



probability

Stage2

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Probability :

It is a branch of mathematics that deals with the occurrence of a random event. The value is expressed from zero to one. Probability has been introduced in Maths to predict how likely events are to happen. The meaning of probability is basically the extent to which something is likely to happen. This is the basic probability theory, which is also used in the probability distribution, where you will learn the possibility of outcomes for a random experiment. To find the probability of a single event to occur, first, we should know the total number of possible outcomes.

Probability Definition in Math:

Probability is a measure of the likelihood of an event to occur. Many events cannot be predicted with total certainty. We can predict only the chance of an event to occur i.e., how likely they are going to happen, using it. Probability can range from 0 to 1, where 0 means the event to be an impossible one and 1 indicates a certain event.

Probability for Class 10 is an important topic for the students which explains all the basic concepts of this topic. The probability of all the events in a sample space adds up to 1.

Example:

when we toss a coin, either we get Head OR Tail, only two possible outcomes are possible (H, T). But when two coins are tossed then there will be four possible outcomes,

i.e $\{(H, H), (H, T), (T, H), (T, T)\}$.

Solved Examples:

1) There are 6 pillows in a bed, 3 are red, 2 are yellow and 1 is blue. What is the probability of picking a yellow pillow?

Ans: The probability is equal to the number of yellow pillows in the bed divided by the total number of pillows, i.e. $2/6 = 1/3$.

2) There is a container full of coloured bottles, red, blue, green and orange. Some of the bottles are picked out and displaced. Sumit did this 1000 times and got the following results:

No. of blue bottles picked out: 300

No. of red bottles: 200

No. of green bottles: 450

No. of orange bottles: 50

a) What is the probability that Sumit will pick a green bottle?

Ans: For every 1000 bottles picked out, 450 are green.

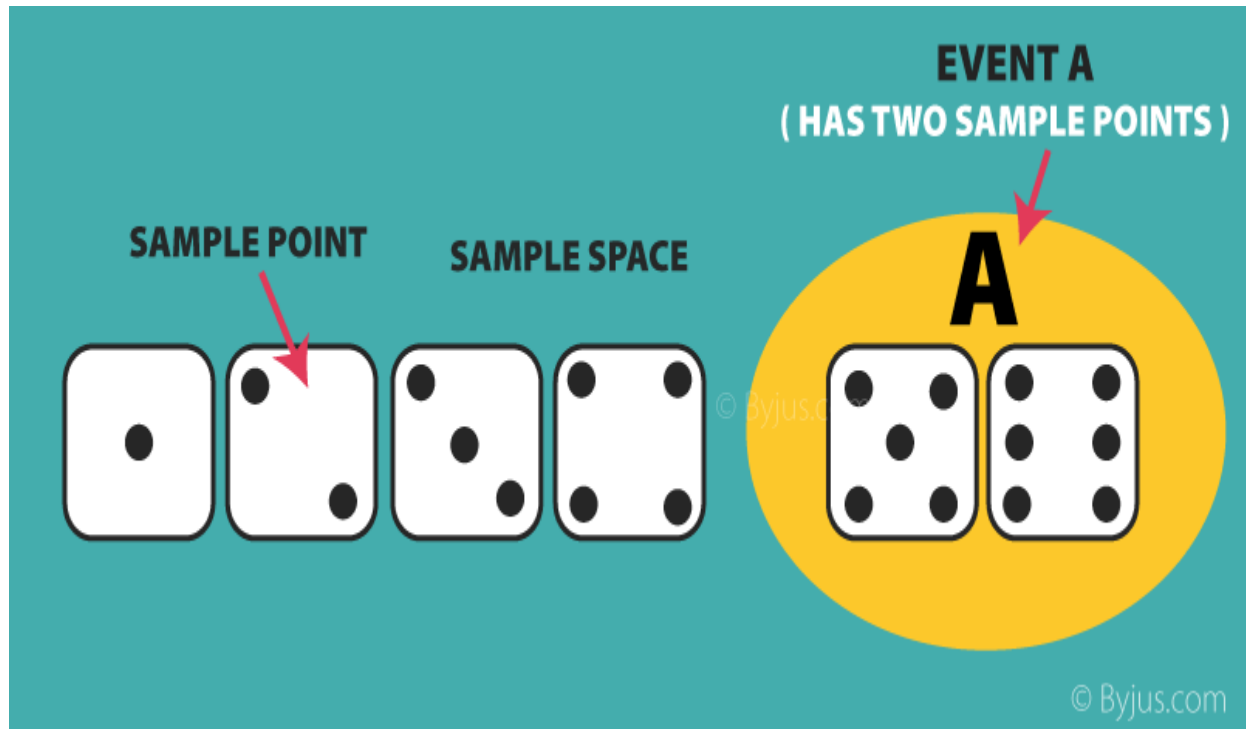
Therefore, $P(\text{green}) = 450/1000 = 0.45$

b) If there are 100 bottles in the container, how many of them are likely to be green?

Ans: The experiment implies that 450 out of 1000 bottles are green.

Therefore, out of 100 bottles, 45 are green.

Probability Terms and Definition:



Question 1: Find the probability of 'getting 3 on rolling a die'.

Solution:

Sample Space = $S = \{1, 2, 3, 4, 5, 6\}$

Total number of outcomes = $n(S) = 6$

Let A be the event of getting 3.

Number of favourable outcomes = $n(A) = 1$

i.e. $A = \{3\}$

Probability, $P(A) = n(A)/n(S) = 1/6$

Hence, $P(\text{getting 3 on rolling a die}) = 1/6$

Question 2: Draw a random card from a pack of cards. What is the probability that the card drawn is a face card?

Solution:

A standard deck has 52 cards.

Total number of outcomes = $n(S) = 52$

Let E be the event of drawing a face card.

Number of favourable events = $n(E) = 4 \times 3 = 12$ (considered Jack, Queen and King only)

Probability, P = Number of Favourable Outcomes/Total Number of Outcomes

$$P(E) = n(E)/n(S)$$

$$= 12/52$$

$$= 3/13$$

P(the card drawn is a face card) = 3/13

Question 3: A vessel contains 4 blue balls, 5 red balls and 11 white balls. If three balls are drawn from the vessel at random, what is the probability that the first ball is red, the second ball is blue, and the third ball is white?

Solution:

Given,

The probability to get the first ball is red or the first event is $5/20$.

Since we have drawn a ball for the first event to occur, then the number of possibilities left for the second event to occur is $20 - 1 = 19$.

Hence, the probability of getting the second ball as blue or the second event is $4/19$.

Again with the first and second event occurring, the number of possibilities left for the third event to occur is $19 - 1 = 18$.

And the probability of the third ball is white or the third event is $11/18$.

Therefore, the probability is $5/20 \times 4/19 \times 11/18 = 44/1368 = 0.032$.

Or we can express it as: $P = 3.2\%$.

Question 4: Two dice are rolled, find the probability that the sum is:

equal to 1

equal to 4

less than 13

Solution:

To find the probability that the sum is equal to 1 we have to first determine the sample space S of two dice as shown below.

$S = \{ (1,1),(1,2),(1,3),(1,4),(1,5),(1,6)$

$(2,1),(2,2),(2,3),(2,4),(2,5),(2,6)$

$(3,1),(3,2),(3,3),(3,4),(3,5),(3,6)$

$(4,1),(4,2),(4,3),(4,4),(4,5),(4,6)$

$(5,1),(5,2),(5,3),(5,4),(5,5),(5,6)$

$(6,1),(6,2),(6,3),(6,4),(6,5),(6,6) \}$

So, $n(S) = 36$

1) Let E be the event “sum equal to 1”. Since, there are no outcomes which where a sum is equal to 1, hence,

$$P(E) = n(E) / n(S) = 0 / 36 = 0$$

2) Let A be the event of getting the sum of numbers on dice equal to 4.

Three possible outcomes give a sum equal to 4 they are:

$$A = \{(1,3),(2,2),(3,1)\}$$

$$n(A) = 3$$

$$\text{Hence, } P(A) = n(A) / n(S) = 3 / 36 = 1 / 12$$

3) Let B be the event of getting the sum of numbers on dice is less than 13.

From the sample space, we can see all possible outcomes for the event B, which gives a sum less than B. Like:

(1,1) or (1,6) or (2,6) or (6,6).

So you can see the limit of an event to occur is when both dies have number 6, i.e. (6,6).

Thus, $n(B) = 36$

Hence,

$$**P(B) = n(B) / n(S) = 36 / 36 = 1**$$