probability and Statistics

Random means "haphazard" Hence any experiment happening under uncertain situations is called a random trial / a ~~random experiment~~ (or) a random experiment (or) / experiment of chance.

Ex: result of tossing a coin / trowing a dice / drawing a card from a pack of 52 playing cards. — are random events (or) random experiments.

Event : Any question that we ask with regard to a random experiment defines an event.

Elementary events : Suppose that we have conducted a random. Experiment. It is completely defined when we know all the possible out comes. Each outcome of this experiment is called an elementary event. Suppose a coin is tossed then either a head (H) or a tail (T) may turn up. Therefore head or Tail are two elementary events of the experiment of tossing a coin.

Sample Space : Sample space of a random experiment is the set of all possible outcomes is the set of all elementary events of experiments. that is the set of finite. and this set is

$S = \{H, T\}, \{1, 2 \dots 6\}$, two coin $\{HH, TT, TH, HT\}$,

Note when two random experiment having m out comes $e_1, e_2, \dots e_m$ and n out comes $P_1, P_2, P_3 \dots P_n$ respectively. are conducted simultaneously then the sample space consists of mn elementary events and hence is the set $S = \{(e_1, P_1) \dots (e_1 P_n), (e_m P_1) \dots (e_m P_n)\}$

$= \{(e_i, P_j) \mid i = 1, 2 \dots m, \ j = 1, 2 \dots n$

The order pair (e_i, P_j) means that e_i is the outcome of the first experiment and P_j is the outcome of the second experiment

If three coins are tossed simultaneously -

$s = \{ \quad \}$ throwing two dice $S = \{ \quad \}$ Now

Two balls are to be drawn simultaneously from a set of this red and 2 white white band.

R_1, R_2, R_3

$\{R_1R_2, R_1R_3, R_2R_3, R_1w_1, R_1w_2, R_2w_2, R_3w, R_2w_2, w_1w_2\}$. $5C_2 = 10$

Equally likely events

Let S be the Sample space of a random expriment. If all the elementary events of S have the same chance of occuring then the events are said to be equally likely events.

Mutually exclusive events

dice sum ≤ 4

Let the set E_1 of outcomes of the event A is $\{2,3,4\}$

" " E_2 " " " B : $\{ \quad \}$.

$S = \{2,3 \cdots 12\}$.

$E_1 \cap E_2 = \phi \Rightarrow$ The sets E_1, E_2 are disjoint. we then say that the events A and B are mutually exlusive.

That is one event has occured the other event cannot occur or two events cannot occur together.

Ex

Mutually exhastive events

Let S be the sample space of random experiment and $A_1, A_2, A_3 \ldots A_m$ be the events defined on the sample space If $A_1 \cup A_2 \cup \cdots \cup A_m = S$ and $A_i \cap A_j = \phi$, $i \neq j$ then the events are said to be exhaustive.

∴ The events are said to be mutually exclusive and exhastive.

Combination of events

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Now we consider combination of ~~eegs~~ events in an experiment. This can be done by using the operation 'or' 'and', 'not'

<u>Example</u> Throwing two dice simulteneously and noting the ~~tool~~ total of the numbers that have turned up.

and Define the events

A : sum is ≤ 5, B : $4 \leq$ sum ≤ 8, C : S $5 < sum < 8$

Let E_1, E_2 and E_3 denote the set of outcomes of the events A, B & C, respectively. $E_1 = \{2, 3, 4, 5\}$, $E_2 = \{4, 5, 6, 7, 8\}$, $E_3 = \{6, 7\}$

while sampling space $S = \{2, 3 - - - 12\}$.

We define the event A or B ~~as~~ as the event which occurs when either A or B or both occur. i.e. $A \cup B$,

$E = E_1 \cup E_2 = \{2, 3, 4, 5, 6, 7, 8\}$

event A and B $\Rightarrow$ as the ~~ear~~ event which occurs when A and B both occur. $\Rightarrow$ $A \cap B$ $\Rightarrow$ $E = E_1 \cap E_2 = \{4, 5\}$

We define the event not A $\Rightarrow$ the ~~too~~ event which occurs when A does not occur.

when A does not occur.

the set representing the evnt A.

If E_1 is the set representing

Then the set representing not A contains all elements of the sample spaces. which do not belong to E_1

That is A is representing by the complement in 'S' of the set E_1 which denoted by E_1^c / $\overline{E_1}$

$\therefore$ not A is also called the complementary event of A or negation of A

$\therefore$ A − B $\Rightarrow$ The event occur but not B.

- A coin is tossed Thrice. If event A denotes the the number of heads is odd' and the event B denotes the number of tails is odd then find the cases of favourable to $A \cap B$, $A \cup B$,

$S = \{HHH, HHT, HTH ---\}$

$A = \{HHH, HTT, THT, TTH\}$ $B = \{HHT, HTH, THH, TTT\}$

$A \cup B =$ —. $A \cap B = \{\} = \phi$,

$A \cap \bar{A} = \phi$,

probability of event

let ~~the set~~ E be the set of all outcomes of the event A. If the experiment produces an outcome which belongs to E then the event A is said to have occured and ~~n and me (M≤n)~~.

total number in sample space is 'n'

and total number in E is M.

Then probability of the event of A is denoted by $p = P(A)$ which is defined as ~~number of elementary~~

$$\frac{\text{number of elementary events favourable to E}}{\text{total number of equally likely elementary events}}$$

(or) is'

$P(A) = \frac{M}{n}$, This result is called the statistical defination of probability.

$P(\phi) = 0$, $P(S) = 1$

$0 \leq P(A), P(B) \leq 1$

→ Two dice are tossed once. Find the probability of getting an even number on the first dice or a total of 8.

A: getting an even number on the first dice

B: getting a total of 8

$A = \{(2,1) \cdots (2,6), (4,1), \cdots (4,1), (6,1) \cdots (6,6)\} \Rightarrow P(A) = \frac{18}{36} = \frac{1}{2}$

$B = \{(2,6), (3,5), (5,3) (6,2) (4,4)\} \Rightarrow P(B) = 5/36 =$

$A \cap B = \{(2,6), (4,4) (6,2)\} \Rightarrow P(A \cap B) = 3/36 = 1/12$

$P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{1}{2} + 5/36 - 1/12 = 5/9$

→ From a pack of well shuffled cards one card is drawn. Find the probability that this card is either a king or an ace

A: Card drawn is a king, B: Card drawn is an ace

54 — 4 king, of 4 aces,

$P(A) = 4/52 = 1/13$, $P(B) = \frac{1}{13}$, $P(A \cap B) = \phi$

$P(A \cup B) = P(A) + P(B) = 2/13$.

(or) total (8), $\underline{8c_1 / 52c_1}$

card.

→ Four cards are drawn. Find the probability that there are two hearts and two diamonds.

total number of possibility $= 52c_4 =$

Two hearts can be chosen in $13c_2$ ways

" diamo " " " $13c_2$ way.

required probability $\frac{13c_2 \times 13c_2}{52c_4} =$

→ A bag contains 4 red and 3 black balls. A second bag contains 2 red and 4 black balls. One bag is selected at random. From the selected bag one ball is drawn. Find the probability that the ball drawn is red.

A: The ball is drawn from the first bag
B: " " second bag.
Since both bags are equally likely to be selected:
we have $P(A) = P(B) = 1/2$
Now probability of drawing a red ball from the first bag $P_1 = \frac{4}{7} = 4+3$
" " " second $P_2 = \frac{2}{6} = 1/3$

$\therefore P(A) P_1 + P(B) P_2 = \frac{1}{2} \cdot 4/7 + \frac{1}{2} \cdot 1/3 = \frac{19}{42}$

→ A bag contains 6 red and 5 blue balls and another bag contains 5 red 8 blue balls. A ball is drawn from the first bag and without seeing its colour is put in the second bag. A ball is then drawn from the second bag. Find the probability that the ball drawn is blue in colour / red.

Sol Two cases arise. The ball drawn from the first bag is either red or blue

Case 1 Let the ball drawn from the first bag be red. The probability of drawing red ball from this bag is $= \frac{6}{11}$. The ball is now put in the second bag. The second bag has now 6 red and 8 blue.
The probability of drawing a ball of blue in colour is
$P_2 = 8/14$
probability of these two events occuring simultaneously is $P = P_1 P_2 = 6/11 \times 8/14 = 24/77$

Case 2 Let the ball drawn from the first bag be blue
The probability of drawing a blue ball from this bag is
$P_4 = 5/11$
The ball put in 2nd bag. then 5 red 9 blue ball
$P_5 = 9/14, \Rightarrow P = 5/11 \times 9/14 = 45/154$.

Three coins are tossed simultaneously, what is probability that at least two heads occur to :8, $4/8 = 1/2$,
at least one, atmost 2,

→ What is the probability that a number selected from numbers 1, 2 --- 20 is an even number, when each of the given numbers is equally likely to be selected.

Sol From the numbers 1, 2, -- 20, the even numbers are 2, 4, 6 -- 20, or total 10 even numbers.
Since each number is equally likely to be selected.
∴ the required probability $\frac{10}{20} = 1/2$

(Law of addition)

If A, B are any two events associated with a random experiment then $P(A\cup B) = P(A) + P(B) - P(A\cap B)$

Consider the Venn diagram A, B subset of S

$A\cup B = I + II + III$ these there are mutually exclusive theorem. $(P(A\cup B) = P(A) + P(B))$

$P(A\cup B) = P(I) + P(II) + P(III)$

$I = A - B = A - (A\cap B)$

$II = B - A$

$III = A\cap B$,

$= B - A\cap B$,

$A\cup B = (A-B)\cup(B-A)\cup A\cap B$.

$\therefore P(A\cup B) = P(A-B) + P(B-A) + P(A\cap B)$

$= P(A) - P(A\cap B) + P(B) - P(A\cap B) + P(A\cap B)$

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

mutually excl. — 0

$P(A\cup B\cup C) = P(A) + P(B) + P(C) - P(A\cap B) - P(B\cap C) - P(C\cap A) + P(A\cap B\cap C)$

$P(\text{not } A) = P(\bar{A}) = P(A^c) = 1 - P(A)$

$A\cup A^c = S \Rightarrow P(S) = P(A) + P(A^c) = 1$

$A\subset B \Rightarrow P(A) \le P(B)$

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→ Two dice are tossed once find the probability of getting an event number on the first dice or a total of 8, $S = 36$,

Conditional probability

The probability of happening of an event A under the condition that another event B is already known to happen is called conditional probability. It is denoted by

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

(OR) Let 'S' be the sample space of an experiment having n elementary. Let M_1 denote the number of elementary events favourable to B which are also favourable to A and M_2 denote the number of elementary ~~of elementary even~~ events in the sample space which are favourable to B $(M_2 \geq M_1)$

$M_1 \leq M_2$ $B \subseteq A$ ~~$A \subseteq B$~~ $A \subseteq B$. $B \subseteq A$.

$$P(A/B) = \frac{M_1}{M_2} = \frac{M_1/n}{M_2/n} = \frac{P(A \text{ and } B)}{P(B)} = \frac{P(A \cap B)}{P(B)}$$

$P(B) \neq 0$,

Illy the conditional probability of B when A has occured is given by

$$P(B/A) = \frac{P(B \text{ and } A)}{P(A)} = \frac{P(A \cap B)}{P(A)} \Rightarrow P(A \cap B) = P(A)P(B/A)$$
$$= P(B)P(B/A)$$

A dice is thrown twice and the sum of the numbers appearing is noted to be 8. What is the conditional probability that the number 5 has appeared atleast once

$A = \{(5,1)\ (5,2)\ ---\ (5,6),\ (1,5),(2,5)\ (3,5)\ (4,5)\ (6,5)\}$

= The number 5 appears atleast once

B = The sum of the number S appearing is 8

$= \{(2,6)\ (3,5),\ (5,3)\ (6,2)\}$ $A \cap B = \{(5,3),(3,5)\}$

$P(A) = \frac{4}{36}$, $P(B) = 5/36$ $P(A \cap B) = 2/36$

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = 2/5-4$$

$P(A) = 0.5$
$P(B) = 0.6$
$P(A \cup B) = 0.8$
$P(A/B)$
$P(B/A)$

$P(A), P(B)$
~~$P(A \cup \bar{B}) = 0.7$~~, $P(A) = 0.4$
$P(A \cap \bar{B}) = 1/4$, $P(A \cup B) = 3/4$

Mutually ~~exclusive~~ exhaustive event

Let S be the sample space of an random experiment and $A_1, A_2, A_3 --- A_m$ be the events defined on the sample space, If $A_1 \cup A_2 \cup A_3 -- \cup A_m = S$, and

$A_i \cap A_j = \phi$, if $i \neq j$,

Then events are said to be an mutually exclusive and exhaustive.

Probability of an Event.

To every event in random experiment we attach a numerical value which is called its probability. We denote the probability of the event A by P(A). and is defined as

$$P(A) = \frac{\text{number of elementary events favourable to } E}{\text{total number of equally likely elementary events}}$$

where E represents an event A.

This result is called the statistical definition of probability. $P(\phi) = 0$, and $P(S) = 1$,

A - any event, then $0 \leq P(A) \leq 1$,

This result is also an axiom of calculus of probability

Ex Three coins are tossed simultaneously. what is the probability that at least two tails occur.

$S = \{$ 4, A = at least two tails occur.

$P(A) = \frac{4}{8} = 1/4$

→ what is the probability that a number selected from the numbers 1, 2, 2 - - 20 is an even number $P(A) = \frac{10}{20} = 1/2$

→ Three dice are thrown simultaneously find the probability of appearing on the faces the sum is ≥ 6,

→ Two dice thrown is —

(i) getting sum is 8 (ii) getting a sum of at least 9

(ii) at most 5, (iv) getting sum is even.

Law of addition of probability.

→ If A and B are any two events associated with a random experiment then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Note ① If A and B are mutually exclusive (or) exhaustive events $A \cap B = \phi$, ⇒ $P(A \cap B) = P(\phi) = 0$.

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

② Let A, B & C are events then

$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C)$
$- P(A \cap C) + P(A \cap B \cap C)$.

③ $P(\text{not } A) = P(\bar{A}) = 1 - P(A)$, $(\bar{A} \cup A = S$.

④ $P(A \cup \bar{A}) = P(S) = 1$,

⑤ If $A \subset B$ ⇒ $P(A) \leq P(B)$

→ Two dice are tossed once. Find the probability of getting an even number on the first dice or total is 8.

Let define A: getting even number on dice B: getting total 8.

$P(A) = \{(2,1) \dots (2,6) \dots\} = 18$, ⇒ $P(A) = \frac{18}{36} = 1/2$

$B = \{(2,6) \dots (6,2)\} = 5$ ⇒ $P(B) = 5/36$

$A \cap B = 3$ ⇒ $P(A \cap B) = 3/36 = 1/12$

$P(A \cup B) = 1/2 + 5/36 - 1/12 = 5/9$

→ From a pack of well shuffled card. four cards are drawn. find probability three are two hearts and two diamonds.

$P(S) = {}^{52}C_4$, two hearts ${}^{13}C_2$ two diamonds ${}^{13}C_2$

required probab. $\frac{{}^{13}C_2 \times {}^{13}C_2}{{}^{52}C_4}$

→ What is the chance that a leap year selected at random will contain 53 Sundays.

leap year $366 \rightarrow 52$ full weeks, ⇒ 52 Sundays.

we have extra two days, — Mon, Tue, Tue-Wed, Wed-Thu

we have seven cases the two cases are favourable.

$= 2/7$

Conditional Probability

the probability of the random event A under the condition that the random event B has occured. ~~that~~ this probability is called as the conditional probability of A when B has occured. That is the probability of happening of an event A under the condition that another event B. is already known to happen.

and it is denoted by $P(A/B)$ and is defined as $P(A/B) = \cancel{P(A)} \cdot \frac{P(A \cap B)}{P(A)}$.

Let ~~n be the total number of outcomes in the first trail~~
~~m be favourable to the event A $\Rightarrow P(A) = \frac{m}{n}$~~

~~and~~

Let S be the sample space of an experiment having 'n' elementary events. Let m_1 be the number of elementary events favourable to B which are also favourable to A and M_2 be the number of elementary events in 'S' which are favourable to 'B' obviously $M_2 \geq m_1$

hence $P(A/B) = \frac{M_1}{M_2} = \frac{M_1/n}{M_2/n} = \frac{P(A \cap B)}{P(A)} = \frac{P(A \cap B)}{P(B)}$.

Multiplication Law of Probability

Let $P(A/B)$ and $P(B/A)$ denote the conditional probability of A when B has occured. and of B when A has occured then $P(A \cap B) = P(B)\,(P(A/B))$
$= P(A)\,P(B/A)$.

Note. Independent.

(1) The events are A & B are independent $\Leftrightarrow P(A \cap B) = P(A)P(B)$.

That is The events are Independent means the probability of event A does not depend on occurence or non-occurence of the event B. hence in this case the conditional probability $P(A/B)$ is same as $P(A)$

$P(A/B) = P(A)$, and $P(B/A) = P(B)$

Note let A, B are Independent then (i) $\bar{A}$ & $\bar{B}$ (ii) $\bar{A}$ & B

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A dice is thrown twice and the sum of the numbers appearing is noted to be 8. What is that conditional probability that the number 5 has appeared atleast once.

A : the number 5 appears atleast once

$= (5,1) \ldots (5,5) (5,6), (1,5) (2,5), (3,5) (6,5) \} = 11$

$P(A) = 11/36,$

B : The sum of the numbers appearing is 8

$= \{ (2,6), (3,5) (5,3), (4,4), (6,2) \} = 5 \Rightarrow P(B) = \frac{5}{36},$

$A \cap B = \{ (3,5) (5,3) \} \Rightarrow P(A \cap B) = 2/36$

$$P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{2/36}{5/36} = 2/5.$$

→ $P(A) = 0.5, P(B) = 0.6, P(A \cup B) = 0.8$ find $P(A/B), P(B/A)$

→ $P(A) = 0.6$ $P(B) = 0.4$ $P(A \cap B) = 0.25,$ $P(A/B)$ $P(B/A)$

→ $P(A) = 0.4$ $P(A \cup \bar{B}) = 0.7,$ A, B are independent find $P(B)$

→ $P(A \cap \bar{B}) = \frac{1}{4}$ $P(A \cup B) = 3/4$ find $P(B), P(A),$

→ P(.

Random variables

Let S be the sample space corresponding to a random experiment E. A random variable (RV) on a sample space S defines a function that assigns a real number $X(s)$, $s \in S$. that is a random variable defines a function $X: S \to R$, where S is the domain and range is $R = (-\infty, \infty)$. The set of all possible values of X which is a subset of R is called the range space R_X.

when the random variable X takes a value 'x' and its corresponding probability is defined as $p(X=x) = P(x)$.

Ex tossing a two coins, the random variable as the number of heads $x=0$, $x=1$, $x=2$, The corresponding probabilities.

$p(x=0) = \frac{1}{4}$, $p(x=1) = 2/4$, $p(x=2) = 1/4$

One Dimensional Random Variable.

① Discrete random variable ② Continuous random variables.

Random variable / stochastic variable / variable / chance variable.

A random variable is of two types.

(1) D.r. ② C.rv

Discrete random variable

A random variable X is said to be discrete if it takes a finite number or an infinite but countable number of values. we denote the possible values taken by X as $x_1, x_2 \cdots x_n \cdots$ which terminate in the finite case.

therefore, a real valued function X defined on a discrete sample space 'S' is called a discrete random variable.

Ex ① Tossing of a two coins, the possible values of the random variable (number of heads) are 0, 1, 2,

① Trowing a dice.

Note Discrete theoretical Distribution.

1) Binomial distribution 2) Poisson di- / 3) Rectangular dist
4) Multinomial distr (5) Negative Binomial, distr
(6) Geometric distribution. 7) Hyper-geometric distribution

probability function of D.R.V.

If for a discrete random variable X the real valued function $p(x)$ such that $P(X=x) = p(x)$ then $p(x)$ is called probability function / probability density function / of a DRV X. / point probability function / probability mass function

probability function $p(x)$ gives the measure of / probability for different value of X.

Note: Let X be a DRV which takes values $x_1, x_2, x_3 \ldots$ and let $P(X=x_i) = P(x_i) = p_i$ is probability function.

and it satisfies the following condition.

(i) $p_i \geq 0 \ \forall i$ (ii) $\sum_{i=1} p_i = 1$.

Note: The collection of pairs (x_i, p_i) $i = 1, 2, 3 \ldots$

X	x_i	x_2	x_3	----
$P(X=x_i)$	p_i	p_2	p_3	....

is called the probability distribution / the discrete probability distribution of the discrete random variable X.

Ex From a lot of 12 items containing 3 defective items. a sample of 4 items are drawn at random. without replacement. Let a random variable X denote the number of defective items in the sample.

Find the probability distribution of X.

$x=0 \Rightarrow P(x=0) = \frac{9C_4}{12C_4} = \frac{14}{55}$, $P(X=1) = \frac{9C_3\,3C_1}{12C_4} =$ $P(X=2), P(X=3)$
no def one def

Probability mass function.

If X is discrete RV then its probability function $P(x)$ is a discrete probability function / probability mass function. In other words. Let $x_1, x_2, \dots x_n$ are n different values of a discrete RV X and $P(x_1), P(x_2) \dots P(x_n)$ be their respective probability such that:

(i) $P(x_i) \geq 0$ (ii) $\sum_{i=1}^{n} P(x_i) = 1$ $i = 1, 2, 3, \dots n$.

then $P(x)$ is known as the probability mass function of the variable X.

and the values $P(x_i)$; $i = 1, 2 \dots 3n$ are called as the probability distribution of the random variable X.

Variance standard Deviation:

The standard deviation of the probability distribution of a random variable X is the positive square-root of the variance of that random variable.

$$S.D = \sigma = \sqrt{E(X^2) - (E(X))^2} = \sqrt{E(X - E(X))^2} = \sqrt{E(X^2) - \mu^2}$$

Note $V(cX) = c^2 V(X)$, $V(c) = 0$; $V(X+c) = V(X)$.

$V(aX+b) = a^2 V(X)$, $\cancel{V(aX+b)}$

If X, Y are two independent RV then

$V(X \pm Y) = V(X) + V(Y)$.

Distribution function / cumulative distribution

Let X be a RV then the ~~function~~ $F(x)$ the distribution function ~~is~~ of RV X is denoted by $F(x)$ and is defined as $F(x) = P(X \leq x)$. and It has the following properties

$= \sum_{x_i < x} P(x_i)$, (1)

(1) $0 \leq F(x) \leq 1$, (11) If $x_1 < x_2 \Rightarrow F(x_1) < F(x_2)$

$P(a \leq X \leq b) = F(b) - F(a)$.

mathematical expectation / Expected values / Mean of random Variable

The mean of random variable is obtained by multiplying each probable value of the variable by its corresponding probability and then adding these products.

Let a random variable X assumes the value $x_1, x_2 \ldots x_n$ with probabilities $p_1, p_2, p \ldots p_n$ resp. The mean of RV X denoted by $E(X)$ or μ.

$$E(X) = x_1 p_1 + x_2 p_2 + \cdots + x_n p_n = \sum_{i=1}^{n} x_i p_i$$

Note $E(x)$, let X, Y are RV and a, b, c are constants

(1) → $E(c) = c$, → $E(cX) = cE(X)$, → $E(aX \pm b) = aE(X) \pm b$,

→ $E\left(\frac{aX+b}{c}\right) = \frac{1}{c}[aE(X)+b]$,

→ $E(X+Y) = E(X) + E(Y)$.

→ $E(X \cdot Y) = E(X) \cdot E(Y)$ if X, Y independent.

→ $E\left(\frac{1}{X}\right)$ and $\frac{1}{E(X)}$ are not same.

→ $E[X - E(X)] = 0$.

Variance

Variance of the probability distribution of a random variable X is the mathematical expectation of $[X - E(X)]^2$

Then $Var(X) = E(X - E(X))^2$

$\sigma^2 / V(X)$

$$= \sum_{i=1}^{n} [x_i - E(X)]^2 p_i$$

$$= \sum_{i=1}^{n} [x_i^2 + [E(X)]^2 - 2x_i E(X)] p_i$$

$$= \sum_{i=1}^{n} x_i^2 p_i + \sum_{i=1}^{n} (E(X))^2 p_i - 2E(X) \sum_{i=1}^{n} x_i p_i$$

$$= E(x^2) + (E(X))^2 - 2E(X) \cdot E(X)$$

$$= E(X)^2 + (E(X))^2 - 2E(X)^2 = E(X^2) - (E(X))^2$$

-> Mean and s.d of a RV X are 5 and 4 resp. Then find $E(X^2)$ and s.d of $(5-3X)$

Find the variance of x from the following da

x	2.0	3.5	4.5	5.0	6.0
p	0.1	0.2	0.4	0.2	0.1

$E(X) = 4.3$, $E(X^2) = 19.55$

$V(X) = 1.06$.

-> Daily demand for transistors is having the following probability distribution.

Demand	1	2	3	4	5	6
probability	0.10	0.15	0.20	0.25	0.18	0.12

Determine the expected dialy demand for transistor and find variance.

-> The the probability distribution of a RVX is given belo. Find $E(X)$, $V(X)$, $E(2x-3)$, $V(2X-3)$.

x	-2	-1	0	1	2
P	0.2	0.1	0.3	0.3	0.1

-> A RV X has the following probability distribution

$X=x_i$	0	1	2	3	4
$P(X=x_i)$	c	2c	2c	c^2	$5c^2$

find 'c' $P(X<3)$, $P(0<X<4)$

0	1	2	3	4	5	6	7
0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

k, $P(X \le x) > 1/2$, $P(X<6)$ $P(0<X<5)$ $P(X \ge 6)$,

0	1	2
0	k	2k

$X=x_i$	0	1	2	3	4	5	6
$P(x_i)$	k	3k	5k	7k	9k	11k	13k

$P(X<4)$, $P(X \ge 5)$, $P(3 \le X \le 6)$

what will be the minimum value of k so that $P(X \le 3) > 3$,

y	1 2 3 4 5	
p	c c 3c c^2+c $6c^2$	

or

x	-2	-1	0	1	2	3
p	0.1	k	0.2	2k	0.3	k
	1/6	M	1/4	M	1/6	

M, V.