# NCERT SOLUTIONS

# Probability

# Ex - 15.1

**Q1.** 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.

**Sol.** Total number of trials or chances = 30

Number of chances when the boundary is not hit = 30 – 6 = 24

P (The boundary is not hit) = $\dfrac{24}{30} = \dfrac{4}{5} = 0.8$

**Q2.** 1500 families with 2 children were selected randomly, and the following data were recorded:

| No. of girls in a family | 2 | 1 | 0 |
|---|---|---|---|
| No. 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.

**Sol.** Total number of families = 1500

(i) ∵ No. of families having 2 girls = 475

∴ P (family having 2 girls) $= \dfrac{475}{1500} = \dfrac{19}{60}$

(ii) No. of families having 1 girl = 814.

∴ P (family having 1 girl) $= \dfrac{814}{1500} = \dfrac{407}{750}$

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

∴ P(family having no girl) $= \dfrac{211}{1500}$

Now, the sum of the obtained probabilities

$= \dfrac{19}{60} + \dfrac{407}{750} + \dfrac{211}{1500} = \dfrac{1500}{1500} = 1$

i.e., sum of the above probabilities is 1.

**Q3.** Refer to Example 5, Section 14.4, Chapter 14 of NCERT. Find the probability that a student of the class was born in August. The statement of the data in the example is stated as below :

In a particular section of class IX, 40 students were asked about the months of their birth and the following graph was prepared to represent the data :
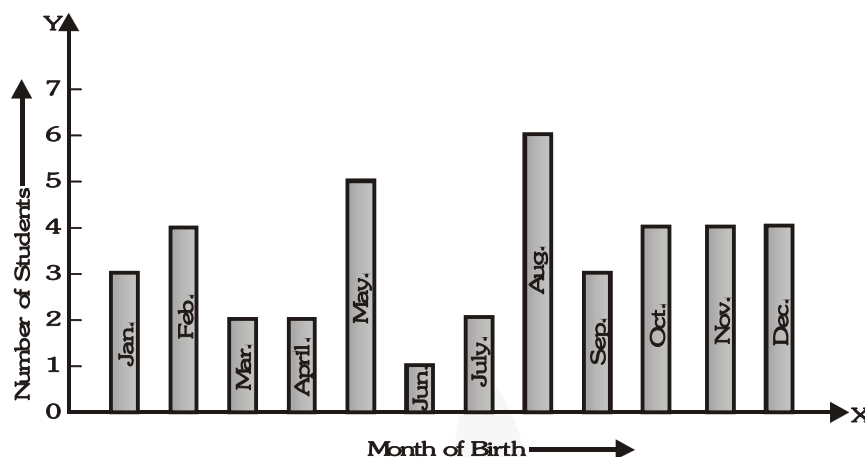
**Sol.** Total number of students = 40

(In the particular section of class IX)

Number of students born in August = 6

P (A student of the class was born in August) = $\dfrac{6}{40} = \dfrac{3}{20}$

**Q4.** 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.

**Sol.** Total number of trials = 200

Number of chances favouring 2 heads = 72.

P (2 heads) = $\dfrac{72}{200} = \dfrac{9}{25}$

**Q5.** 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 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.

**Sol.**  Here, total no. of families = 2400.
(i) Number of families earning `10,000 – `13,000 per month and owning exactly 2 vehicles = 29.

∴ P(owning exactly 2 vehicles) $= \dfrac{29}{2400}$

(ii) Number of families earning ` 16000 or more per month and owning exactly 1 vehicle = 579.

∴ P(owning exactly 1 vehicles) $= \dfrac{579}{2400}$

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

∴ P(no vehicle) $= \dfrac{10}{2400} = \dfrac{1}{240}$

(iv) P(more than 2 vehicles) $= \dfrac{25}{2400} = \dfrac{1}{96}$

(v) Number of families owning not more than 1 vehicles
[Number of families having no vehicle] + [Number of families having only 1 vehicle]
$\Rightarrow [10 + 1 + 2 + 1] + [160 + 305 + 535 + 469 + 579]$
$\Rightarrow 14 + 2048 = 2062.$

∴ P (owning not more than 1 vehicle) $= \dfrac{2062}{2400} = \dfrac{1031}{1200}$

**Q6.**  Refer to chapter 14 (NCERT), the table below:

| Marks (out of | No. 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 |

(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.

**Sol.** Total number of students = 90.

  (i) Number of students getting less than 20% marks, i.e., less than 20 marks out of 100 = 7.

    The probability that a student, selected at random obtained less than 20% marks = $\dfrac{7}{90}$

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

    ∴ The required probability = $\dfrac{23}{90}$

**Q7.** To know the opinion of the student about the subject statistics, a survey of 200 students was conducted.

The data is recorded in the following table.

| Opinion | Like | Dislike |
|---|---|---|
| No. of Students | 135 | 65 |

Find the probability that a student chosen at random

(i) likes statistics,         (ii) does not like it.

**Sol.** Total nummber of students = 200

  (i) Number of students who like the subject of statistics = 135

    The probability that a student likes that subject = $\dfrac{135}{200} = \dfrac{27}{40}$

  (ii) Number of students who dislike the subject of statistics = 65.

    The probability that a student dislikes the subject = $\dfrac{65}{200} = \dfrac{13}{40}$

**Q8.** Refer to Q.2, Exercise 14.2 (NCERT). 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 $\dfrac{1}{2}$ km from her place of work?

**Sol.** Total number of Engineers = 40

  (i) ∴ Probability of an engineer (living within 7 km from work place) = $\dfrac{9}{40}$.

  (ii) ∴ Probability of an engineer (living at distances more than or equal to 7 km) = $\dfrac{31}{40}$

  (iii) ∴ Probability of an engineer who is living within $\dfrac{1}{2}$ km from work place = $\dfrac{0}{40} = 0$

**Q9.** **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.

**Sol.** It is an activity. Students can do it themselves.

**Q10.** **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.

**Sol.** A class room activity for students.

**Q11.** 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.

**Sol.** Total number of bags = 11.

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

The probability that a bag, selected at random, has more than 5 kg of flour = $\dfrac{7}{11}$

**Q12.** In Q. 5, Exercise 14.2 (NCERT), 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.

**Sol.** Total number of days = 30.

The number of days (on which the sulphur dioxide concentration is in the interval 0.12 – 0.16) = 2

∴   Probability $= \dfrac{2}{30} = \dfrac{1}{15}$

**Q13.** In Q.1, Exercise 14.2 (NCERT), 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.

**Sol.**  From the given data, the frequency distribution table is as below :

| Blood group | Tally Marks | Frequency or Number of sutdents |
|---|---|---|
| A | 卌 IIII | 9 |
| B | 卌 I | 6 |
| O | 卌 卌 II | 12 |
| AB | III | 3 |
| Total number of students | | 30 |

The number of students having their blood group AB = 3.

The probability that a student, selected at random, has his blood group AB $= \dfrac{3}{30} = \dfrac{1}{10}$