

ASSIGNMENT-4

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QUESTION

A black and a red dice is rolled.

- Find the conditional probability of obtaining a sum greater than 9, given that black die resulted in a 5
- Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4

SOLUTION

- let, B denote black coloured die and R denote red colored die then, the sample space for the given experiment will be:

$$S = \{ (B1,R1), (B1,R2), (B1,R3), (B1,R4), (B1,R5), (B1,R6), \\ (B2,R1), (B2,R2), (B2,R3), (B2,R4), (B2,R5), (B2,R6), \\ (B3,R1), (B3,R2), (B3,R3), (B3,R4), (B3,R5), (B3,R6), \\ (B4,R1), (B4,R2), (B4,R3), (B4,R4), (B4,R5), (B4,R6), \\ (B5,R1), (B5,R2), (B5,R3), (B5,R4), (B5,R5), (B5,R6), \\ (B6,R1), (B6,R2), (B6,R3), (B6,R4), (B6,R5), (B6,R6) \}$$

let A be the event of 'obtaining a sum greater than 9' and B be the event of 'getting 5 on black die'

then $A = \{(B4,R6),(B5,R5),(B5,R6),(B6,R4), (B6,R5),(B6,R6)\}$

and $B = \{(B5,R1),(B5,R2),(B5,R3), (B5,R4),(B5,R5),(B5,R6)\}$

$$\Rightarrow A \cap B = \{(B5, R5), (B5, R6)\}$$

So,

$$P(A) = \frac{6}{36} = \frac{1}{6}, \quad (1)$$

$$P(A \cap B) = \frac{2}{36} = \frac{1}{18} \quad (2)$$

Now we know that by definition of conditional probability,

$$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

Now substituting the value we get

$$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{1}{18}}{\frac{1}{6}} = \frac{6}{18} = \frac{1}{3} \quad (3)$$

- let, A be the event of obtaining a sum 8 and B be the event of 'getting a number less than 4 on red die'
then $A = \{(B2, R6), (B3, R5), (B4, R4), (B5, R3), (B6, R2)\}$
 $B = \{(B1, R1), (B2, R1), (B3, R1), (B4, R1), (B5, R1), (B6, R1), (B1, R2), (B2, R2), (B3, R2), (B4, R2), (B5, R2), (B6, R2), (B1, R3), (B2, R3), (B3, R3), (B4, R3), (B5, R3), (B6, R3)\}$
and, $\Rightarrow A \cap B = \{(B5, R3), (B6, R2)\}$

So,

$$P(A) = \frac{5}{36} \quad (4)$$

$$P(B) = \frac{18}{36} = \frac{1}{2}, \quad (5)$$

$$P(A \cap B) = \frac{2}{36} = \frac{1}{18} \quad (6)$$

so, we know that by conditional probability,

$$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

Now by substituting the value we get

$$\Rightarrow P\left(\frac{A}{B}\right) = \frac{\frac{1}{18}}{\frac{1}{2}} = \frac{2}{18} = \frac{1}{9} \quad (7)$$