

Probability and random variables assignment

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1 Q 24

Abstract—This section provides the solution to Q24 of EX 15.1 in CBSE class 10th NCERT textbook of mathematics

1.1. A die is thrown twice. What is the probability that:

- (i) 5 will not come up either time?
- (ii) 5 will come up at least once?

Solution:

5 appearing on the dice is treated as success with probability $p = \frac{1}{6}$ and 5 not appearing on the dice is treated as failure with probability $q = \frac{5}{6}$

Here we have done 2 trials, so $n = 2$.

Let $X \in \{0, 1, 2\}$ be the random variable representing the number of 5s appeared after both the trials

$X = 0$: zero 5s

$X = 1$: exactly one 5

$X = 2$: exactly two 5s

By bernoulli distribution,

$$P(X = r) = \binom{n}{r} \times p^r \times q^{n-r} \quad (1.1.1)$$

Probability that no 5 appears(say P_1) :

$$P_1 = P(X = 0) \quad (1.1.2)$$

$$= \binom{n}{0} \times p^0 \times q^2 \quad (1.1.3)$$

$$= \left(\frac{5}{6}\right)^2 \quad (1.1.4)$$

$$= \frac{25}{36} \quad (1.1.5)$$

Probability that atleast one 5 appears(say P_2) :

$$P_2 = P(X = 1) + P(X = 2) \quad (1.1.6)$$

$$= \binom{n}{1} \times p^1 \times q^1 + \binom{n}{2} \times p^2 \times q^0 \quad (1.1.7)$$

$$= \frac{10}{36} + \frac{1}{36} \quad (1.1.8)$$

$$= \frac{11}{36} \quad (1.1.9)$$

ALTERNATE METHOD: we know that, since the events are exhaustive and exclusive

$$P_1 + P_2 = 1 \quad (1.1.10)$$

$$\Rightarrow P_2 = 1 - P_1 \quad (1.1.11)$$

$$\Rightarrow P_2 = 1 - \frac{25}{36} \quad (1.1.12)$$

$$\Rightarrow P_2 = \frac{11}{36} \quad (1.1.13)$$

