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.

Answer:

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.

Answer:

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

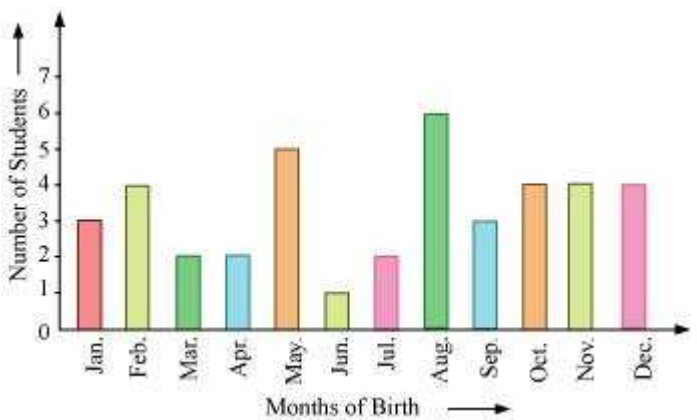
$$P_3 \text{ (a randomly chosen family has no girl)} = \frac{\text{Number of families having no girl}}{\text{Total number of families}}$$
$$= \frac{211}{1500}$$

$$\text{Sum of all these probabilities} = \frac{19}{60} + \frac{407}{750} + \frac{211}{1500}$$
$$= \frac{475 + 814 + 211}{1500}$$
$$= \frac{1500}{1500} = 1$$

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.

Answer:

Number of students born in the month of August = 6

Total number of students = 40

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

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

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.

Answer:

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:

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.

Answer:

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.

Answer:

Totalnumber 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

Answer:

Total number of students = 135 + 65 = 200

(i) Number of students liking statistics = 135

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

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

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

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 $\frac{1}{2}$ km from her place of work?

Answer:

(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 $\frac{1}{2}$ km from her place of work = 0

Hence, required probability that an engineer lives within $\frac{1}{2}$ km from her place of work, P = 0

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.

Answer:

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:

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

The above 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.

Answer:

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:

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

The above 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.

Answer:

Number of students having blood group AB = 3

Total number of students = 30

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