

Assignment 2

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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:

Let S_1 denote the section of 40 students and S_2 denote the section of 60 students.

Let X, Y be the random variables denoting **Me** and **My Friend** respectively.

| RV | Values | Value of RV when student Enter S_1 | Value of RV when student Enter S_2 |
|-----|------------|--------------------------------------|--------------------------------------|
| X | $\{0, 1\}$ | 0 | 1 |
| Y | $\{0, 1\}$ | 0 | 1 |

TABLE 2
WHERE S_1, S_2 ARE SECTIONS OF 40, 60 STUDENTS RESPECTIVELY

1)

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

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

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

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

$$= 0.158 \quad (5)$$

$$\Pr(X = 1) = \frac{60}{100} \quad (6)$$

$$\Pr(Y = 1|X = 1) = \frac{59}{99} \quad (7)$$

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

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

$$= 0.358 \quad (10)$$

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

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

$$= 0.516 \quad (13)$$

2)

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

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

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

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

$$= 0.242 \quad (18)$$

$$\Pr(Y = 0) = \frac{40}{100} \quad (19)$$

$$\Pr(X = 1|Y = 0) = \frac{60}{99} \quad (20)$$

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

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

$$= 0.242 \quad (23)$$

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

$$= 0.484 \quad (25)$$