

# Assignment 1

## AI1110: Probability and Random Variables

### Indian Institute of Technology Hyderabad

CS22BTECH11046

P.Yasaswini

**10.15.1.25: Question.** Which of the following arguments are correct and which are not correct? Give reasons for your answer.

(i) If two coins are tossed simultaneously there are three possible outcomes —two heads, two tails or one of each. Therefore, for each of these outcomes, the probability is  $\frac{1}{3}$ .

(ii) If a die is thrown, there are two possible outcomes— an odd number or an even number. Therefore, the probability of getting an odd number is  $\frac{1}{2}$ .

**Solution:**

(i) X is random variable which denotes the number of heads obtained when two coins are tossed simultaneously,  $X=\{0, 1, 2\}$ ,

p= probability of getting head.

$$\Pr(X = r) = \binom{n}{r} \times \frac{1}{2^n} \quad (1)$$

Therefore,

$$\Pr(X = 0) = \binom{2}{0} \times \frac{1}{2^2} \quad (2)$$

$$\Pr(X = 1) = \binom{2}{1} \times \frac{1}{2^2} \quad (3)$$

$$\Pr(X = 2) = \binom{2}{2} \times \frac{1}{2^2} \quad (4)$$

**Reason:** For  $X=1$ , it contains two mutually exclusive events (H, T), (T, H). Therefore, probability of getting one of each is  $\frac{1}{2}$  and not  $\frac{1}{3}$ . So, the above statement is incorrect.

(ii) Here, let E be the event ‘getting an odd number’.

sample space  $\Omega = \{(1, 2, 3, 4, 5, 6)\}$ .  $E = \{(1, 3, 5)\}$

Therefore,

$$\Pr(E) = \frac{3}{6} = \frac{1}{2} \quad (5)$$

**Reason:** Event of getting an odd number and Event of getting an even number are equally likely and they together forms an exhaustive event. Hence,

$$\Pr(E) = \frac{1}{2} \quad (6)$$

$$\Pr(\bar{E}) = \frac{1}{2} \quad (7)$$

So the above statement is correct.