaining number of cards = 52 - 8 = 44.

   P(getting a card which is neither a king nor a queen) = $\frac{44}{52} = \frac{11}{13}$.

10. We know that ,When a pair of dice is thrown, the total number of possible outcomes are 36.

    Favourable outcomes of the sum greater than 10 = {(5,6)(6,5)(6,6)}

    Therefore, number of cases favourable to the event=3

    Hence, Probability of getting the sum greater than 10 = $\frac{3}{36} = \frac{1}{12}$.

11. Total number of outcomes = 36

    Favourable outcomes are (2,6), (3,5), (4,4), (5,3), (6,2) = 5

    $Probability = \frac{Number\ of\ favorable\ outcome}{Total\ number\ of\ outcome}$

    ∴ Required probability = $\frac{5}{36}$

12. Given numbers 3, 5, 7, 9 ....., 35, 37 form an AP with a = 3 and d = 2.

    Let T_n = 37. Then,

    $3 + (n-1)2 = 37$

    $\Rightarrow 3 + 2n - 2 = 37$

    $\Rightarrow 2n = 36$

    $\Rightarrow n = 18$

    Thus, total number of outcomes = 18.

    Let E be the event of getting a prime number.

    Out of these numbers, the prime numbers are 3, 5, 7, 11, 13, 17, 19, 23, 29, 31 and 37.

    The number of favorable outcomes = 11.

    Therefore, P(getting a prime number) = P(E) = $\frac{\text{Number of outcomes favorable to } E}{\text{Number of all possible outcomes}} = \frac{11}{18}$

13. According to the question:

    Number of girls = 18

    Number of boys = 16

    Total pupil = 18 + 16 = 34

i. Probability of a girl monitor = $\frac{18}{34} = \frac{9}{17}$

ii. Probability of a boy monitor = $\frac{16}{34} = \frac{8}{17}$

14. Total cards = 52

Cards removed = 6

Cards left = 52 - 6 = 46

So total possibilities n=46

i. Total black kings = 2

Probability of drawing black king $= \frac{m}{n} = \frac{2}{46} = \frac{1}{23}$

ii. Total red cards = 26 - 6 = 20 So m=20

iii. Probability of drawing red colour card = $\frac{m}{n} = \frac{20}{46} = \frac{10}{23}$

iv. Total card of black colour = 26 so m = 26

Probability of drawing black colour card= $\frac{m}{n} = \frac{26}{46} = \frac{13}{23}$

15. Total numbers = 8

∴ Number of all possible outcomes = 8

i. Number of outcomes favourable to the event that the arrow will point at 8 = 1

∴ Probability that the arrow will point at 8

Probability of the event= $\frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes} = \frac{1}{8}$

ii. Number of outcomes favourable to the event that the arrow will point at an odd number (1, 3, 5, 7) = 4

∴ Probability that the arrow will point at an odd number

Probability of the event $= \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes} = \frac{4}{8} = \frac{1}{2}$

iii. Number of outcomes favourable to the event that the arrow will point at a number greater than 2.(3, 4, 5, 6, 7, 8) = 6

∴ Probability that the arrow will point at a number greater than 2

Probability of the event $= \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes} = \frac{6}{8} = \frac{3}{4}$

iv. Number of outcomes favourable to the event that the arrow will point at a number less than 9.(1, 2, 3, 4, 5, 6, 7, 8) = 8

∴ Probability that the arrow will point at a number less than 9 = Probability of the event $= \frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes} = \frac{8}{8} = 1$

16. No. of possible outcomes = 30

i. P(prime no. > 7) = 11,13,17,19,23,29 so m=6

$P(E_1) = \frac{m}{n} = \frac{6}{30} = \frac{1}{5}$

No. of perfect square are 1,4,9,16,25, = 5

ii. No. of non perfect square = 30 - 5 = 25 so m=25

iii. P(not a perfect square) = $\frac{m}{n} = \frac{25}{30} = \frac{5}{6}$

17. Total number of days to visit the shop = 6

Two customers can visit the shop on two days in 6 × 6 = 36 ways

So total number of outcomes = 36

i. Two customers can visit the shop on same day of the week in 6 ways i.e.

(M, M), (T, T), (W, W), (Th, Th), (F, F), (S, S)

Favourable number of ways = 6

∴P(both will reach on same day) = $\frac{6}{36} = \frac{1}{6}$

ii. We know, Probability of occurrence of an event + Probability of non occurrence of event = 1

i.e. P(E) + $P(\overline{E})$ = 1

P(both will reach on same day) = $\frac{1}{6}$

$\Rightarrow \frac{1}{6} + P(\overline{E}) = 1$

$\Rightarrow P(\overline{E}) = 1 - \frac{1}{6}$

$\Rightarrow P(\overline{E}) = \frac{5}{6}$

Hence, P(both will reach on different day) = $\frac{5}{6}$

iii. Two customers can visit the shop on consecutive days in 5 ways i.e.

(M, T), (T, W), (W, Th), (Th, F), (F, S)

Favourable number of ways = 5

P(both will reach on consecutive days) = $\frac{5}{36}$.

18. We form following table for calculations:

Marks	**c.f.**	**Marks C.I.**	X_i	$d_i = x_i - a$	f_i	$f_i d_i$
0 and above	80	0-10	5	-50	80-77 = 3	-150
10 and above	77	10-20	15	-40	*77-72= 5*	-200
20 and above	72	20-30	25	-30	72 - 65 = 7	-210
30 and above	65	30-40	35	-20	65 - 55 = 10	-200
40 and above	55	40-50	45	-10	55-43 =12	-120
50 and above	43	50-60	**55**	0	43 - 28 = 15	0

60 and above	28	60-70	65	10	28-16 = 12	120
70 and above	16	70-80	75	20	16-10 = 6	120
80 and above	10	80-90	85	30	10-8 = 2	60
90 and above	8	90-100	95	40	8-0=8	320
100 and above	0	100-110	105	50	0	0
.	.	.	.	.	$\sum f_i = 80$	$\sum f_i d_i = -260$

a = assumed mean = 55

$\sum f_i d_i$= -260

$\sum f_i$ = 80

$\overline{x} = a + \frac{\sum f_i d_i}{\sum f_i} = 55 - \frac{260}{80} = 55 - \frac{13}{4}$ = 55 - 3.25

$\Rightarrow \overline{x} = 51.75$

This method is called deviation method.

Hence, the mean marks of students = 51.75.

19. i. Cards of spade or an ace = 13 + 3 = 16 Hence m=16

Total no. of cards = 52 So n=52

P (spade or an ace) = $\frac{m}{n} = \frac{16}{52} = \frac{4}{13}$

ii. Black kings = 2 so m=2

P(a black king) = $\frac{m}{n} = \frac{2}{52} = \frac{1}{26}$

iii. Jack or king = 4 + 4 = 8 so for neither jack nor a king =52-8=44 hence m=44

P(neither jack nor a king) = $\frac{m}{n} = \frac{44}{52} = \frac{11}{13}$

iv. King or queen = 4 + 4 = 8,So m=8

P (either a king or a queen) = $\frac{m}{n} = \frac{8}{52} = \frac{2}{13}$

20. Number of white balls in the bag = 4

Number of red balls in the bag = 6

Number of black ball in the bag = 7

Number of blue balls in the bag = 3

∴ Total number of balls in the bag = 4 + 6 + 7 + 3 = 20

∴ Number of all possible outcomes = 20

Proabibilty of the event = $\frac{Number\ of\ favourble\ outcomes}{Total\ number\ of\ possible\ outcomes}$

i. Let E be the event that the ball drawn is white.

   Then, the number of outcomes favourable to E is 4.

   So, P(E) = P (white)= $\frac{4}{20} = \frac{1}{5}$

ii. Let E be the event that the ball drawn is no black.

   Then, the number of outcomes favourable to E is 4 + 6 + 3 = 13.

   So, P(E) = P(not black)= $\frac{13}{20}$

iii. Let E be the event that the ball drawn is neither white nor black.

   Then, the number of outcomes favourable to E is 6 + 3 = 9.

   So, P(E) = P (neither white nor black)= $\frac{9}{20}$

iv. Let E be the event that the ball drawn is red or white.

   Then, the number of outcomes favourable to E is 6 + 4 = 10.

   So, P(E) = P (red or white) = $\frac{10}{20} = \frac{1}{2}$