Assignment 2

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Question 11.16.4.5: Out of 100 students,two section 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:

$$S1 \text{ is section of 40 students }, S2 \text{ is section of 60 students.}$$
$$X=0 : I \in S1 , X=1 : I \in S2.$$
$$Y=0 : \text{My friend} \in S1 , Y=1 : \text{My friend} \in S2.$$

1)

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

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

$$\Pr(X = 0, Y = 0) = \Pr(Y = 0|X = 0)\Pr(X = 0) \tag{3}$$

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

$$= 0.158 \tag{5}$$

$$\Pr(X = 1) = 60/100 \tag{6}$$

$$\Pr(Y = 1|X = 1) = 59/99 \tag{7}$$

$$\Pr(X = 1, Y = 1) = \Pr(Y = 1|X = 1) . \Pr(X = 1) \tag{8}$$

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

$$= 0.358 \tag{10}$$

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

$$= 0.158 + 0.358 \tag{12}$$

$$= 0.516 \tag{13}$$

2)

$$\Pr(X = 0) = 40/100 \tag{14}$$

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

$$\Pr(X = 0, Y = 1) = \Pr(Y = 1|X = 0)\Pr(X = 0) \tag{16}$$

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

$$= 0.242 \tag{18}$$

$$\Pr(Y = 0) = 40/100 \tag{19}$$

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

$$\Pr(X = 1, Y = 0) = \Pr(X = 1|Y = 0)\Pr(Y = 0) \tag{21}$$

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

$$= 0.242 \tag{23}$$

$$\Pr(X = 1, Y = 0) + \Pr(X = 0, Y = 1) = 0.242 + 0.242 \tag{24}$$

$$= 0.484 \tag{25}$$