

# Probability Assignment

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**Abstract**—This document contains the solution to Question 21 of Exercise 3 in Chapter 16 of the class 11 NCERT textbook.

- 1) In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
  - a) The student opted for NCC or NSS.
  - b) The student has opted neither NCC nor NSS.
  - c) The student has opted NSS but not NCC.

**Solution:** Define random variables  $X$  and  $Y$  as shown in Tables 1 and 2. From the given data

$X = 0$	Student does not opt for NCC.
$X = 1$	Student opts for NCC.

TABLE 1: Definition of  $X$ .

$Y = 0$	Student does not opt for NSS.
$Y = 1$	Student opts for NSS.

TABLE 2: Definition of  $Y$ .

$$\Pr(X = 1) = \frac{30}{60} = \frac{1}{2} \quad (1)$$

$$\Pr(Y = 1) = \frac{32}{60} = \frac{8}{15} \quad (2)$$

$$\Pr(X = 1, Y = 1) = \frac{24}{60} = \frac{2}{5} \quad (3)$$

Thus, we write

$$\begin{aligned} \Pr(X = 1, Y = 0) \\ = \Pr(X = 1) - \Pr(X = 1, Y = 1) = \frac{1}{10} \end{aligned} \quad (4)$$

$$\begin{aligned} \Pr(X = 0, Y = 1) \\ = \Pr(Y = 1) - \Pr(X = 1, Y = 1) = \frac{2}{15} \end{aligned} \quad (5)$$

$$\begin{aligned} \Pr(X = 0, Y = 0) \\ = \Pr(Y = 0) - \Pr(X = 1, Y = 0) \end{aligned} \quad (6)$$

$$= 1 - \Pr(Y = 1) - \Pr(X = 1, Y = 0) \quad (7)$$

$$= 1 - \frac{8}{15} - \frac{1}{10} = \frac{11}{30} \quad (8)$$

and form the joint pmf as in Table 3.

	$X = 0$	$X = 1$
$Y = 0$	$\frac{11}{30}$	$\frac{1}{10}$
$Y = 1$	$\frac{2}{15}$	$\frac{2}{5}$

TABLE 3: Joint pmf of  $X$  and  $Y$ .

- a) We are required to find  $\Pr(X + Y \geq 1)$ . Thus, from Table 3,

$$\begin{aligned} \Pr(X + Y \geq 1) &= 1 - \Pr(X + Y = 0) \quad (9) \\ &= \frac{19}{30} \end{aligned} \quad (10)$$

- b) We are required to find  $\Pr(X = 0, Y = 0)$ . But from Table 3, this value is  $\frac{11}{30}$ .
- c) We are required to find  $\Pr(X = 0, Y = 1)$ . But from Table 3, this value is  $\frac{2}{15}$ .