Probability and random variables assignment

Maharshi Kadeval

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 5_s appeared after both the trials
X = 0 : zero 5_s
X = 1 : exactly one 5
X = 2 : exactly two 5_s
By bernoulli distribution,

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

Probability that no 5 appears$(sayP_1)$:

$$P_1 = P(X = 0) \tag{1.1.2}$$
$$= \binom{n}{0} \times p^0 \times q^2 \tag{1.1.3}$$
$$= \left(\frac{5}{6}\right)^2 \tag{1.1.4}$$
$$= \frac{25}{36} \tag{1.1.5}$$

Probability that atleast one 5 appears$(sayP_2)$:

$$P_2 = P(X = 1) + P(X = 2) \tag{1.1.6}$$
$$= \binom{n}{1} \times p^1 \times q^1 + \binom{n}{2} \times p^2 \times q^0 \tag{1.1.7}$$
$$= \frac{10}{36} + \frac{1}{36} \tag{1.1.8}$$
$$= \frac{11}{36} \tag{1.1.9}$$

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

$$P_1 + P_2 = 1 \tag{1.1.10}$$
$$\implies P_2 = 1 - P_1 \tag{1.1.11}$$
$$\implies P_2 = 1 - \frac{25}{36} \tag{1.1.12}$$
$$\implies P_2 = \frac{11}{36} \tag{1.1.13}$$