Assignment 4

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I. CLASS-10-PROBABILITY-EXERCISE-15.1

Question 25: Which of the following arguments are correct and which are not correct? Give reasons for your answer.

(i) If 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: We can individually find the probability using random variables.

(i) The possible events are (H,H); (H,T); (T,H) and (T,T).

Lets take a random variable 'X', which maps the corresponding cases.

$$\therefore X \in \{(H,H),(H,T),(T,H),(T,T)\}$$

For each of the following case, finding the probability.

- **Case when both are heads:**

$$P(X = \{(H,H)\}) = \frac{n(X = \{(H,H)\})}{n(X)}$$
(I.1)

$$= \frac{1}{4} = 0.25$$
(I.2)

∴ The probability of obtaining both heads is 0.25.

- **Case when both are tails:**

$$P(X = \{(T,T)\}) = \frac{n(X = \{(T,T)\})}{n(X)}$$
(I.3)

$$= \frac{1}{4} = 0.25$$
(I.4)

∴ The probability of obtaining both tails is also 0.25.

- **Case when one is head and other is tail:**

$$P(\{(H,T),(T,H)\}) = \frac{n(\{(H,T),(T,H)\})}{n(X)}$$
(I.5)

$$= \frac{2}{4} = \frac{1}{2} = 0.5$$
(I.6)

∴ The probability of obtaining either one on each coin is 0.5.

Therefore, this statement is incorrect.

(ii) Lets assign a random variable 'Y', such that it maps to the possible outcomes from a die,i.e.,

$$Y \in \{1, 2, 3, 4, 5, 6\}$$

Now for each of the following case, we can find the probability as follows.

- **Case when there is an odd number:** The possible outcomes are $\{1, 3, 5\}$,

$$P(Y = \{1, 3, 5\}) = \frac{n(\{1, 3, 5\})}{n(Y)}$$
(I.7)

$$= \frac{3}{6} = \frac{1}{2} = 0.5$$
(I.8)

∴ The probability of obtaining an odd number on the die is 0.5.

- **Case when there is an even number:** The possible outcomes are $\{2, 4, 6\}$,

$$P(Y = \{2, 4, 6\}) = \frac{n(\{2, 4, 6\})}{n(Y)}$$
(I.9)

$$= \frac{3}{6} = \frac{1}{2} = 0.5$$
(I.10)

∴ The probability of obtaining an even number on the die is also 0.5.

Therefore, this statement is correct.