Probability

Introduction

In our conversations, we frequently use the words "probably", "chance" or "may" whatever there is an element of uncertainty in what we're predicting.

For example, we come across statements like:

- Probably today will be a hot day
- There is a chance of our team winning the cup
- My friend may come for dinner tomorrow.

In all these statements, the event in question is not certain to take place. Probability is a concept which measures this degree of uncertainty numerically.

The theory of probability is basically used in experiments for which there is no single definite outcome. For example, when a coin is tossed we cannot say beforehand whether it will show head or tail.

Though this theory had its origin in gambling, now it is used extremely in other fields like Weather Forecasting, Medicine etc.

Random Experiment

An activity whose outcome is not predictable beforehand is called a "Random Experiment".

Activity 1

TOSS a coin 15 times and note down the number of times it shows heads and the number of times the tail shows up.

Repeat the experiment by tossing the coin, 20 times, 25 times etc. and each time noting the number of times head shows up and the number of times tail shows up. We make a table of values as follows:

No. of times a coin is tossed	No. of times head shows up	No. of times tail shows up	$\frac{\text{No. of times head shows}}{\text{No. of times coin is tossed}}$	$\frac{\text{No. of times tail shows}}{\text{No. of times coin is tossed}}$
15	7	8	$\frac{7}{15}$	$\frac{8}{15}$
20	9	11	$\frac{9}{20}$	$\frac{11}{20}$
25	12	13	$\frac{12}{25}$	$\frac{13}{25}$

We call each toss of the coin as a trial and for each trial the possible outcome can be 'head' or 'tail'.

An event is a collection of some outcome of the experiment. In the above activity "getting a head" is an event. Similarly "getting a tail" is an event. What we have calculated in the last two columns is the empirical probability of the two events namely "head showing up" and "tail showing up" .

Hence we calculate the probability of an event based on the results of our trials. The more the number of trials, better will be the estimation of the probability.

The empirical probability P(E) of an event E is given by

$$P(E) = \frac{\text{Number if trials in which the event happened}}{\text{The total number of trials}}$$