Exercise 15.1 Page: 283

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:

According to the question,

Total number of balls = 30

Numbers of boundary = 6

Number of time batswoman didn't hit boundary = 30 - 6 = 24

Probability she did not hit a boundary $= \frac{24}{30} = \frac{4}{5}$

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:

Total numbers of families = 1500

(i) Numbers of families having 2 girls = 475

Probability = Numbers of families having 2 girls/Total numbers of families

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

(ii) Numbers of families having 1 girls = 814

Probability = Numbers of families having 1 girls/Total numbers of families

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

(iii) Numbers of families having 2 girls = 211

Probability = Numbers of families having 0 girls/Total numbers of families

$= \frac{211}{1500}$

Sum of the probability $= \frac{19}{60} + \frac{407}{750} + \frac{211}{1500}$

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

Yes, the sum of these probabilities is 1.

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3. Refer to Example 5, Section 14.4, Chapter 14. Find the probability that a student of the class was born in August. Solution:

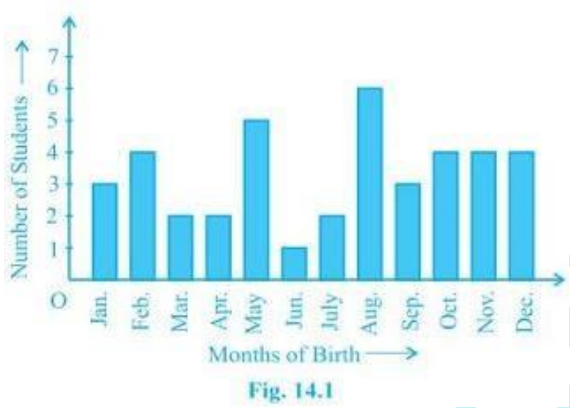

Fig. 14.1

Total numbers of students in the class = 40
Numbers of students born in August = 6

The probability that a student of the class was born in August, $= \frac{6}{40} = \frac{3}{20}$

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 = 200

∴, the probability of 2 heads coming up $= \frac{72}{200} = \frac{9}{25}$

5. An organisation 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 ₹)	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

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Suppose a family is chosen. Find the probability that the family chosen is

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

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

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

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

(v) owning not more than 1 vehicle.

Solution:

Total number of families = 2400

(i) Numbers of families earning ₹10000 –13000 per month and owning exactly 2 vehicles = 29 ∴, the probability that the family chosen is earning ₹10000 – 13000 per month and owning exactly 2 vehicle $= \frac{29}{2400}$

(ii) Number of families earning ₹16000 or more per month and owning exactly 1 vehicle = 579
∴, the probability that the family chosen is earning ₹16000 or more per month and owning exactly 1 vehicle $= \frac{579}{2400}$

(iii) Number of families earning less than ₹7000 per month and does not own any vehicle = 10
∴, the probability that the family chosen is earning less than ₹7000 per month and does not own any vehicle $= \frac{10}{2400} = \frac{1}{240}$

(iv) Number of families earning ₹13000-16000 per month and owning more than 2 vehicles = 25
∴, the probability that the family chosen is earning ₹13000 – 16000 per month and owning more than 2 vehicles $= \frac{25}{2400} = \frac{1}{96}$

(v) Number of families owning not more than 1 vehicle = 10+160+0+305+1+535+2+469+1+579
= 2062
∴, the probability that the family chosen owns not more than 1 vehicle $= \frac{2062}{2400} = \frac{1031}{1200}$

6. Refer to Table 14.7, Chapter 14.

(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:

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

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Total number of students = 90

(i) Number of students who obtained less than 20% in the mathematics test = 7

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

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

∴, the probability that a student obtained marks 60 or above = $\frac{23}{90}$

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:

Total number of students = 135 + 65 = 200

(i) Number of students who like statistics = 135
∴, the probability that a student likes statistics = $\frac{135}{200} = \frac{27}{40}$

(ii) Number of students who do not like statistics = 65
∴, the probability that a student does not like statistics = $\frac{65}{200} = \frac{13}{40}$

8. Refer to Q.2, Exercise 14.2. 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:

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	3	2
17	16	2	7	9	7	8	3	5	12	15	18	3	12	14	2	9	6
15	15	7	6	12													

Total numbers of engineers = 40

(i) Number of engineers living less than 7 km from their place of work = 9
∴, the probability that an engineer lives less than 7 km from her place of work = $\frac{9}{40}$

(ii) Number of engineers living more than or equal to 7 km from their place of work = 40 - 9 = 31
∴, probability that an engineer lives more than or equal to 7 km from her place of work = $\frac{31}{40}$

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

∴, the probability that an engineer lives within $\frac{1}{2}$ km from her place of work $= \frac{0}{40} = 0$

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

Solution:

The question is an activity to be performed by the students.
Hence, perform the activity by yourself and note down your inference.

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 her/him is divisible by 3? Remember that a number is divisible by 3, if the sum of its digits is divisible by 3.

Solution:

The question is an activity to be performed by the students.
Hence, perform the activity by yourself and note down your inference.

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:

Total number of bags present = 11
Number of bags containing more than 5 kg of flour = 7

∴, the probability that any of the bags chosen at random contains more than 5 kg of flour = $\frac{7}{11}$

12. In Q.5, Exercise 14.2, you were asked to prepare a frequency distribution table, regarding 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.

The data obtained for 30 days is as follows:

0.03 0.08 0.08 0.09 0.04 0.17 0.16 0.05 0.02 0.06 0.18 0.20 0.11
0.08 0.12 0.13 0.22 0.07 0.08 0.01 0.10 0.06 0.09 0.18 0.11 0.0 7
0.05 0.07 0.01 0.04

Solution:

Total number of days in which the data was recorded = 30 days
Numbers of days in which sulphur dioxide was present in between the interval 0.12-0.16 = 2
∴, the probability of the concentration of sulphur dioxide in the interval 0.12-0.16 on any of these days $= \frac{2}{30} = \frac{1}{15}$

EDUGROSS
WISDOMISING KNOWLEDGE

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13. In Q.1, Exercise 14.2, you were asked to prepare a frequency distribution table regarding 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.

The blood groups of 30 students of Class VIII are recorded as follows:

A, B, O, O, AB, O, A, O, B, A, O, B, A, O, O, A, AB, O, A, A, O, O, AB, B, A, O, B, A, B, O.

Solution:

Total numbers of students = 30

Number of students having blood group AB = 3

∴, the probability that a student of this class, selected at random, has blood group AB = $\frac{3}{30} = \frac{1}{10}$