

# Assignment 7

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# 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

$$\Pr(X = 1) \Pr(X = 3) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4} \neq \frac{1}{6} \neq \Pr(X = 1, Y = 1).$$

Therefore, the two sets are not Independent.