CBSE NCERT Solutions for Class 9 Mathematics Chapter 15

Back of Chapter Questions

Exercise: 15.1

1. In a cricket match, a batswoman hits a boundary 6 times out of 30 balls she plays. Find the probability that she did not hit a boundary.

Solution:

Number of times batswoman hits a boundary = 6

Total number of balls played by her = 30

∴ Number of times that the batswoman does not hit a boundary = 30 − 6 = 24

$$\text{Required Probability} = \frac{\text{Number of times that the batswoman does not hit a boundary}}{\text{Total number of balls played by her}}$$

$$= \frac{24}{30}$$

$$= \frac{4}{5}$$

Hence, the probability that she did not hit a boundary is $\frac{4}{5}$.

2. 1500 families with 2 children were selected randomly, and the following data were recorded:

Number of girls in a family	2	1	0
Number of families	475	814	211

Compute the probability of a family, chosen at random, having

(i) 2 girls

(ii) 1 girl

(iii) No girl

Also, check whether the sum of these probabilities is 1.

Solution:

(i) Total number of families = 475 + 814 + 211 = 1500

Number of families having 2 girls = 475

$$\text{Required Probability} = \frac{\text{Number of families having 2 girls}}{\text{Total number of families}}$$

$$= \frac{475}{1500}$$

$$= \frac{19}{60}$$

(ii) Number of families having 1 girl = 814

$$\text{Required Probability} = \frac{\text{Number of families having 1 girl}}{\text{Total number of families}}$$

$$= \frac{814}{1500}$$

$$= \frac{407}{750}$$

(iii) Number of families having no girl = 211

$$\text{Required Probability} = \frac{\text{Number of families having no girl}}{\text{Total number of families}}$$

$$= \frac{211}{1500}$$

$$\text{Sum of all probabilities} = \frac{19}{60} + \frac{407}{750} + \frac{211}{1500}$$

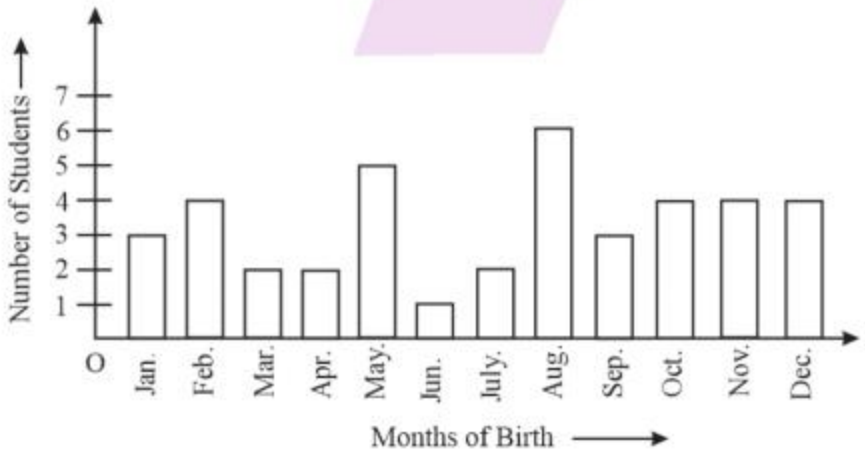
$$= \frac{475 + 814 + 211}{1500}$$

$$= \frac{1500}{1500}$$

$$= 1$$

Thus, the sum of all these probabilities is 1.

3. In a particular section of Class IX, 40 students were asked about the months of their birth and the following graph was prepared for the data so obtained:



Find the probability that a student of the class was born in August.

Solution:

From the graph, it is clear that, number of students that are born in the month of August = 6

Total number of students = 40

$$\text{Required Probability} = \frac{\text{Number of students that are born in the month of August}}{\text{Total number of students}}$$

$$= \frac{6}{40}$$

$$= \frac{3}{20}$$

Hence, the probability that a student of the class was born in August is $\frac{3}{20}$

4. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes:

Outcome	3 heads	2 heads	1 head	No head
Frequency	23	72	77	28

If the three coins are simultaneously tossed again, compute the probability of 2 heads coming up.

Solution:

Number of times 2 heads come up = 72

Total number of times the coins were tossed = 23 + 72 + 77 + 28 = 200

$$\text{Required Probability} = \frac{\text{Number of times 2 heads come up}}{\text{Total number of times the coins were tossed}}$$

$$= \frac{72}{200}$$

$$= \frac{9}{25}$$

5. An organization selected 2400 families at random and surveyed them to determine a relationship between income level and the number of vehicles in a family. The information gathered is listed in the table below:

Monthly income (in Rs)	Vehicles per family			
	0	1	2	Above 2
Less than 7000	10	160	25	0
7000 – 10000	0	305	27	2
10000 – 13000	1	535	29	1
13000 – 16000	2	469	59	25
16000 or more	1	579	82	88

Suppose a family is chosen, find the probability that the family chosen is

(i) earning Rs 10000 – 13000 per month and owning exactly 2 vehicles.

(ii) earning Rs 16000 or more per month and owning exactly 1 vehicle.

(iii) earning less than Rs 7000 per month and does not own any vehicle.

(iv) earning Rs 13000 – 16000 per month and owning more than 2 vehicles.

(v) owning not more than 1 vehicle.

Solution:

Total number of families surveyed = 2400

(i) Number of families earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles = 29

$$\text{Required probability} = \frac{\text{Number of families earning Rs.10000 – 13000 per month and owning exactly 2 vehicles}}{\text{Total number of families surveyed}}$$

$$= \frac{29}{2400}$$

(ii) Number of families earning Rs. 16000 or more per month and owning exactly 1 vehicle = 579

$$\text{Required probability} = \frac{\text{Number of families earning Rs.16000 or more per month and owning exactly 1 vehicle}}{\text{Total number of families surveyed}}$$

$$= \frac{579}{2400} = \frac{193}{800}$$

(iii) Number of families earning less than Rs. 7000 per month and do not own any vehicle = 10

$$\text{Required probability} = \frac{\text{Number of families earning less than Rs.7000 per month and do not own any vehicle}}{\text{Total number of families surveyed}}$$

$$= \frac{10}{2400} = \frac{1}{240}$$

(iv) Number of families earning Rs. 13000 – 16000 per month and owning more than 2 vehicles = 25

$$\text{Required probability} = \frac{\text{Number of families earning Rs.13000 – 16000 per month and owning more than 2 vehicles}}{\text{Total number of families surveyed}}$$

$$= \frac{25}{2400} = \frac{1}{96}$$

(v) Number of families owning not more than 1 vehicle = 10 + 160 + 0 + 305 + 1 + 535 + 2 + 469 + 1 + 579 = 2062

$$\text{Required probability} = \frac{\text{Number of families owning not more than 1 vehicle}}{\text{Total number of families surveyed}}$$

$= \frac{2062}{2400} = \frac{1031}{1200}$

6. A teacher wanted to analyze the performance of two sections of students in a mathematics test of 100 marks. Looking at their performances, she found that a few students got under 20 marks and a few got 70 marks or above. So she decided to group them into intervals of varying sizes as follows: $0-20, 20-30 \ldots 60-70, 70-100$. Then she formed the following table:

Marks	Number of student
$0-20$	7
$20-30$	10
$30-40$	10
$40-50$	20
$50-60$	20
$60-70$	15
$70-$ above	8
Total	90

(i) Find the probability that a student obtained less than 20% in the mathematics test.

(ii) Find the probability that a student obtained marks 60 or above.

Solution:

Total number of students $= 90$

Number of students who obtained less than 20% marks in the test $= 7$

Required probability $= \frac{\text{Number of students who obtained less than 20\% marks in the test}}{\text{Total number of students}}$

$= \frac{7}{90}$

Hence, the probability that a student obtained less than 20% in the mathematics test is $\frac{7}{90}$.

Number of students who obtained marks 60 or above $= 15 + 8 = 23$

Required probability $= \frac{\text{Number of students who obtained marks 60 or above}}{\text{Total number of students}}$

$= \frac{23}{90}$

Hence, the probability that a student obtained marks 60 or above is $\frac{23}{90}$.

7. To know the opinion of the students about the subject statistics, a survey of 200 students was conducted. The data is recorded in the following table.

Opinion	Number of students

Like	135
dislike	65

Find the probability that a student chosen at random

(i) likes statistics,

(ii) does not like it

Solution:

(i) Total number of students $= 135 + 65 = 200$

Number of students who like statistics $= 135$

$$P(\text{student likes statistics}) = \frac{\text{Number of students who like statistics}}{\text{Total number of students}} = \frac{135}{200} = \frac{27}{40}$$

Hence, the required probability is $\frac{27}{40}$.

(ii) Number of students who do not like statistics $= 65$

$$P(\text{student does not like statistics}) = 1 - P(\text{student likes statistics})$$

$$= 1 - \frac{\text{Number of students who like statistics}}{\text{Total number of students}}$$

$$= 1 - \frac{27}{40}$$

$$= \frac{13}{40}$$

Hence, the required probability is $\frac{13}{40}$

8. The distance (in km) of 40 engineers from their residence to their place of work were found as follows:

5	3	10	20	25	11	13	7	12	31
19	10	12	17	18	11	32	17	16	2
7	9	7	8	3	5	12	15	18	3
12	14	2	9	6	15	15	7	6	12

What is the empirical probability that an engineer lives:

(i) less than 7 km from her place of work?

(ii) more than or equal to 7 km from her place of work?

(iii) within $\frac{1}{2}$ km from her place of work?

Solution:

Total number of engineers $= 40$

(i) Number of engineers living at a distance of less than 7 km form work place = 9

$\therefore$ Required empirical probability = $\frac{\text{Number of engineers living at a distance of less than 7 km form work place}}{\text{Total number of engineers}} = \frac{9}{40}$

(ii) Number of engineers living at a distance of more than or equal to 7 km from their workplace = $40 - 9 = 31$

$\therefore$ Required empirical probability = $\frac{31}{40}$

(iii) Number of engineers living within a distance of $\frac{1}{2}$ km from their workplace = 0

$\therefore$ Required empirical probability = 0

9. Eleven bags of wheat flour, each marked 5 kg, actually contained the following weights of flour (in kg):

4.975.05 5.08 5.03 5.00 5.06 5.08 4.98 5.04 5.07 5.00

Find the probability that any of these bags chosen at random contains more than 5 kg of flour.

Solution:

Total number of bags = 11

Number of bags containing more than 5 kg of flour = 7

Required probability = $\frac{\text{Number of bags containing more than 5 kg of flour}}{\text{Total number of bags}}$

$= \frac{7}{11}$

Hence, the probability that any of these bags chosen at random contains more than 5 kg of flour is $\frac{7}{11}$.

10. A study was conducted to find out the concentration of Sulphur dioxide in the air in parts per million (ppm) of a certain city. The frequency distribution of the data obtained for 30 days is as follows:

Concentration of SO_2 (in ppm)	Number of days (frequency)
0.00 – 0.04	4
0.04 – 0.08	9
0.08 – 0.12	9
0.12 – 0.16	2
0.16 – 0.20	4
0.20 – 0.24	2

Total	30

Using this table, find the probability of the concentration of sulphur dioxide in the interval $0.12 - 0.16$ on any of these days.

Solution:

Total number of days $= 30$

Number days for which the concentration of sulphur dioxide was in the interval of $0.12 - 0.16 = 2$

$\therefore$ Required probability $= \frac{\text{Number days for which the concentration of sulphur dioxide was in the interval of } 0.12 - 0.16}{\text{Total number of days}}$

$= \frac{2}{30} = \frac{1}{15}$

11. The blood groups of 30 students of class VIII are given in the following frequency distribution table:

Blood group	Number of students
A	9
B	6
AB	3
O	12
Total	30

Use this table to determine the probability that a student of this class, selected at random, has blood group AB.

Solution:

Total number of students $= 30$

Number of students having blood group AB $= 3$

Required Probability $= \frac{\text{Number of students having blood group AB}}{\text{Total number of students}}$

$= \frac{3}{30}$

$= \frac{1}{10}$

Hence, the probability that a student of this class, selected at random, has blood group AB is $\frac{1}{10}$.