probability

15 Chapter

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.

Ans: No. of time she hit boundary: 6

Total No. of balls played: 30

$\therefore$ No. of times she does not hit boundary: $30-6=24$

Probability that she does not hit the ball:

$$\frac{24}{30}=\frac{4}{5}=0.8$$

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.

Ans: Total number of families = 1500

P1 (family with 2 girls)

$$\frac{475}{1500} = \frac{19}{60} = 0.317$$

P2 (family with 1 girl)

$$\frac{814}{1500} = \frac{407}{750} = 0.54$$

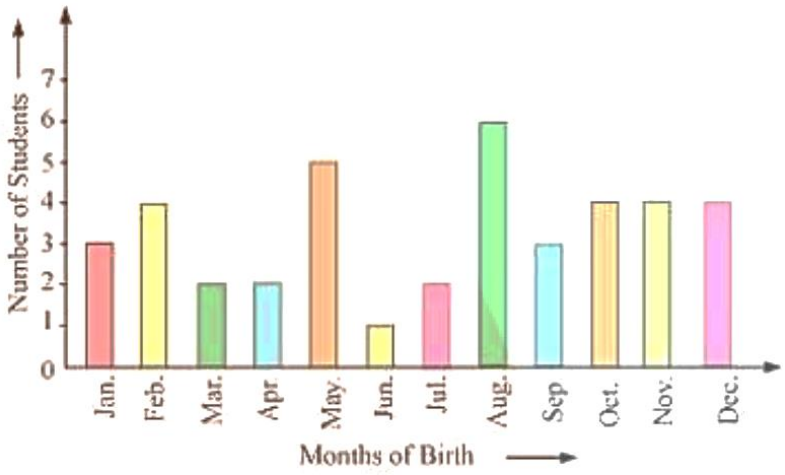
P3 (family with 0 girls)

$$\frac{211}{1500} = 0.14$$

Sum of Probabilities:

$$\frac{475}{1500} + \frac{814}{1500} + \frac{211}{1500} = \frac{1500}{1500} = 1$$

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:



Ans: Total no. of students: 40

No. of students born in august: 6

Probability of a student born in august:

$$\frac{6}{40} = \frac{3}{20} = 0.15$$

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.

Ans: Total number of tosses: 200

Number of times we obtained 2 heads: 72

Probability of obtaining 2 heads again: $\frac{72}{200} = \frac{9}{25} = 0.36$

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

(i) Earning Rs.$10000-13000$ per month and owning exactly 2 vehicles.

Ans: Total number of families surveyed: 2400

Number of families earning $10000-13000$ and own exactly 2 vehicles: 29

Probability of choosing this family: $\frac{29}{2400}$

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

Ans: Number of families earning Rs. 16000 or more per month and owning exactly 1 vehicle: 579

Probability of choosing this family: $\frac{579}{2400} = \frac{193}{800}$

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

Ans: Number of families earning less than Rs. 7,000 per month and does not own any vehicle: 10

Probability of choosing this family: $\frac{10}{2400} = \frac{1}{240}$

(iv) Earning Rs. $13000-16000$ **per month and owning more than 2 vehicles.**

Ans: Number of families earning Rs. $13000-16000$ per month and owning more than 2 vehicles: $\frac{25}{2400} = \frac{1}{96}$

(v) Owning not more than 1 vehicle.

Ans: Number of families owning not more than 1 vehicle:

$$\frac{25+27+29+59+82+2+1+25+88}{2400} = \frac{338}{2400} = \frac{169}{1200}$$

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:**

$$\mathbf{0-20},\ \mathbf{20-30},\ \ldots,\ \mathbf{60-70},\ \mathbf{70-100}$$

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.

Ans: Total number of students: **90**

No. of students obtained less than 20 % marks = is 7

Probability of required event: $\frac{7}{90}$

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

Ans: No. of students who obtained marks 60 or above: $15+8=23$

Probability of required event: $\frac{23}{90}$

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

Ans: Total number of students: 200

Number of students who like the subject: 135

Required probability: $\frac{135}{200} = \frac{27}{40}$

(ii) Does not like it

Ans: Number of students who does not like the subject: 65

Required Probability: $\frac{65}{200} = \frac{13}{40}$

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

Ans: Total number of engineers: 40

Number of engineers who reside within less than 7km from their work: 9

Probability of choosing one of them: $\frac{9}{40}$

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

Ans: Probability of choosing an engineer who resides more than or equal to 7km from their work: $1-\frac{9}{40}=\frac{31}{40}$

(iii) within ½ km from her place of work?

Ans: Number of engineers who reside within $\frac{1}{2}$ km from their work: 0

Probability of choosing one such engineer: $\frac{0}{40}=0$

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.

Ans: Let the number of two-wheeler vehicles you observed be: x

Number of three-wheeler vehicles be y

And number of four-wheeler vehicles be z

Now, probability of any vehicle be a two-wheeler is: $\frac{x}{x+y+z}$

Note: One has to physically observe vehicles and note the values of x, y and z.

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.

Ans: A dataset is provided below:

561, 891, 352, 658, 735, 187, 286, 374, 537, 385, 165, 537, 438, 682,
658, 572, 647, 901, 374, 977, 531, 909, 549, 286, 520, 170, 102, 328, 856

Total numbers: 29

Numbers divisible by 3: 11

Probability that a number is divisible by 3: $\frac{11}{29}$

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.

Ans: Total number of bags: 11

Number of bags which contain more than 5kg wheat: 7

Hence the required probability is: $\frac{7}{11}$

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 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

Ans: Total number of days, data is recorded: 30

Number of days found with concentration 0.120.16 : 2

Hence the required probability is: $\frac{2}{30} = \frac{1}{15}$

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

Ans: Total number of students: 30

Number of students with blood group AB: 3

Probability of choosing a student with blood group AB: $\frac{3}{30} = \frac{1}{10}$.