

Assignment 2

Tera Keshavardhan Reddy
AI22BTECH11029

Question 11.16.4.5: Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that

- 1) you both enter the same section?
- 2) you both enter the different sections?

Solution:

S_1 is section of 40 students, S_2 is section of 60 students.

$X = 0 : I \in S_1$, $X = 1 : I \in S_2$.

$Y = 0 : \text{My friend} \in S_1$, $Y = 1 : \text{My friend} \in S_2$.

1)

$$\Pr(X = 0) = \frac{40}{100} \quad (1)$$

$$\Pr(Y = 0|X = 0) = \frac{39}{99} \quad (2)$$

$$\Pr(X = 0, Y = 0) = \Pr(Y = 0|X = 0) \Pr(X = 0) \quad (3)$$

$$= \left(\frac{40}{100}\right)\left(\frac{39}{99}\right) \quad (4)$$

$$= 0.158 \quad (5)$$

$$\Pr(X = 1) = 60/100 \quad (6)$$

$$\Pr(Y = 1|X = 1) = 59/99 \quad (7)$$

$$\Pr(X = 1, Y = 1) = \Pr(Y = 1|X = 1) \cdot \Pr(X = 1) \quad (8)$$

$$= \left(\frac{60}{100}\right)\left(\frac{59}{99}\right) \quad (9)$$

$$= 0.358 \quad (10)$$

$$\Pr(X = 1, Y = 1) + \Pr(X = 0, Y = 0) = \left(\frac{40}{100}\right)\left(\frac{39}{99}\right) + \left(\frac{60}{100}\right)\left(\frac{59}{99}\right) \quad (11)$$

$$= 0.158 + 0.358 \quad (12)$$

$$= 0.516 \quad (13)$$

2)

$$\Pr(X = 0) = \frac{40}{100} \quad (14)$$

$$\Pr(Y = 1|X = 0) = \frac{60}{99} \quad (15)$$

$$\Pr(X = 0, Y = 1) = \Pr(Y = 1|X = 0) \Pr(X = 0) \quad (16)$$

$$\Pr(X = 0, Y = 1) = \left(\frac{60}{99}\right)\left(\frac{40}{100}\right) \quad (17)$$

$$= 0.242 \quad (18)$$

$$\Pr(Y = 0) = 40/100 \quad (19)$$

$$\Pr(X = 1|Y = 0) = 60/99 \quad (20)$$

$$\Pr(X = 1, Y = 0) = \Pr(X = 1|Y = 0) \Pr(Y = 0) \quad (21)$$

$$\Pr(X = 1, Y = 0) = \left(\frac{40}{99}\right)\left(\frac{60}{100}\right) \quad (22)$$

$$= 0.242 \quad (23)$$

$$\Pr(X = 1, Y = 0) + \Pr(X = 0, Y = 1) = 0.242 + 0.242 \quad (24)$$

$$= 0.484 \quad (25)$$