

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	S_1	S_2
X	0	1
Y	0	1

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

From given data we know:

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

$$\Pr(Y = 0) = \frac{40}{100} \quad (2)$$

$$\Pr(X = 1) = \frac{60}{100} \quad (3)$$

$$\Pr(Y = 0|X = 0) = \frac{39}{99} \quad (4)$$

$$\Pr(Y = 1|X = 1) = \frac{59}{99} \quad (5)$$

$$\Pr(Y = 1|X = 0) = \frac{60}{99} \quad (6)$$

$$\Pr(X = 1|Y = 0) = \frac{60}{99} \quad (7)$$

Now

1)

$$\Pr(X = 0, Y = 0) = \Pr(Y = 0|X = 0) \times \Pr(X = 0) \quad (8)$$

$$= \frac{40}{100} \times \frac{39}{99} \quad (9)$$

$$= 0.158 \quad (10)$$

$$\Pr(X = 1, Y = 1) = \Pr(Y = 1|X = 1) \times \Pr(X = 1) \quad (11)$$

$$= \frac{60}{100} \times \frac{59}{99} \quad (12)$$

$$= 0.358 \quad (13)$$

$$\Pr(X = 1, Y = 1) + \Pr(X = 0, Y = 0) = \frac{40}{100} \times \frac{39}{99} + \frac{60}{100} \times \frac{59}{99} \quad (14)$$

$$= 0.158 + 0.358 \quad (15)$$

$$= 0.516 \quad (16)$$

Hence probability of me and my friend enter same section is 0.516

2)

$$\Pr(X = 0, Y = 1) = \Pr(Y = 1|X = 0) \times \Pr(X = 0) \quad (17)$$

$$\Pr(X = 0, Y = 1) = \frac{60}{99} \times \frac{40}{100} \quad (18)$$

$$= 0.242 \quad (19)$$

$$\Pr(X = 1, Y = 0) = \Pr(X = 1|Y = 0) \times \Pr(Y = 0) \quad (20)$$

$$\Pr(X = 1, Y = 0) = \frac{40}{99} \times \frac{60}{100} \quad (21)$$

$$= 0.242 \quad (22)$$

$$\Pr(X = 1, Y = 0) + \Pr(X = 0, Y = 1) = 0.242 + 0.242 \quad (23)$$

$$= 0.484 \quad (24)$$

Hence probability of me and my friend enter different section is 0.484