

MATHEMATICS

CLASS NOTES FOR CBSE

Chapter 15. Probability

01. Experimental or Empirical Approach to Probability

The 'experiment' means an operation which can produce some well defined outcome(s). There are two types of experiments:

- (i) Deterministic
- (ii) Random or probabilistic

Deterministic experiments are those experiments which when repeated under identical conditions produced the same result or outcome. **For example**, if we mark head (H) on both sides of a coin and it is tossed, then we always get the same outcome assuming that it does not stand vertically.

If an experiment, when repeated under identical conditions, do not produce the same outcome every time but the outcome in trial is one of the several possible outcomes, then it is known as a **Random or Probabilistic experiment**. **For example**, in the tossing of a coin one is not sure if a head (H) or tail (T) will be obtained, so it is a random experiment. Similarly, rolling an unbiased die is an example of a random experiment.

Trial : When we perform an experiment it is called a trial of the experiment.

Elementary Event : An outcome of trial is an elementary event.

Definition : Let there be n trials of an experiment and A be event associated to it such that A happens in m -trials. Then empirical probability of happening of event A is denoted by $P(A)$ and is given by

$$P(A) = \frac{m}{n}$$

$$\text{i.e., } P(A) = \frac{\text{Number of trials in which the event happens}}{\text{Total number of trials.}}$$

Clearly, $0 \leq m \leq n$. Therefore,

$$0 \leq \frac{m}{n} \leq 1$$

$$\Rightarrow 0 \leq P(A) \leq 1$$

Thus, the probability of happening of an event always lies between 0 and 1. If $P(A) = 1$, then A is called a **certain event** and A is known as an **impossible event**, if $P(A) = 0$.



MISOSTUDY.COM

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804

Example : A coin is tossed 500 times with the following frequencies of two outcomes :
 head : 240 times, tail: 260 times

Find the probability of occurrence of each of these events.

Solution : It is given the coin is tossed 500 times.

$\therefore$ Total number of trials = 500

Let us denote the vents of getting a head and of getting a tail by A and B respectively. then,

Number of trials in which the event A happens = 240

and, Number of trails in which the event B happens = 260

$\therefore P(A) = \frac{\text{Number of trials in which the event A happens}}{\text{Total number of trials}} = \frac{240}{500} = 0.48$

and, $P(B) = \frac{\text{Number of trials in which the event B happens}}{\text{Total number of trials}} = \frac{260}{500} = 0.52$

Note : We not that $P(A) + P(B) = 0.48 + 0.52$. Therefore, A and B are the only two possible outcome of a trial.

Example : Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes:

Outcome:	3heads	2heads	1head	No head
Frequency:	23	72	77	28

Find the probability of getting: (i) three heads (ii) two heads and one tails (iii) at least two heads

Solution : Let us define the following events:

A = Getting three heads

B = Getting two heads and one tail

C = Getting at least two heads.

We have, Total number of trials = 200

Number of trails in which we get three heads i.e. in which event A happens = 23

Number of trials in which we get two heads and one tail i.e. in which event B happens = 72

Number of trials in which we get either two heads and one tails or all heads i.e. in which event C happens = $72 + 23 = 95$

Hence, $P(A) = \frac{23}{200} = 0.165$, $P(B) = \frac{72}{200} = 0.36$ and $P(C) = \frac{95}{200} = 0.475$

Example : The record of a weather station shows that out of the past 250 consecutive days, its weather forecast were correct 175 times. What is the probability that on a given day 9 (i) it was correct? (ii) it was not correct?

Solution : We have,

Total number of days for which the weather forecast was made = 250

Number of days for which the forecast was correct = 175

Number of days for which the forecast was not correct = $250 - 175 = 75$



MISOSTUDY.COM

The Best Online Coaching for IIT-JEE | NEET Medical | CBSE INQUIRY +91 8929 803 804