

Chapter : 15

Probability

Exercise 15.1

Question: 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.

Answer:

Total number of balls played = 30

Numbers of boundary hit = 6

Number of times she missed the boundary = $30 - 6$
 $= 24$

Hence,

The probability of she didn't hit a boundary

$$= \frac{\text{No.of times she didn't hit a boundary}}{\text{Total no.of balls}}$$

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

Divide numerator and denominator by 6 to get

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

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 = 1500

(i) Numbers of families having two girls = 475

The probability of families having two girls will be,

$$\begin{aligned} &= \frac{\text{no.of families having two girls}}{\text{Total no.of families}} \\ &= \frac{475}{1500} \\ &= \frac{19}{60} \end{aligned}$$

(ii) Number of families having one girl = 814

The probability of families having one girl will be,

$$\begin{aligned} &= \frac{\text{no.of families having one girls}}{\text{Total no.of families}} \\ &= \frac{814}{1500} \end{aligned}$$

Sum of probabilities

$$\begin{aligned}
 &= \frac{19}{60} + \frac{407}{750} + \frac{211}{1500} \\
 &= \frac{475+814+211}{1500} \\
 &= \frac{1500}{1500} \\
 &= 1
 \end{aligned}$$

Hence,

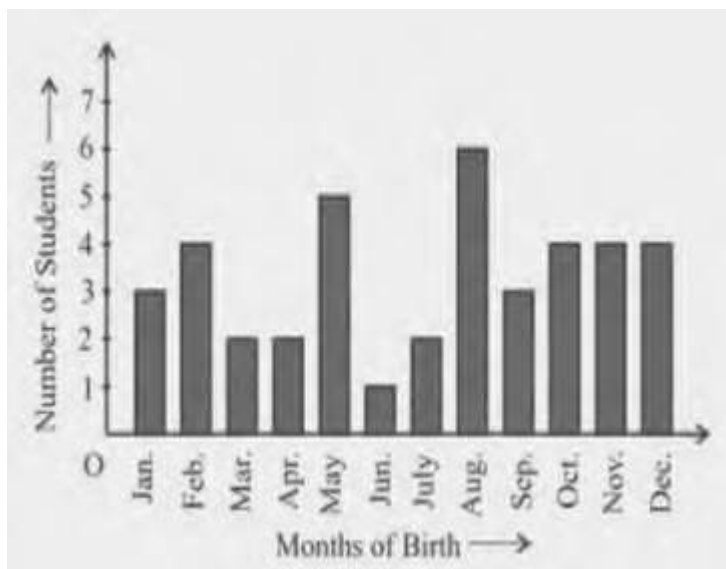
Yes, the sum of these probabilities is 1.

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

Answer:

Total numbers of students = 40

Number of students in august = 6



Hence,

The required probability

$$= \frac{\text{No.of students in august}}{\text{total no.of students}}$$

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

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

= 0.15 Hence, Probability of students that are born in the month of August is 0.15

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 two heads come up = 72

Total number of times the coins were tossed = 200

The probability of the number of times two head come up

$$= \frac{\text{No.of times two heads come up}}{\text{Total no.of times the coins were tossed}}$$

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

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

Question: 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:

Answer:

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:

Total number of families = 2400

(i) Number of families earning Rs. 10,000 – 13,000 per month and owning exactly two vehicles = 29

Hence,

Probability of families earning Rs. 10,000 – 13,000 per month and owning exactly two vehicles will be,

=

$$\frac{\text{No.of families earning Rs.10000–13000 per month and owning exactly two vehicles}}{\text{Total numbers of families}}$$

$$= \frac{29}{2400}$$

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

Hence,

Probability of families earning Rs. 16000 or more per month and owning exactly one vehicle will be,

=

$$\frac{\text{No.of families earning Rs.16000 or more per month and owning exactly one vehicles}}{\text{Total numbers of families}}$$

$$= \frac{579}{2400}$$

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

Hence,

Probability of families earning less than Rs. 7,000 per month and doesn't own any vehicles will be,

=

$$\frac{\text{No.of families earning less than Rs.7000 or more per month and owning no vehicles}}{\text{Total numbers of families}}$$

$$= \frac{10}{2400}$$

$$= \frac{1}{240}$$

(iv) Number of families earning Rs. 13,000-16000 per month and owning more than two vehicles = 25

Hence,

Probability of families earning Rs. 13,000-16000 per month and owning more than two vehicles will be,

$$\frac{\text{No. of families earning Rs. 13000 – 16000 per month and owning more than two vehicles}}{\text{Total numbers of families}}$$

$$= \frac{25}{2400}$$

$$= \frac{1}{96}$$

(v) Number of families owning not more than 1 vehicle are

$$= 10 + 160 + 0 + 305 + 1 + 535 + 2 + 469 + 1 + 579$$

$$= 2062$$

Hence,

Probability of families owning not more than one vehicle will be

$$= \frac{\text{No. of families owning not more than one vehicle}}{\text{Total number of families}}$$

$$= \frac{2062}{2400}$$

$$= \frac{1031}{1200}$$

Question: 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.

Answer:

Total number of students = 90

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 who like statistics = 135

Hence,

Probability of students liking statistics will be

$$= \frac{\text{No. of students liking statistics}}{\text{Total number of students}}$$

$$= \frac{135}{200}$$

$$= \frac{27}{40}$$

(ii) Number of students who dislike statistics = 65

Hence,

$$\begin{aligned}
 &= \frac{\text{No. of students disliking statistics}}{\text{Total number of students}} \\
 &= \frac{65}{200} \\
 &= \frac{13}{40}
 \end{aligned}$$

Question: 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 1/2 km from her place of work?

Answer:

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 number of engineers = 40

- (i) Number of engineers living less than 7 km from their place of work = 9

Hence,

Probability of engineers living less than 7 km from their place of work will be,

$$\begin{aligned}
 &= \frac{\text{No. of engineers living less than 7 km from their place of work}}{\text{Total no. of engineers}} \\
 &= \frac{9}{40}
 \end{aligned}$$

- (i) Number of engineers living more than 7 km from them

$$\text{place of work} = 40 - 9 = 31$$

Hence,

Probability of engineers living more than 7 km from their place of work will be,

$$= \frac{\text{No. of engineers living more than 7 km from her place of work}}{\text{Total no. of engineers}}$$

$$= \frac{31}{40}$$

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

Hence,

Probability of engineers living within $\frac{1}{2}$ km from her place of work would be,

$$= \frac{\text{No. of engineers living within } \frac{1}{2} \text{ km from her place of work}}{\text{Total no. of engineers}}$$

$$= \frac{0}{40}$$

$$= 0$$

Question: 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.

Answer:

Activity:

The following data collected is collected in a duration of 1 hour. Data Collected: Number of two-wheeler passing = 127 Number of four wheeler passing = 21 Probability that the vehicle

$$P = \frac{\text{Number of two wheeler}}{\text{Total number of vehicles passing}}$$

$$P = \frac{127}{148}$$

$$P = 0.858$$

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

Answer:

$$\text{Total Three Digits Number} = 999 - 99 = 900$$

$$\text{Number of 3 digits number divisible by 3} = \frac{999}{3} - \frac{99}{3} = \frac{900}{3} = 300$$

Thus, the probability that the number was written by her/him is divisible by 3 is given as:

$$\frac{300}{900} = \frac{1}{3} = 0.33$$

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:

Total number of bags = 11

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

Hence,

Probability of bags containing more than 5 kg of flour will be

$$= \frac{\text{No.of bags containing more than 5 kg of flour}}{\text{total no.of bags}}$$

$$= \frac{7}{11}$$

Question: 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.

Answer:

Total number of days recorded = 30 days

Number of days in which sulphur dioxide is in the interval 0.12 - 0.16 = 2

Hence,

Probability of days in which SO₂ is in the interval 0.12 – 0.16 will be

$$= \frac{\text{Number of days in which sulphur dioxide is in the interval 0.12–0.16}}{\text{Total no.of days recorded}}$$

$$= \frac{2}{30}$$

$$= \frac{1}{15}$$

Question: 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

Answer:

Total number of students = 30

Number of students having blood group AB = 3

Hence,

Probability of students having blood group AB will be,

$$= \frac{\text{No. of students having blood group AB}}{\text{total number of students}}$$

$$= \frac{3}{30}$$

$$= \frac{1}{10}$$