

Assignment 2

AI1110: Probability and Random Variables

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5 [9th NCERT Probability Exercise 15.1]:

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:

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

TABLE I

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:

Random Variable	Description
X	denotes number of vehicles a family owns
Y	denotes the monthly income of a family

TABLE II

2)

$$\begin{aligned}\Pr(X = 2, 10000 < Y < 13000) &= \frac{29}{2400} \quad (2.1) \\ &= 0.012 \quad (2.2)\end{aligned}$$

3)

$$\begin{aligned}\Pr(X = 1, Y > 16000) &= \frac{579}{2400} \quad (3.1) \\ &= 0.241 \quad (3.2)\end{aligned}$$

4)

$$\begin{aligned}\Pr(X = 0, Y < 7000) &= \frac{10}{2400} \quad (4.1) \\ &= 0.0042 \quad (4.2)\end{aligned}$$

5)

$$\begin{aligned}\Pr(X > 2, 13000 < Y < 16000) &= \frac{25}{2400} \quad (5.1) \\ &= 0.0104 \quad (5.2)\end{aligned}$$

- 6) For this case, the number of families is given by the sum of columns 0 and 1 in Table I. Hence,

$$\begin{aligned}\Pr(X < 2) &= \frac{2062}{2400} \quad (6.1) \\ &= 0.859 \quad (6.2)\end{aligned}$$

- 1) Total number of families is sum of values in all cells, which is = 2400