Assignment 7

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Outline

1. Problem Statement

2. Given

3. Solution

Problem Statement

13.2 Q5 [NCERT 12]

A die marked $1, 2, 3$ in red and $4, 5, 6$ in green is tossed. Let A be the event, 'the number is even,' and B be the event, 'the number is red'. Are A and B independent?

Given

Let's denote the situation of the problem by random variable's X and Y such that $X \in \{0, 1\}, Y \in \{0, 1\}$
where,

Variable	Event
$X = 0$	The number is odd
$X = 1$	The number is even
$Y = 0$	Colour of side is green
$Y = 1$	Colour of side is red

Table 1

Probabilities

probability	value
$\Pr(X = 0)$	$\frac{1}{2}$
$\Pr(X = 1)$	$\frac{1}{2}$
$\Pr(Y = 0)$	$\frac{1}{2}$
$\Pr(Y = 1)$	$\frac{1}{2}$
$\Pr(X = 1, Y = 1)$	$\frac{1}{6}$

Table 2: Probability values

Solution

Theorem

Two sets, say A and B, are independent if $P(AB) = P(A)P(B)$

Conclusion

$\Pr(X = 1)\Pr(Y = 1) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \neq \frac{1}{6} \neq \Pr(X = 1, Y = 1)$.
Therefore , the two sets are not Independent.