Probability :-

The word probability is commonly used word in our day to day conversation like probability It may rain today

probabily I am not attending today's class.

The probability we can another name "change".

sample space.

Let S be the finite set all possible outcomes of the random experiment of the problem is said to be a sample space.

Ex: Tosing of a coin one time, the sample space is given by

Ex:- Coin 1 time

$S = \{H, T\}$

Event :
A Event E is any subset of sample space

Ex. :
For above example H be the one event, now T be the one event..

T : event
H : event

Defination of Probability :
Let 'S' be the finite sample space and 'E' be the event. The probability of event E is given by the ratio Event by Sample space.

OR.

The probability of E is given by the ratio of favarable outcomes to the all possible outcomes and is denoted by.

$$P_r(E) = P(E) = \frac{\text{Event}}{\text{Sample space}} = \frac{O(E)}{O(S)} = \frac{|E|}{|S|} = P_r$$

$$= \frac{\text{Favorable outcomes}}{\text{All possible outcomes}}$$

A tossing of a coin 2 times, Find the probability orate

i) Atleast once head appeard in both the toss.

ii) Exactly 2 times tail appeared in the ~~toss~~

A tossing of a coin 2 times. All possible outcomes (Sample space) is

$$S = \{HH, HT, TH, TT\}$$

All possible outcomes $= o(s) = |s| = 4$

T tossing of a

$o(s)$ = order of S

$|S|$ = cordinality of S.

i) Let E be the event atleast once head appeared in any one of the task and is given by

$$E = \{HH, HT, TH\}, \quad |E| = 3$$

$$P_r(E) = \frac{|E|}{|S|} = \frac{3}{4}$$

ii) Let E_1 be the event exactly 2 tail appearence in the outcomes and event is given by

$$E_1 = \{TT\}$$

$$|E_1| = 1$$

$$P_r(E_1) = 1/4.$$

Random variable :- | Stochastic | Chance variable

Let S be the sample space a real number "x" is associated with some particular rule on sample space is said to be random variable.

For example,

A tossing of a coin 2 times we can assign the random variables X and Y in the following form.

$$S = \{HH, TT, HT, TH\}$$

X : No of heads turning up.

Outcome	HH	TT	HT	TH
Random variable X	2	0	1	1

Range of $X = \{0, 1, 2\}$
(set of all ~~real~~) no of x

Y : No of tail turning up

Outcome :	HH	TT	HT	TH
Random variable Y :	0	2	1	1

Range of $Y = \{0, 1, 2\}$.

The are 2 types in random variables
1) Discrete random variable
2) Continuous random variable.

Dis

A random variable can takes finit values or countabally infinite values such a random variables is said to be discrete random variable.

Tossing of a coin observing the outcome.

Throughing the die observing, the no of faces.

In a mobile phone dialing different no is not a discret random variable selection

~~Continuous~~
~~Discrete random variable~~

Discrete probability distribute

Let x_i be the real number associated with a random variable such that another real no $P(x_i)$ which varifies

i) $P(x_i) \geq 0$

ii) $\sum_{i=1}^{n} P(x_i) = 1$

Here $[x_i, P(x_i)]$ is said to be discrete probability distribution values on random variable X. and $P(x_i)$ is said to be discrete probability function. or discrete density function

For the set of values $[x_i, P(x_i)]$ we can find mean value

Random v

$$\text{Mean}(\mu) = \sum_{i=1}^{n} x_i \times P(x_i)$$

$$\text{Variance}(V) = \sum_{i=1}^{n} (x_i - \mu)^2 P(x_i)$$

$$= \sum_{i=1}^{n} x_i^2 P(x_i) - \mu^2$$

Standard deviation (SD) : $\sigma = \sqrt{V}$

1) A coin is tossed twice a random variable X represents the no of heads turning ups. Find the discrete probability distribution of x also find its mean and variable.

Sample space is given by $S = \{HH, TT, HT, TH\}$

Here X be the random variable the no of Heads turning up like 2, 0, 1, 1 respectively

$P(X = 0)$ = No Head appearce

$= P(TT) = \frac{1}{4}$

$P(X=1)$ = 1 time head appearce

$= P(HT \cup TH) = P(HT) \cup P(TH) = 1/4 + 1/4 = 1/2$

$P(X = 2)$ = 2 times Head appearce:

$P(HH) = 1/4$

The discrete probability distribution table is given by

$x_i \sim x$	0	1	2
$p(x_i)$	$1/4$	$1/2$	$1/4$

i) Mean $(\mu) = \sum_{i=1}^{n} x_i p(x_i) = 0 \times 1/4 + 1 \times 1/2 + 2 \times 1/4 = 1$

ii) Variable$(v) = \sum_{i=1}^{n} (x_i - \mu)^2 p(x_i) =$

$= (0-1)^2 \times 1/4 + (1-1)^2 \times 1/2 + (2-1)^2 \times 1/4$

$= 1/4 + 0 + 1/4$

$= 1/2.$

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2) A sealed box containing a dozen apples it was found that 3 apples are perished (not good), obtain the probability distribution of the number of perished apples were, 2 apples are drawn at random. also find the mean and verience of this distribution

Let ~~X~~ S be the sample space

Given a box containing 1 dozen apples among these 3 apples are perished [not good]. Remaining 9 are good ap

Here X be the random variable the no of selection of perished apples that means

Among 12 apples 2 apples are selected the sample space is given by

$P(X=0$: i.e no perished apples selected :) $= \frac{^3C_0 \times {}^9C_2}{^{12}C_2}$

$= 0.5454$

$P(X=1$: i.e 1 perished apple selected :) $= \frac{^3C_1 \, {}^9C_1}{^{12}C_2}$

$= 0.4090$

$P(X=2$: i.e 2 perished apples selected $= \frac{^3C_2 \times {}^9C_0}{^{12}C_2}$

$= 0.04545$.

The Discrete probability distribution is given by

$x_i \sim X$	0	1	2
$P(x_i)$	0.5454	0.4090	0.04545

i) $P(x_i) \geq 0$ ii) $\sum_{i=1}^{n} P(x_i) = 1$

$$Mean(\mu) = \sum_{i=1}^{n} x_i P(x_i) = 0 \times 0.5454 + 1 \times 0.4090 + 2 \times 0.04545$$

Avarage or Mean $(\mu) = 0.4999 \simeq 0.5$

$$Varience\ (V) = \sum_{i=1}^{n} (x_i - \mu)^2 p(x_i) = (0-0.5)^2 0.5454 + (1-0.5)^2 \times 0.4090 + (2-0.5)^2 \times 0.04545$$

$\underline{V} = 0.3408$

$S.D\ (\sigma) = \sqrt{V} = 0.583$

The probability distribution of finite random ~~ran~~ variable is given by the following table

x_i	-2	-1	0	1	2	3
$P(x_i)$	0.1	K	0.2	2K	0.3	K

Find the value of K & also find mean, varience and standard variation

Given a finite distribution table values now we can verify discrete probability distribution.

i) $P(x_i) \geq 0$ ii) $\sum_{i=1}^{n} P(x_i) = 1$

$$\sum_{i=1}^{n} P(x_i) \Rightarrow 0.1 + K + 0.2 + 2K + 0.3 + K = 1$$

$$0.6 + 4K = 1$$

$$4K = 0.4$$

$$\underline{K = 0.1}$$

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Table becomes

x_i	-2	-1	0	1	2	3
$P(x_i)$	0.1	0.1	0.2	0.2	0.3	0.1

Mean $(\mu) = \sum_{i=1}^{n} x_i P(x_i)$

$\mu = (-2)\times 0.1 + (-1)\times 0.1 + 0\times 0.2 + 1\times 0.2 + 2\times 0.3 + 3\times 0.$

$\mu = 0.8$

Variance $(V) = \sum_{i=1}^{n} (x_i - \mu)^2 P(x_i) = \sum_{i=1}^{n} x_i^2 P(x_i) - \mu^2$

$V = \{(-2)^2\times 0.1 + (-0.1)^2\times 0.1 + 0^2\times 0.2 + 1^2\times 0.2 + 2^2\times 0.3 + 3^2\times 0.1\} - 0.1$

$V = 2.16$

Standard deviation $(\sigma) = \sqrt{V} = 1.4696$

8P

A random variable x has the following probability function for the various values of.

x	0	1	2	3	4	5	6	7
$P(x_i)$	0	K	$2K$	$2K$	$3K$	K^2	$2K^2$	$7K^2+K$

Find i) K ii) $P(x<6)$, $P(x \geq 6)$ $P(3 < x \leq 6)$.

Given X be the a finit random variable then to verify discrete probability distribution properties.

i) $P(x_i) \geq 0$ ii) $\sum_{i=1}^{n} P(x_i) = 1$

$$\sum_{i=1}^{n} P(x_i) = 1 \quad 0+k+2k+2k+3k+k^2+2k^2+7k^2+k=1$$

$$10k^2+9k=1$$

$$10k^2+9k-1=0$$

$$10k^2+10k-k-1=0$$

$$10k(k+1)-(k+1)=0$$

$$k+1=0 \qquad 10k-1=0$$

$$k=-1 \qquad k=0.1$$

If k value is -1. Then $P(x_i)$ values is negative.

Therefore neglecting $k=-1$ $[\because P(x_i) \geq 0]$.

x_i	0	1	2	3	4	5	6	7
$P(x_i)$	0	0.1	0.2	0.2	0.3	0.01	0.02	0.17

adding all values $=1$

$$P(x<6) = P(0)+P(1)+P(2)+P(3)+P(4)+P(5)$$

$$= 0+0.1+0.2+0.2+0.3+0.01$$

$$P(x<6) = 0.81$$

$$P(x \geq 6) = P(6)+P(7)$$

$$= 0.02+0.17$$

$$= 0.19$$

$$P(3 < x \leq 6) = P(4)+P(5)+P(6)$$

$$= 0.3+0.01+0.02$$

$$= 0.33$$