

Exercise 15.1

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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,

$$\text{Total number of balls} = 30$$

$$\text{Numbers of boundary} = 6$$

$$\text{Number of time batswoman didn't hit boundary} = 30 - 6 = 24$$

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

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 girl = 814

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

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

- (iii) Numbers of families having 0 girls = 211

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

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

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

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

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:

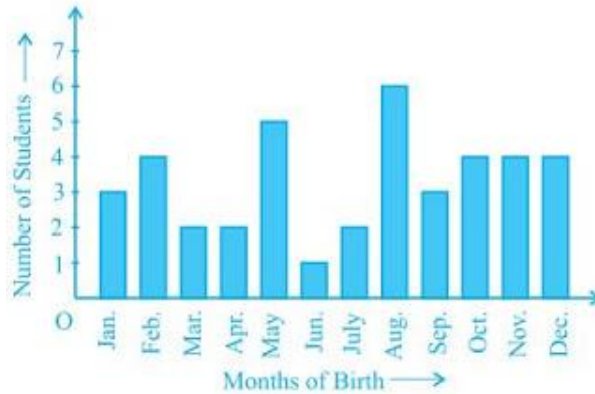


Fig. 14.1

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

\therefore , 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

- earning ₹10000 – 13000 per month and owning exactly 2 vehicles.
- earning ₹16000 or more per month and owning exactly 1 vehicle.
- earning less than ₹7000 per month and does not own any vehicle.
- earning ₹13000 – 16000 per month and owning more than 2 vehicles.
- 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
 \therefore , 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
 \therefore , 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
 \therefore , 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
 \therefore , 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 = $10+160+0+305+1+535+2+469+1+579$
 $= 2062$

\therefore , 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.

- Find the probability that a student obtained less than 20% in the mathematics test.
- 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

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

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

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

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

$$\therefore, \text{the probability that a student likes statistics} = \frac{135}{200} = \frac{27}{40}$$

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

$$\therefore, \text{the probability that a student does not like statistics} = \frac{65}{200} = \frac{13}{40}$$

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

$$\therefore, \text{the probability that an engineer lives less than 7 km from her place of work} = \frac{9}{40}$$

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

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

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

\therefore , 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

\therefore , 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

\therefore , the probability of the concentration of sulphur dioxide in the interval 0.12-0.16 on any of these days = $\frac{2}{30} = \frac{1}{15}$

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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

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