Exercise (15.1)

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

Solution 1:
Number of times the batswoman hits a boundary = 6
Total number of balls played = 30
∴ Number of times that the batswoman does not hit a boundary = 30 − 6 = 24

$$P \text{ (she does not hit a boundary)} = \frac{\text{Number of times when she does not hit boundary}}{\text{Total number of balls played}}$$

$$= \frac{24}{30} = \frac{4}{5}$$

Question 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 2:
Total number of families = 475 + 814 + 211 = 1500

(i) Number of families having 2 girls = 475

$$P_1 \text{ (a randomly chosen family has 2 girls)} = \frac{\text{Number of families having 2 girls}}{\text{Total number of families}}$$

$$= \frac{475}{1500} = \frac{19}{60}$$

(ii) Number of families having 1 girl = 814

$$P_2 \text{ (a randomly chosen family has 1 girl)} = \frac{\text{Number of families having 1 girl}}{\text{Total number of families}}$$

$$= \frac{814}{1500} = \frac{407}{750}$$

(iii) Number of families having no girl = 211

P_3 (a randomly chosen family has no girl) = $\frac{\text{Number of families having no girl}}{\text{Total number of families}}$

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

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

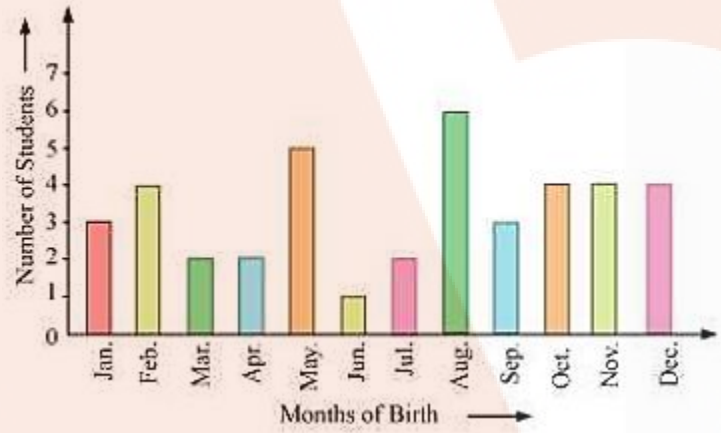
$$= \frac{475 + 814 + 211}{1500}$$

$$= \frac{1500}{1500} = 1$$

Therefore, the sum of all these probabilities is 1.

Question 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 3:

Number of students born in the month of August = 6

Total number of students = 40

P (Students born in the month of August) = $\frac{\text{Number of students born in August}}{\text{Total number of students}}$

$$= \frac{6}{40} = \frac{3}{20}$$

Question 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 4:

Number of times 2 heads come up = 72

Total number of times the coins were tossed = 200

$$P\text{ (2 heads will come up)} = \frac{\text{Number of times 2 heads come up}}{\text{Total number of times the coins were tossed}}$$

$$= \frac{72}{200} = \frac{9}{25}$$

Question 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:

	Vehicles per family			
Monthly income (in Rs.)	**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 5:

Number of total families surveyed = 10 + 160 + 25 + 0 + 0 + 305 + 27 + 2 + 1 + 535 + 29 + 1 + 2 + 469 + 59 + 25 + 1 + 579 + 82 + 88 = 2400

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

Hence, required probability, $P = \frac{29}{2400}$

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

Hence, required probability, $P = \frac{579}{2400}$

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

Hence, required probability, $P = \frac{10}{2400} = \frac{1}{240}$

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

Hence, required probability, $P = \frac{25}{2400} = \frac{1}{96}$

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

Hence, required probability, $P = \frac{2062}{2400} = \frac{1031}{1200}$

Question 6:

A teacher wanted to analyse 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, …, 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 6:
Total number of students = 90

(i) Number of students getting less than 20 % marks in the test = 7

Hence, required probability, $P = \frac{7}{90}$

(ii) Number of students obtaining marks 60 or above = 15 + 8 = 23

Hence, required probability, $P = \frac{23}{90}$

Question 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 7:

Total number of students = 135 + 65 = 200

(i) Number of students liking statistics = 135

P (students liking statistics) = $\frac{135}{200} = \frac{27}{40}$

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

P (students not liking statistics) = $\frac{65}{200} = \frac{13}{40}$

Question 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 ½ km from her place of work?

Solution 8:

(i) Total number of engineers = 40

Number of engineers living less than 7 km from their place of work = 9

Hence, required probability that an engineer lives less than 7 km from her place of work, $P = \frac{9}{40}$

(ii) Number of engineers living more than or equal to 7 km from their place of work = 40 − 9 = 31

Hence, required probability that an engineer lives more than or equal to 7 km from her place of work, $P = \frac{31}{40}$

(iii) Number of engineers living within ½ km from her place of work = 0

Hence, required probability that an engineer lives within ½ km from her place of work, P = 0

Question 9:

Activity

Note the frequency of two – wheeler, three-wheeler and four-wheelers going past during a time – interval in front of school gate. Find the probability that any one vehicle out of the total vehicles you have observed is a two-wheeler.

Solution 9: To be done by individual self.

Question 10:

Activity

Ask all the students in your class to write a 3-digit number. Choose any student from the room at random. What is the probability that the number written by him/her is divisible by 3 ? Remember that a number is divisible by 3, if the sum of it's digits is divisible by 3.

Solution 10: To be done by individual self.

Question 11:

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

4.97, 5.05, 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 11:

Number of total bags = 11

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

Hence, required probability, $P = \frac{7}{11}$

Question 12:

The below frequency distribution table represents the concentration of Sulphur dioxide in the air in parts per million of a certain city for 30 days. Using this table,

find the probability of the concentration of Sulphur dioxide in the interval 0.12−0.16

on any of these days.

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

Solution 12:

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

Total number of days = 30

Hence, required probability, $P = \frac{2}{30} = \frac{1}{15}$

Question 13:

The below frequency distribution table represents the blood groups of 30 students of a class. Use this table to determine the probability that a student of this class, selected at random, has blood group AB.

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

Solution 13:

Number of students having blood group AB = 3

Total number of students = 30

Hence, required probability, $P = \frac{3}{30} = \frac{1}{10}$