Activity 27

Objective

To explain the computation of conditional probability of a given event A, when event B has already occurred, through an example of throwing a pair of dice.

Material Required

A piece of plywood, white paper pen/pencil, scale, a pair of dice.

Method of Construction

1. Paste a white paper on a piece of plywood of a convenient size.
2. Make a square and divide it into 36 unit squares of size 1cm each (see Fig. 27).
3. Write pair of numbers as shown in the figure.

1, 1	1, 2	1, 3	1, 4	1, 5	1, 6
2, 1	2, 2	2, 3	2, 4	2, 5	2, 6
3, 1	3, 2	3, 3	3, 4	3, 5	3, 6
4, 1	4, 2	4, 3	4, 4	4, 5	4, 6
5, 1	5, 2	5, 3	5, 4	5, 5	5, 6
6, 1	6, 2	6, 3	6, 4	6, 5	6, 6

Fig. 27

Demonstration

1. Fig. 27 gives all possible outcomes of the given experiment. Hence, it represents the sample space of the experiment.
2. Suppose we have to find the conditional probability of an event A if an event B has already occurred, where A is the event "a number 4 appears on both the dice" and B is the event "4 has appeared on at least one of the dice" i.e, we have to find P(A | B).
3. From Fig. 27 number of outcomes favourable to A = 1

   Number of outcomes favourable to B = 11

   Number of outcomes favourable to $A \cap B = 1$.
4. (i) $P(B) = \frac{11}{36}$,

   (ii) $P(A \cap B) = \frac{1}{36}$

   (iii) $P(A \mid B) = \frac{P(A \cap B)}{P(B)} = \frac{1}{11}$.

Note

1. You may repeat this activity by taking more events such as the probability of getting a sum 10 when a doublet has already occurred.
2. Conditional probability $P(A \mid B)$ can also be found by first taking the sample space of event B out of the sample space of the experiment, and then finding the probability A from it.

Observation

1. Outcome(s) favourable to A : ________, $n(A)$ = ________.
2. Outcomes favourable to B : ________, $n(B)$ = ________.
3. Outcomes favourable to $A \cap B$: ________, $n(A \cap B)$ = ________.
4. $P(A \cap B)$ = ________.
5. $P(A \mid B)$ = ________ = ________.

Application

This activity is helpful in understanding the concept of conditional probability, which is further used in Bayes' theorem.