

CBSE Class 9 Mathematics
NCERT Solutions
CHAPTER 15
Probability(Ex. 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. Probability = $\frac{\text{Favourable outcomes}}{\text{Total outcomes}}$

Number of times on boundary is not hit = $30 - 6 = 24$

$\therefore P(\text{did not hit a boundary}) = \frac{24}{30} = \frac{4}{5}$

2. 1500 families with 2 children were selected randomly and the following data were recorded:

No. of girls in a family	No. of families
2	475
1	814
0	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. (i) Total number of families = 1500

No. of families having 2 girls = 475

$\therefore P(\text{Family having 2 girls}) = \frac{475}{1500} = \frac{19}{60}$

(ii) No of families having 1 girl = 814

$\therefore P(\text{Family having 1 girl}) = \frac{814}{1500} = \frac{407}{750}$

(iii) No. of families having no girl = 211

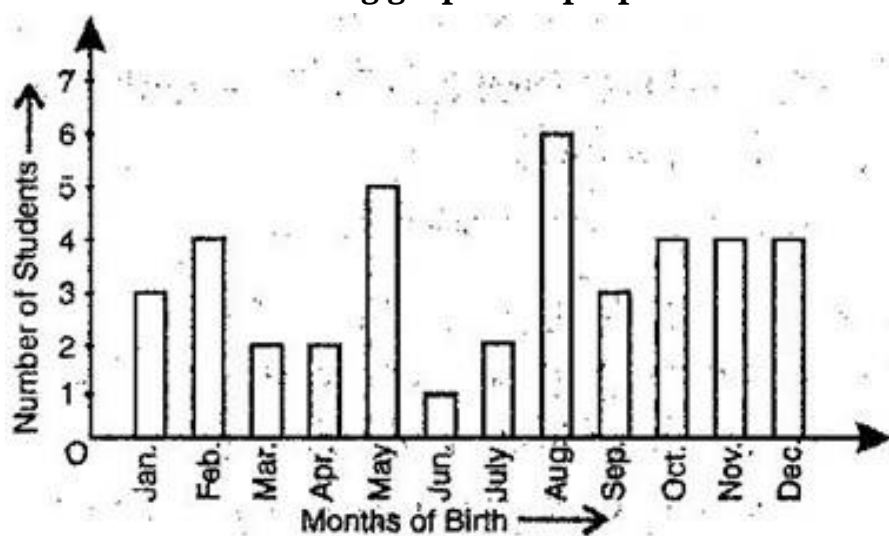
$$\therefore P(\text{Family having no girl}) = \frac{211}{1500}$$

Checking: Sum of all probabilities = $\frac{19}{60} + \frac{407}{750} + \frac{211}{1500}$

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

Yes, the sum of probabilities is 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:



Find the probability that a student of the class was born in August.

Ans. From the bar graph, we observe,

Total no. of students of Class IX = 40

No. of students of Class IX born in August = 6

$$\therefore P(\text{A student born in August}) = \frac{6}{40} = \frac{3}{20} = 0.15$$

4. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes:

Outcomes	Frequency
3 heads	23
2 heads	72
1 head	77
No head	28

If the three coins are simultaneously tossed again, compute the probability of 2 heads coming up.

Ans. No. of 2 heads = 72

Total number of outcomes = 23 + 72 + 77 + 28 = 200

$$\therefore P(2 \text{ heads}) = \frac{72}{200} = \frac{9}{25}$$

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) not more than 1 vehicle.

Ans. (i) $P(\text{earning Rs. 10000 – 13000 per month and owning exactly 2 vehicles}) = \frac{29}{2400}$

(ii) $P(\text{earning Rs. 16000 or more per month and owning exactly 1 vehicles}) = \frac{579}{2400}$

(iii) $P(\text{earning Rs. 7000 per month and does not own any vehicles}) = \frac{10}{2400} = \frac{1}{240}$

(iv) $P(\text{earning Rs. 13000 – 16000 per month and owning more than 2 vehicles}) = \frac{25}{2400} = \frac{1}{96}$

(v) Number of families owning not more than 1 vehicle = $10 + 160 + 0 + 305 + 1 + 532 + 2 + 469 + 1579 = 2062$

Therefore, $P(\text{owning not more than 1 vehicle}) = \frac{2062}{2400} = \frac{1031}{1200}$

6. A teacher analyses the performance of two sections of students in a mathematics test of 100 marks given in the following table:

Marks	No. of students
0 – 20	7
20 – 30	10
30 – 40	10
40 – 50	20
50 – 60	20
60 – 70	15
70 and 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 60 or above.

Ans. (i) No. of students obtaining marks less than 20 out of 100, i.e. 20% = 7

Total students in the class = 90

$$\therefore P(\text{A student obtained less than 20\%}) = \frac{7}{90}$$

(ii) No. of students obtaining marks 60 or above = 15 + 8 = 23

$$\therefore P(\text{A student obtained marks 60 or above}) = \frac{23}{90}$$

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	No. of students
likes	135
dislikes	65

Find the probability that a student chosen at random:

(i) likes statistics (ii) dislikes it.

Ans. Total no. of students on which the survey about the subject of statistics was conducted = 200

(i) No. of students who like statistics = 135

$$\therefore P(\text{a student likes statistics}) = \frac{135}{200} = \frac{27}{40}$$

(ii) No. of students who do not like statistics = 65

$$\therefore P(\text{a student does not like statistics}) = \frac{65}{200} = \frac{13}{40}$$

8. Refer 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?

Ans. Total number of engineers = 40

(i) No. of engineers living less than 7 km from her place of work = 9

$$\therefore P(\text{Engineer living less than 7 km from her place of work}) = \frac{9}{40}$$

(ii) No. of engineers living more than or equal to 7 km from her place of work = $40 - 9 = 31$

$$\therefore P(\text{Engineer living more than or equal to 7 km from her place of work}) = \frac{31}{40}$$

(iii) No. of engineers living within $\frac{1}{2}$ km from her place of work = 0

$$\therefore P(\text{Engineer living within } \frac{1}{2} \text{ km from her place of work}) = \frac{0}{40} = 0$$

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.

Ans. Let you noted the frequency of types of wheelers after school time (i.e. 3 pm to 3.30 pm) for half an hour.

Let the following table shows the frequency of wheelers.

Type of wheelers	Frequency of wheelers
Two wheelers	125
Three wheelers	45
Four wheelers	30

Probability that a two wheelers passes after this interval = $\frac{125}{200} = \frac{5}{8}$

10. Activity: Ask all the students in your class room to write a 3-digit number. Choose any student from the room at random. What is the probability that the number written by him is divisible by 3, if the sum of its digits is divisible by 3.

Ans. Let number of students in your class is 24.

Let 3-digit number written by each of them is as follows:

837, 172, 643, 371, 124, 512, 432, 948, 311, 252, 999, 557, 784, 928, 867, 798, 665, 245, 107, 463, 267, 523, 944, 314

Numbers divisible by 3 are = 837, 432, 948, 252, 999, 867, 798 and 267

Number of 3-digit numbers divisible by 3 = 8

$$\therefore P(\text{3-digit numbers divisible by 3}) = \frac{8}{24} = \frac{1}{3}$$

11. Eleven bags of wheat flour, each marked 5 kg, actually contained the following weights of four (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. Number of bags containing more than 5 kg of wheat flour = 7

Total number of wheat flour bags = 11

$$\therefore P(\text{a bag containing more than 5 kg of wheat flour}) = \frac{7}{11}$$

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.

Ans. From the frequency distribution table we observe that:

No. of days during which the concentration of Sulphur dioxide lies in interval 0.12 – 0.16 = 2

Total no. of days during which concentration of Sulphur dioxide recorded = 30

$$\therefore P(\text{day when concentration of Sulphur dioxide (in ppm) lies in } 0.12 - 0.16) = \frac{2}{30} = \frac{1}{15}$$

13. In Q.1, Exercise 14.1 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.

Ans. From the frequency distribution table we observe that:

Number of students having blood group AB = 3

Total number of students whose blood group were recorded = 30

$$\therefore P(\text{a student having blood group AB}) = \frac{3}{30} = \frac{1}{10}$$