

PROBABILITY

CLASS X

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**PROBABILTY IS NOTHING
BUT COMMON SENSE
REDUCED
TO CALCULATION
-PIERRE SIMON LAPLACE**

Examples of Uncertainties

It may rain today



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Most probably Rachana will stand first this time



There is a 50 – 50
chance of India
Winning the toss
today



In all these above cases we see the words may, probably, chance show the uncertainties.

The answer could be **Yes** or **No**.

They don't give quantitative measure of uncertainty.

Here comes the role of Probability.

So, Probability is the numerical measure of uncertainty

We learn Probability of 2 types

- i. Experimental probability (Empirical Probability)
- ii. Theoretical Probability (Classical Probability)

Expected Learning objectives

- To learn about Theoretical (Classical) Probability
- To learn the meaning of the terms like
 - i. Random experiment
 - ii. Equally likely outcome
 - iii. Elementary events

Probability

Previous Knowledge Required

- Knowledge of Empirical Probability
- Definition of an experiment
- Definition of an event

Examples of Experimental (Empirical) Probability



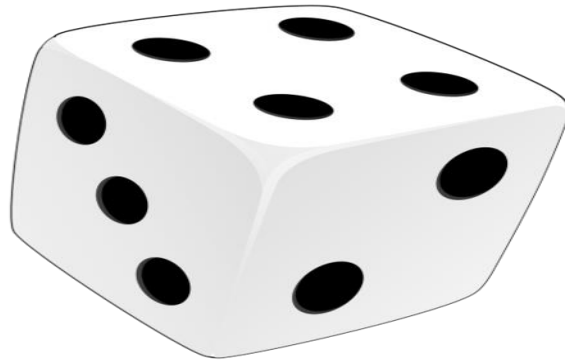
Tossing a coin 10 times, the
out comes are head and tail

Heads = 4

Tails = 6

Probability of getting a
head= $P(\text{head}) = 4/10$

$P(\text{tail}) = 6/10$



Dice



A die is thrown 50 times. The outcomes are 1,2,3,4,5,6.

Suppose

1 occurred = 8, $P(1) = 8/50$

2 occurred = 10, $P(2) = 10/50$

3 occurred = 9, $P(3) = 9/50$

4 occurred = 11, $P(4) = 11/50$

5 occurred = 9, $P(5) = 9/50$

6 occurred = 3, $P(6) = 3/50$



There are 2 blue balls and 1 red ball.

The probability of drawing a blue ball = $2/3$

$P(\text{red ball}) = 1/3$



A jar contains 25 orange balls, 30 yellow balls and 15 green balls.

$$P(\text{orange balls}) = 25/70$$

$$P(\text{yellow balls}) = 30/70$$

$$P(\text{green ball}) = 15/70$$

In all these cases,

$$P(\text{event}) = P(E)$$

(Number of trials in which the event
has happened) / The total number of
trials

If a coin is tossed several times,
as the number of tosses increases,
the experimental probability of a
head(or tail) comes closer and closer
to $\frac{1}{2}$ which is what is called the
theoretical (classical) probability

**Toss a coin at random. We can
assume**

**That each outcome is equally
likely.**

So, the $P(\text{head}) = \frac{1}{2}$

$P(\text{tail}) = \frac{1}{2}$



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Playing Cards

Outcomes = diamond,
hearts,spade,clubs.

$$P(\text{diamond}) = 13/52 = \frac{1}{4}$$

$$P(\text{spade}) = 13/52 = \frac{1}{4}$$

$$P(\text{hearts}) = 13/52 = \frac{1}{4}$$

$$P(\text{clubs}) = 13/52 = \frac{1}{4}$$



There are 2 blue
and 1 red balls.
So getting a blue
ball or drawing a
red ball
Is not equally
likely.

**So, equally likely outcomes
are outcomes having
the same chance of
happening**

Empirical Probability is calculated by repeating an experiment a large number of times, which is not feasible in every situation.

Like, tossing a coin several times can be repeated but an experiment of frequently launching a satellite to know its failure or noting whether an helicopter will crash in a lake or a forest are not possible.



Helicopter crashing into the lake



An earth satellite launching to see its failure



Hence, we make certain assumptions
to avoid the repetition. These
assumptions
help in computing
the exact(theoretical) probability
Of those experiments in which
The outcomes are equally likely .
eg. 1 Toss of a coin
eg.2. throw a die

In experiments where the outcomes are equally likely as in the case of tossing a coin or rolling a die, the theoretical Probability which is written as $P(E)$ can be determined.

$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of all possible outcomes of the experiment}}$

Eg:1. Find the probability of getting a head when a coin is tossed once. Find the probability of getting a tail.

Soln: Let E be the event , 'getting head'. The number total outcomes = 2 and the number of outcomes favourable to E, (getting a head) is 1.

Therefore

$$P(E) = P(\text{head}) = \frac{1}{2}$$

$$P(F) = P(\text{Tail}) = \frac{1}{2}$$

A bag contains a red ball, blue ball and a yellow ball, of the same size. A ball is taken out from the bag without looking into it. What is the probability that the ball is
a) Yellow ball b) red ball c) blue ball

Soln: Let $P(Y)$ be the probability of getting yellow ball,
 $P(B)$ be the probability
of blue ball and $P(R)$ is the probability of red ball
The number of possible outcomes = 3
 $P(Y) = 1/3$, $P(B) = 1/3$, $P(R) = 1/3$
Now, $P(Y) + P(B) + P(R) = 1/3 + 1/3 + 1/3 = 1$

Each of these events are called elementary events.

So, An event having only one outcome is an elementary event.

The sum of the probabilities of all the elementary events of any experiment is 1.

To Recapitulate :

The Empirical probability of an event
= (Number of trials in which the event has happened) / The total number of trials

The classical probability of an event
=
Number of outcomes favourable to E

Number of all possible outcomes of the experiment

Question :

One card is drawn from a well shuffled deck of 52 cards. Calculate the probability that the card will

- 1) be an ace
- 2) not be an ace

THANK YOU