Assignment 3 -Probability and Random Variable

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I. PROBLEM STATEMENT-PROBLEM 2.10

Bag I contains 3 red and 4 black balls and Bag II contains 4 red and 5 black balls. One ball is transferred from Bag I to Bag II and then a ball is drawn from Bag II. The ball so drawn is found to be red in colour. Find the probability that the transferred ball is black.

II. SOLUTIONS

Bag 1 contains 3 red and 4 black balls.
Bag 2 contains 4 red and 5 black balls.

let C1: Event of transferring black ball from bag 1 to 2
let C1: Event of transferring red ball from bag 1 to 2
let A : Event that the ball drawn from 2 is red after the transfer of a ball from bag 1 to bag 2.

$$Pr(C1) = \frac{4}{7}$$

$$Pr(C2) = \frac{3}{7}$$

$$Pr(A/C1) = \frac{4}{10} = \frac{2}{5}$$

$$Pr(A/C2) = \frac{5}{10} = \frac{1}{2}$$

From Baye's theoram

Pr(Drawn ball is red) = $P(A)$

$$= Pr(\frac{A}{C1}) \times Pr(C1) + PrC2 \times Pr(\frac{A}{C2})$$

$$= \frac{4}{10} \times \frac{4}{7} + \frac{5}{10} \times \frac{3}{7}$$

$$= \frac{16 + 15}{70}$$

$$= \frac{31}{70}$$

The probability that the transferred ball is black It is equal to conditional probability of C1 when event A has already happened
The desired probability is given by

$$Pr(\frac{C1}{A}) = \frac{Pr(C1 \cap A)}{Pr(A)}$$

$$= \frac{Pr(\frac{A}{C1})Pr(C1)}{Pr(A)}$$

$$= \frac{\frac{4}{10} \times \frac{4}{7}}{\frac{31}{70}}$$

$$= \frac{16}{31}$$

Hence the desired probability is

$$\frac{16}{31} = 0.516$$