

Probability And Random Variables

Assignment -I

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Q) A fair coin and an unbiased die are tossed.
Let A be the event 'head appears on the coin' and
B be the event '3 on the die'. Check whether A and
B are independent events or not.

Solution :

We can say that two events are independent if
 $P(A \cap B) = P(A).P(B)$ Here we are tossing a fair
coin and rolling an unbiased die, so the possible
outcomes are :

$$S = \{(H, 1), (H, 2), \dots, (H, 6), (T, 1), (T, 2), \dots, (T, 6)\}$$

H represents Head and T represents Tail

So the total number of outcomes are 12

Now, Favourable outcomes of A would be :

$$A : \{(H, 1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6)\}$$

$$P(A) = \frac{6}{12} = \frac{1}{2}$$

Favourable outcomes of B would be :

$$B : \{(H, 3), (T, 3)\}$$

$$P(B) = \frac{2}{12} = \frac{1}{6}$$

The intersection of both the events would be :

$$= \{(H, 3)\}$$

So,

$$P(A \cap B) = \frac{1}{12}$$

And

$$\begin{aligned} P(A).P(B) &= \left(\frac{1}{2}\right) \cdot \left(\frac{1}{6}\right) \\ &= \frac{1}{12} \end{aligned}$$

So here we are getting $P(A \cap B) = P(A).P(B) = \frac{1}{12}$

Therefore, we can say that A and B are independent events.