

20. Two dice are thrown simultaneously. What is the probability that the sum of the numbers appearing on the dice is (i) 7? (ii) a prime number? (iii) 1?

Solution: Let X and Y represent number appearing on two dice. Let Z be the sum of the numbers appearing on two dice.

$$Z = X + Y$$

random variables	description
X	number appearing on first dice
Y	number appearing on second dice
Z	sum of numbers appearing on both dice

We know,

$$\Pr(Z = n) = \begin{cases} 0 & n \leq 1 \\ \frac{n-1}{36} & 2 \leq n \leq 7 \\ \frac{13-n}{36} & 7 < n \leq 12 \\ 0 & n > 12 \end{cases} \quad (1)$$

Then,

(i) The sum of numbers appearing on the dice is 7. Then from (1),

$$\Pr(Z = 7) = \frac{7-1}{36} \quad (2)$$

$$= \frac{1}{6} \quad (3)$$

(ii) The sum of numbers appearing on dice is a prime number. From (1),

$$\Pr(Z = \text{prime number}) = \Pr(Z = 2) + \Pr(Z = 3) + \Pr(Z = 5) + \Pr(Z = 7) + \Pr(Z = 11) \quad (4)$$

$$= \frac{1}{36} + \frac{2}{36} + \frac{4}{36} + \frac{6}{36} + \frac{2}{36} \quad (5)$$

$$= \frac{15}{36} \quad (6)$$

$$= \frac{5}{12} \quad (7)$$

(iii) From (1), the probability of the sum of numbers appearing on the dice is 1 is,

$$\Pr(Z = 1) = 0 \quad (8)$$