PROBABILITY

History:

The foundation of probability were laid by two French mathematicians of the 17th century- Blaise Pascal (1623-1662) and Pierre De Fermat (1601-1665)

Probability:

A numerical measure of the chance that an uncertain event will happen is called probability.

Example: toss a coin, draw a card, and throw a dice.

It is clear what we mean when we make a statements of the type that it is likely to rain today. Or I have a fair chances of passing annual examination.

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Set:

A set is well defined collection or list of distinct objects and term distinct means that each object must appear only once.

For example: a group of students, the book in library.

Members/Elements:

The objects that are in a set called members of elements of that set.

Set are usually denoted by capital letters such as A, B, C, Y. while 3 elements are represented by small letters such as a, b, c, d, y.

A = {a, b, x, y} or B = {1, 2, 3, 4, 7} where A and B are two sets and a, b, x, y are elements / member of set A and 1, 2, 3, 4, 7 are elements of set B

The no: of a set A, written as n(A). If A = {a, b, x, y} then the total elements of set A are 4 then n(A) = 4.

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Kisi bhi cheez ki probability 0 – 1 kae darmiyan ho gi. As to toss coin how much chances to come head 50%
$\frac{50}{100} = 0.5\%$

Sample space → All possible outcomes of an experiment said as sample space

like of dice is 6 so $A = \{1, 2, 3, 4, 5, 6\}$

$n(A)$ = probability
$n(S)$ = Sample space

n = no of elements
So here n of A is 6

S = 7
A = 16
B = 4

Random Experiment:

Experiment:

The term experiment means a planned activity or process whose results yield a set of data.

A single performance of an experiment is called a trial. The result obtained from experiment or trial called outcome.

Random Experiment:

An experiment which produces diff results even though it is repeated a large no: of times under essentially similar conditions, called a random experiment.

Example: tossing of fair coin, Throwing a balanced dice.

Sample Space:

A set consisting of all possible outcomes that can result from random experiment called sample space

1- If we throw a dice

$A = \{1, 2, 3, 4, 5, 6\}$ sample space

All possible outcomes of our experiment.

2- If we toss a single coin there are 2 possible outcomes of experiment head or tail

Probability of A = n(A) / n(S)

So its probability is 1/2

Assignment:

i) S = {ball, pen, table, coin, die, card, book}

n(S) = {7}

ii) A = {1, 3, 5, 7, 8, 9, 0, 4, 2, 12}

n(A) = {10}

iii) B = {book, city, clock, teacher}

n(B) = {4}

Probability

- Empirical probability
- Classical probability
- Rules of Addition
- Rules of Multiplication
- Complement Rule
- Principles of Counting
  - ✓ Multiplication Formula
  - ✓ Permutation
  - ✓ Combination.

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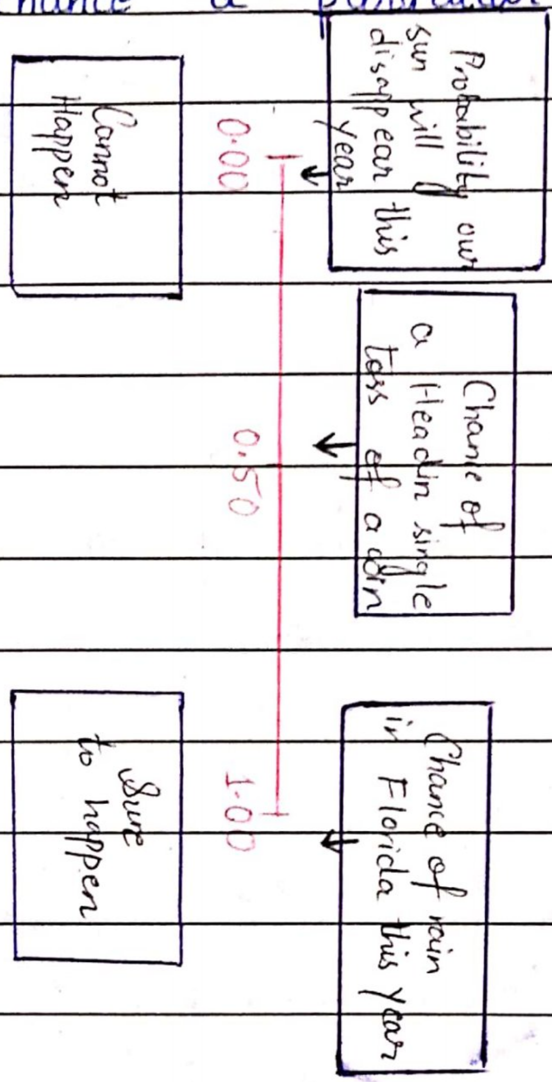
=> Probability:

Probability is a value b/w '0' and '1' inclusive that represents the possibility / chance a particular event will happen.



Three Key words are used in study of probability

- Experiment
- Outcome
- Event

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Experiment:

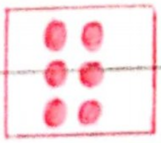
A process that generates possible observations

Outcome:

A particular result of an experiment.

Event: (If we seeing of our own interest)

A collection of one or more outcomes of an experiment

	
Experiment	Roll a die
All possible outcomes	Observe a 1 " " 2 " " 3 " " 4 " " 5 " " 6
Some possible events	Observe an even number " a No: greater than 4 " " " 3 or less

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Approaches to assigning Probabilities

⇒ Classical Prob: (We talk about present)

Classical probability is based on the assumption that the outcomes of an experiment are equally likely.

$$\text{Probability of an event} = \frac{\text{No: of favourable outcomes}}{\text{Total no: of possible outcomes}}$$

⇒ Example:

Consider an experiment of rolling a six-sided die. What is probability of the event

"an even No: of spots appear face up"?

The possible outcomes are:

possible outcomes = sample space

$$\text{Probability of an even number} = \frac{3}{6}$$

$$= 0.5$$

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Example:

A fair coin is tossed. Find the probability

1. Head appears
2. tail "
3. No head appears

All possible outcomes = H, T

A = Head appears = H

B = Tail " = T

C = No head appears = T

$P(A) = \frac{1}{2}$ $\frac{n(A)}{n(S)}$ $P(B) = \frac{1}{2}$ $\frac{n(B)}{n(S)}$ $P(C) = \frac{1}{2}$ $\frac{n(C)}{n(S)}$

If

⇒ **Two coins are tossed:**

Find the probability:

1. No head appears
2. 1 head appear
3. 2 head appears
4. 1 tail and 1 head appear
5. 1 or more than 1 head appear

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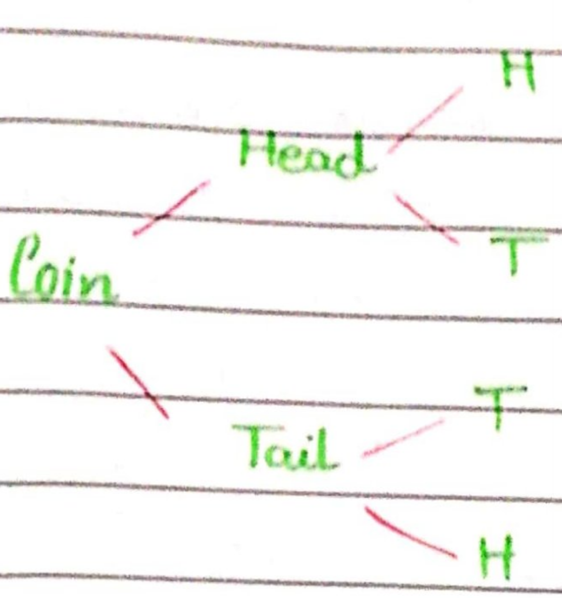

TREE DIAGRAM

All possible outcomes = {HH, HT, TH, TT}

A = No Head appears = TT

B = 1 head appears = HT, TH

C = 2 head appears = HH

D = 1 tail and 1 head appear.
= TH, HT

E = 1 or more than 1 head appear
= HT, TH, HH

	H	T
H	HH	HT
T	TH	TT

P(A) = 1/4

P(B) = 2/4 = 1/2

P(C) = 1/4

P(D) = 2/4 = 1/2

P(E) = 3/4

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⇒ Example:

If a die is rolled. What is the probability.

1- Greater than 4 appear
2- Multiple of 3 appear
3- More than 7 appear

all possible outcomes =

A = Greater than 4 appear = 5, 6
B = Multiple of 3 appear = 3, 6
C = More than 7 appear = 0

$p(A) = \frac{2}{6} \frac{n(A)}{n(S)} = \frac{1}{3}$

Probability have range 0 → 1 and probabili not less than 0.

$p(B) = \frac{2}{6} = \frac{1}{3}$

$p(C) = 0$

Class Probability → ?

→ That tell about future.

⇒ Empirical Probability:

The probability of an event happening is the fraction of the time similar events happened in the past

$$\text{Empirical Probability} = \frac{\text{No of times event occurs}}{\text{Total no of observations}}$$

Important

(Example on Next Page)

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→ Find the probability that one throw of a die will
a) Have 3 on top
b) Have 5 on top
c) Greater than 4
d) An odd number

Sample space is $S = \{1,2,3,4,5,6\}$
Assume that it is a well balanced die, that is, each of six sides will have an equal chance to turn on the top when die stops in a throw. Then sample points are the six dots and sample space is

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

$P(\text{Having a '3'}) = \frac{\text{No. of favourable cases}}{\text{No. of possible cases}} = \frac{1}{6} \quad \frac{n(A)}{n(S)}$

$P(\text{Having a '5'}) = \frac{1}{6}$

$P(\text{More than '4'}) = \frac{\cancel{2}^{1}}{\cancel{6}_{3}} = \frac{1}{3}$

of these 6 outcomes 2 outcomes result event more than 4 that is face 5 or 6.

$P(\text{An odd no.}) = \frac{\cancel{3}^{1}}{\cancel{6}_{2}} = \frac{1}{2}$

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→ An ___ contain 8 balls of which 5 are white & 3 are black. A ball is drawn at random. What probability that the ball drawn is white?

Sol:

$$P(A) = \frac{\text{Favourable to event } A}{\text{No of possible cases}} \Rightarrow \frac{5}{8}$$

let the ball numbered as 1 to 8 and selection of a ball at random can produce 8 different outcomes as any of the balls may turn up.
Let an event A be defined as the ball is white of these 8 diff mutually exclusive and equally likely outcomes. 5 outcomes result in favour of event A.

Example of Empirical Probability:

On Feburary 1, 2003, the space shuttle columbia exploded. This was second disaster in 113 space missions for NASA. On basis of this information, what is the probability that a future mission is successfully

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completed:

$$\text{Probability of a successful flight} = \frac{\text{No of successful flights}}{\text{Total no. of flights}}$$

$$P(A) = \frac{111}{113} \Rightarrow 0.98$$

Based on past experience, the probability is 0.98 that a future space shuttle mission will be safely completed. 98% completed successfully.
Bcz probability v. near to 1 so successful.

⇒ Mutually exclusive events:

Jin kai occur honai kai chances bhi same hon or common point bhi na ho so

Two or more events are said to be mutually exclusive if they cannot occur together, i.e they have no common point

e.g: A & B are mutually exclusive. A die is rolled and A = Even no B = odd no

⇒ Collectively exhaustive:

Two or more events are said to be exhaustive events, if they are mutually exclusive & their union is complete set of outcomes

e.g, $A = \{2, 4, 6\}$, $B = \{1, 3, 5\}$

$A \cup B = \{1, 2, 3, 4, 5, 6\}$

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→ Jis mai common a jayai said est Not Mutually exclusive events
→ Collectively exhaustive   non equal to
Mean jb union lain to is ka Sample space ajai
$A \cup B \Rightarrow$ dono sets kai element mila ke likhay
$A \cap B \Rightarrow$ Jo common hon

From mam (Slides)

(1,1) Mean 2 dies hain roll kiya, one die pai 1 or 2nd die pai bhi 1 a jayai

(3,4) One die pai 3 one die pai 4

Total possible outcomes of 2 die when roll $6 \times 6 = 36$ 36 outcomes

6^{2} How many time roll

Total outcomes of a situation

$A \cap B$ ↓ Not mutually exclusive events

Second die — When 2 dics rolled

First die	1	2	3	4	5	6
1	(1,1)	(1,2)	(1,3)	(1,4)	(1,5)	(1,6)
2	(2,1)	(2,2)	(2,3)	(2,4)	(2,5)	(2,6)
3	(3,1)	(3,2)	(3,3)	(3,4)	(3,5)	(3,6)
4	(4,1)	(4,2)	(4,3)	(4,4)	(4,5)	(4,6)
5	(5,1)	(5,2)	(5,3)	(5,4)	(5,5)	(5,6)
6	(6,1)	(6,2)	(6,3)	(6,4)	(6,5)	(6,6)

i) A = Both dice have same no:
ii) B = less than 5
iii) C = In one 1 must come
iv) $A \cup B$
v) $A \cap B$

i- A = {1,1}, {2,2}, {3,3}, {4,4}, {5,5}, {6,6}

ii- B = {1,1} (1+1=2), {1,2} (1+2=3), {1,3} (1+3=4), {2,1} (2+1=3), {3,1} (3+1=4), {2,2} (2+2=4)

iii- C = {1,1}, {2,1}, {3,1}, {4,1}, {5,1}, {6,1}
{1,2}, {1,3}, {1,4}, {1,5}, {1,6}

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iv- $A \cup B$ $\{(1,1),(2,2),(3,3),(4,4),(5,5),$
$(6,6),(1,2),(1,3),(2,1),(3,1)\}$

v) $A \cap B$ $\{(1,1),(2,2)\}$

$P(A) = \frac{6}{36} = \frac{1}{6}$

$P(B) = \frac{6}{36} = \frac{1}{6}$

$P(C) = \frac{11}{36}$

$P(A \cup B) = \frac{10}{36}$

$P(A \cap B) = \frac{2}{36}$

⇒ General rule of Addition:

The outcomes of an experiment may not be mutually exclusive. The rule for two non-mutually exclusive events designated A and B is written:

$P(A \text{ or } B) = p(A) + p(B) - p(A \cap B)$

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or
and $A \cap B \Rightarrow$ Not mutually exclusive.

→ or = Mean two event are to be added
Us Ka Union lain gai
and - Mean we take intersection mean Multiplication rule apply.

⇒ Special Rule of Addition:

To apply special rule of addition, the events must mutually exclusive.

w $P(A \text{ or } B) = p(A) + p(B)$

For three mutually exclusive events designated A, B & C rule is written:

$p(A \text{ or } B \text{ or } C) = P(A) + P(B) + P(C)$

⇒ Complement Rule:

$P(A) + p(\bar{A}) = 1$

$p(A) = 1 - P(\bar{A})$

$p(\bar{A}) = 1 - P(A)$

It is used to determine the problem of an event occuring by subtracting the prob. of the event not occuring from 1

⇒ Mutually exclusive

Two tems/events ↳ exclusive

Both are unique → mean no common point
↳ No intersection exists

Formula will be

$p(A \text{ or } B) = p(A) + p(B)$

Mutually exclusive ⇒ $P(A)$ or $P(B)$

Not Mutually exclusive ⇒ $p(A \text{ or } B) = p(A) + p(B) - p(A \cap B)$

⇒ General rule of Addition:

Non-mutually exclusive:

not — Both events — Unique

Both events are not unique → some common point is existing somewhere.

mean intersection exists

then above formula becomes

$$p(A \text{ or } B) = p(A) + p(B) - p(A \cap B)$$

$p(A \cup B)$

↳ we subtracted the common point from formula

⇒ Addition law for not mutually exclusive

$$P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Question# 1

A die is tossed. Find probability that the face is a prime or is even number.

Solution

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

$A = \{2, 3, 5\}$ $\qquad$ $B = \{2, 4, 6\}$

$A \cap B = \{2\}$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$$

$$= \frac{3}{6} + \frac{3}{6} - \frac{1}{6}$$

$$= \frac{5}{6}$$

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A die is rolled. Find following probabilities

i) Face is multiple of 3 or multiple of 5

ii) The face is complete square or it is maximum face

Sol:

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

Let A = multiple of 3 so, $A = \{3, 6\}$

B = multiple of 5 $B = \{5\}$

or mean = addition so

$P(A \text{ or } B) = P(A \cup B) = P(A) + P(B)$

$P(A) = \frac{2}{6}$ $P(B) = \frac{1}{6}$

$P(A \cup B) = \frac{2}{6} + \frac{1}{6}$

$= \frac{1}{2}$

ii) A = comple square $= \{1, 2\}$

B = Max face $= \{6\}$

$P(A \cup B) = P(A) + P(B)$

$\Rightarrow P(A) = \frac{2}{6}$ $P(B) = \frac{1}{6}$

$\frac{2}{6} + \frac{1}{6} \Rightarrow \frac{1}{2}$

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Home assignment:

Two coins are tossed. Find probability that both faces are heads or at least one is head.

Sol:

	H	T
H	HH	HT
T	HT	TT

$2^2 = 4$ possible outcomes.

Let A = represent event "both are heads"

B = represent event "at least one is head"

$A = \{(H,H)\}$

$B = \{(HH), (HT), (TH\}$

$A \cap B = \{(HH)\}$

$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$

$P(A) = \frac{1}{4}$ $\quad P(B) = \frac{3}{4}$ $\quad P(A \cap B) = \frac{1}{4}$

$= \frac{1}{4} + \frac{3}{4} - \frac{1}{4} \Rightarrow \frac{3}{4}$ required probability.

A coin is tossed twice. Let A be event that at least one tail appears, B be the event that at most one tail appears and C be the event that exactly 2 tails appear.

Kum sai kum, ziada Jitnai mrzi

(ziada sai ziada)x(

→ Jitna nai, utna to hai us sai Km bni no to chalai ga ;

(H,H) also

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Total possibilities = 4

	H	T
H	HH	HT
T	TH	TT

P(A)

A = (TH), (HT), (TT)

B = (TH), (HT), (HH)

C = (T, T)

i) Are B & C mutually exclusive events? Yes

ii) Are A & B equally likely events? Yes

iii) Are B & C collectively exhaustive events? Yes

A die is thrown. Consider following events:

A = even no: occurs B = prime no: occurs

C = odd no: occurs D = no: is divisible by 5

i- Are A & B equally likely events?

ii- Are A & B mutually exclusive events

iii) " " & C mutually exclusive events?

iv) Are A & C Collectively " "?

v) Which of above events simple & which are compound?

S = {1, 2, 3, 4, 5, 6}

A = {2, 4, 6}

D = {5}

B = {2, 3, 5}

C = {1, 3, 5}

i ——

ii No

iii Yes

iv Yes

v. A, B, C = compound

D = simple

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Two die thrown once following events are defined

A = sum of spots is 6

B = " " " is 8

C = same no appear

D = diff no appear

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

A = {(1,5) (2,4) (3,3) (4,2) (5,1)}

B = {(2,6), (3,5), (4,4) (5,3) (6,2)}

C = {(1,1), (2,2), (3,3), (4,4), (5,5), (6,6)}

D = {(1,2), (1,3), (1,4), (1,5), (1,6), (2,1), (2,3), (2,4),

D = (2,5), (2,6), (3,1), (3,2), (3,4), (3,5), (3,6), (4,1), (4,2),

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

(5,3), (5,4), (5,6)}

i) Yes (No common point)

ii) No (3, 3) common point

iii) Yes

iv) {(1,1) (1,2) (1,3)} Yes

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$P(A \& B) = P(A) \cdot P(B)$
If equal = events independent

Special rule of Multiplication:

A and B

Idependent events:

Two or more events are said to be independent if they happen together and do not effect each other. The selection of events will be with replacement. n(S) remain same

Dependent events:

Two or more events are said to be dependent if they happen one after another and probability of 2nd event is effected due to first. The selection of events will be without replacement n(S) → change ho jata hai

The special rule of multiplication requires that 2 events A & B are independent. It is written symbolically as

$$P(A \& B) = P(A) \cdot P(B)$$

For 3 independent events, A, B, C the special rule of multiplication used to determine probability that all 3 events

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$P(\bar{A} \cap \bar{B}) = P(\bar{A})\, P(\bar{B})$ said to be independent

will occur is:

$P(A \text{ and } B \text{ and } C) = p(A) \cdot p(B) \cdot p(C)$

Example:

Two coins are rolled. Show that the event " head on first coin" and " both faces are same" are independent.

Sol:

Sample space = {HH, HT, TH, TT}

$A = \{HH, HT\}$, $P(A) = 2/4 = 1/2$

$B = \{HH, TT\}$, $P(B) = 2/4 = 1/2$

$P(\bar{A} \cap \bar{B}) = \frac{1}{4} \Rightarrow \frac{1}{4}$ → 1 out of 4 common, $P(\bar{A}) \times P(B) = \frac{1}{4}$

So this is independent Bcz $P(\bar{A} \cap \bar{B}) = P(\bar{A}) \cdot P(\bar{B})$

Example:

A six faced die is rolled. Show that the event " face is even" and the " event is more than 4" are independent

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

$A = \{2, 4, 6\}$

$B = \{5, 6\}$

$P(\bar{A} \cap \bar{B}) = \frac{1}{6}$

$P(A) = \frac{3}{6} = \frac{1}{2}$

$P(\bar{A}) \cdot P(\bar{B}) = \frac{1}{2} \times \frac{1}{3}$

$P(B) = \frac{2}{6} = \frac{1}{3}$

$= \frac{1}{6}$

So Independent.

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n = Total
r = Interest (Jitni select kr rhai)

$$^nP_r = \frac{n!}{(n-r)!}$$

⇒ Principle of Counting:

If no: of possible outcomes in an experiment is small, it is relatively easy to count them. If however, there are a larger no of possible outcomes, it would be difficult to count all the possibilities.

To facilitate counting, we discuss 3 formulas

- Multiplication Formula] less use
- Permutation Formula] → when order matters
- Combination Formula.] More use

→ Multiplication formula:

If there are 'm' ways of doing one thing and 'n' ways of doing another thing, there $m \times n$

In terms of formula:

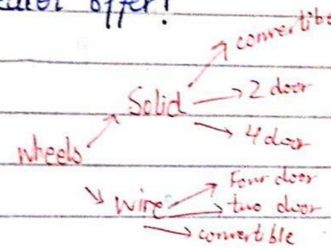
Total no: of arrangements = $m \times n$

This can be extended to more than two events, for 3 events m, n and K:

Total no of arrangements = $m \times n \times K$

Example:

An automobile dealer wants you to advertise that for \$29,999 you can buy a convertible, a two door (system)' sedan or a four-door model with your choice of either wire wheel covers or solid wheel covers. How many different arrangements of models and wheel covers can the dealer offer?



$m = 3$

$n = 2$

Total possible arrangements = $3 \times 2 \Rightarrow 6$

Example:

A developer of a new subdivision offers home buyers a choice of Tudor, rustic, colonial & traditional exterior styling in ranch, two story and split level floor plans. In how many different ways can a buyer order one of these homes?

$m = 4, n = 3$

Total possible arrangement $= 4 \times 3 = 12$

→ **Permutation Formula:** An arrangement of 'r' objects selected from a single group of 'n' possible objects. In it order of the objects selected from a group is important.

$$^nP_r = \frac{n!}{(n-r)!}$$

Arrangement matter krai to permutation if arrangement matter na krdir than combination we use.

$n(A)$ = mean favourable we put

$n(S) = 6$ by 6

Example:

Referring to group of three electronic parts that are to be assembled in any order in how many diff ways can be assembled?

$$^nP_r = \frac{n!}{(n-r)!}$$

$$^3P_3 = \frac{3!}{(3-3)!}$$

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

Example:

Betts Machine shop increase has eight screw machines but only three spaces available in production are for the machines. In how many different ways can 8 machines be arranged in 3 spaces available?

$$^nP_r = \frac{n!}{(n-r)!}$$

$$^8P_3 = \frac{8!}{(8-3)!} \Rightarrow 336$$

Events: An event is an individual outcome or any no: of outcomes (sample points) of a random experiment or a trial. In set terminology any subset of a sample space S of experiment, is called an event.

Simple event → An event that contains exactly one sample point, defined as simple event.

Compound event: Contain more than one sample point & produced by union of simple events.

Example: occurrence of a 6 when die is thrown, is simple event, while occurence of sum of 10 with pair of dice, is compound events, it decomposed into 3 simple events (4,6), (5,5) & (6,4)

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Regression → We check dependency of independent variable on dependent variable.

variable → person to person vary

eg CGPA → Study hrs, interesting sub, concept clearence so this is dependent variable.

dose given to patient we have to see B.P, B.P is dependent & dose is independent.

Imp MCQ → Regression introduced by-? Francis Galton.

Rent example:

dependent variable ← $Y = \underset{\text{intercept}}{\alpha} + \underset{\text{slope}}{\beta} x + \underset{\text{error term}}{\varepsilon}$ (Regression equation)

ZZZ These all words are diff so eror said as natural errors &/ chances must

intercept → (starting point

If value $\beta = 0$ than dependent value equal to intercept comes

$Y = \alpha + \beta x$
If slope 0
$Y = \alpha + 0$
the $Y = \alpha$

β = slope (If one time x change we see what effect come on dependent variable)

x mai 1 unit change krne sai y mai kiya change ayai ga slope tells

Types → Simple (1 dependent & 1 independent)

Multiple → If one dependent & more than one independent.

Types of models

Exact models → like Phy, chem model

Probalastic model → statistical term mai jab error include kr dain so said as statistical model (Bcz variability exists naturally) in stats so said as elastic models

$Y = \alpha + \beta x + \varepsilon$ (This is statistical model)

*(**Lecture**) → Principle of least squares: (We find regression by it)

minimize error — It

(**Regression**) We have to find a & b

$Y = a + bx + e$
$Y = \alpha + \beta x + e$ } Same

To find a $a = \bar{Y} - \bar{b}\bar{x}$

To find b y on x

$$b_{yx} = \frac{n\sum xy - (\sum x)(\sum y)}{n\sum x^2 - (\sum x)^2}$$

Agr y ki jaga x ko rkhai gai to y independent

→ y on x (Y dependent)

→ x on y (x dependent)

denominator mai x ki jagah y

Combination formula;

If the order of the selected objets is not, any selection is called a combination. The formula to count the no: of 'r' object combinations from a set of objects is:

$$^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

Example: A pollster randomly selected 4 of 10 available people. How many diff groups of 4 are possible?

$^{10}C_4 = 210$

$\therefore n = 10$

$\therefore r = 4$

Example: Find $^7C_3$

$C_3 = \frac{n!}{r!(n-r)!} \Rightarrow \frac{7!}{3!(7-3)!} \Rightarrow 35$

Example: In a lottery game, three numbers are randomly selected from a tumbler of balls numbered 1 through 50.

a- How many permutations are possible.

b- How many combinations are possible.

$n = 50$

$r = 3$

$^nP_r = {}^{30}P_3$

$= 17600$

$^nC_r = {}^{50}C_3$

$= 19600$

Lecture

Regression and Correlation

Regression;

The term regression was introduced by the English biometrician, Sir Francis Galton.

Definition: An equation that expresses the linear relationship b/w two variables is called regression equation.

$$\underbrace{Y}_{\text{dependent variable}} = \underbrace{a}_{\text{Y-intercept}} + \underbrace{b}_{\text{slope (Regression coefficient)}}\underbrace{x}_{\text{Independent variable}}$$

- It is relationship b/w independent & dependent variable
- It investigates the dependence of one variable called dependent variable, one or more variables, called independent variable.
- The dependent variable is assumed to be a random variable whereas the independent variables are assumed to have fixed values