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# Rules of Probability

The Probability theory provides a mean of getting an idea of the liklihood of occurance of different events resulting from a random experiment in term of quantitative measures ranging ranging between zero and one. The probability is zero (P=0) for an impossible event and one for an event which is certain to occur (P=1). chances of survival after rabies infection is impossible that is (P=0). The death of living being is inversible event i.e. P=1. The other degree of uncertainties of the liklihood of occurance of events are indicated by probablities ranging between zero and one.

There are two rules of probabilty.

(1) Rule of Addition of probablity
(2) Rule of Multiplication of probability

## (1) Rule of Addition of probability:

This law is applicable to mutually probability events. This means if any event is occuring in two or more cases which are mutually exclusive, then probablity of happening of that event is the total of probablity of happening of those cases.

For example if $P_1, P_2, P_3 \ldots P_n$ are the chances of an happening of the event, given by.

$$P = P_1 + P_2 + P_3 + \ldots\ldots + P_n$$

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(2)

Example. What is the probability of throwing a number greater than 4 with an ordinary dice whose faces are numbered from 1 to 6.

Procedure:

Here the event can happen in two ways. Either it can be 5 or it can be 6 which are mutually exclusive.

(i) Probability of throwing 5 with a single dice is

$$P_1 = \frac{1}{6}$$

(ii) and probability of throwing 6 is

$$P_2 = \frac{1}{6}$$

∴ the required probability (for of throwing more than 4)

$$P = P_1 + P_2 = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}.$$

Procedure:

According to definition there are two favourable cases for the happening of events for throwing a number greater than 4 and throwing a dice all equally likely cases are 6.

∴ Required Probability = $\dfrac{\text{No. of favourable cases}}{\text{Total number of equally likely cases}}$

$$= \frac{2}{6} = \frac{1}{3}$$

## (2) Rule of Multiplication of Probability.

According to this rule the probability of happening of comparable events simultaneously is the product of their separate possibilities.

If $P_1 P_2 P_3 \ldots P_n$ are the probability of happening of all the events $A_1, A_2 A_3 \ldots$ An independent event that are probablity of happening of all the events simultaneously is.

$$P = P_1, P_2, P_3 \ldots P_n$$

Examples: Find the probablity of throwing two dice together with the happening of following events.

1. Both the dice have ace (= a face being one dot)
2. Ace in the first dice and a non-ace in the 2nd.
3. No ace in both the dice.
4. Either of the dice has an ace.

procedure:

Here the probability of throwing an ace with the dice is $\frac{1}{6}$ and the probablity of throwing no dice is $= \frac{5}{6}$

(i) In this case both the dice have ace. So required probability = (Probability of throwing ace in one dice) x (Probability of throwing ace in other dice)

$$= \frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$$

(ii) Two posibilites are there in the case:

(a) The probablity throwing ace in the 1st dice and more than in 2nd is:

$$P_1 = \frac{1}{6} \times \frac{5}{6} = \frac{5}{36}$$

(b) The probability ($P_2$) or throwing non-ace in the first dice and the ace in the second dice is

$$P_2 = \frac{5}{6} \times \frac{1}{6} = \frac{5}{36}$$

(iii) As the two conditions are mutually exclusive therefore, on throwing ace in one dice and no ace in second dice. required probability will be -

$$= \frac{5}{3} + \frac{5}{36} = \frac{5}{18}$$

(iii) Probability of throwing no ace in both the dice will be

$$= \frac{5}{6} \times \frac{5}{6} = \frac{25}{36}$$

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(iv) Two conditions are possible in this case. Either both the dice have ace or one of the dice has no ace. Both of these conditions are mutually exclusive with each other. Therefore, their required probability is shown by:

$$\text{Probability} = \frac{1}{36} \times \frac{10}{36} = \frac{10}{36}$$

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