Probability

$$P_{coin} = \frac{1}{2}$$

$$P_{Dice} = \frac{1}{6}$$

Probability is a measure of the likelihood of an event / experiment.

Rules of prob.

① mutual exclusive event

2 event are mutual exclusive if they cannot occur at the same time.

Coin = H/T

Dice = 1/2/3/4/5/6

non-mutual exclusive

2 event are non-mutual exclusive if they can occur at same time.

Card ⇒

$P_{\text{King and } \diamondsuit} = \frac{4}{52}$

$= \frac{1}{52}$

4 ♠ ♣ ♥ ♦

$P_{\diamondsuit} = \frac{13}{52}$

Probability multiplication Rule

Independent event

Two events are ind. if they donot affect one another

Dependent event

Two event are Depend. if they do affect one another

Independent

Coin => 3 time flip

$P_{coin} = \frac{1}{2}$

$P_{coin} = \frac{1}{2}$

$P_{coin} = \frac{1}{2}$

Dependent

card = 3 time exp.

$P_{Prokmg} = \frac{4}{52}$

$P_{Prokmg} = \frac{3}{51}$

$P_{Prokmg} = \frac{2}{50}$

$P_r(A \text{ and } B) = P(A) \times P(B)$

$P_r(A \text{ and } B) = P(A) * P\left(\frac{B}{A}\right)$

Indep. $P_{coin} = \frac{1}{2} * \frac{1}{2} \times \frac{1}{2} \Rightarrow \frac{1}{8} \Rightarrow 0.125$

$\Rightarrow$

Depend. $P_{queen} = \frac{\cancel{14}}{\cancel{52}\ 13} \times \frac{1}{\cancel{51}\ 17} \times \frac{1}{\cancel{50}\ 25} \Rightarrow \frac{1}{5525} =$

$\Rightarrow$ 0.00018

Permutation

Eg:- In a school trip 50 students

→ facing chocolate (6 chocolate)

⇒ Dairy milk, Star, milkibar, kitkat, perk, munch.

$\Rightarrow$ n = # of object

r = # of object you picking

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

$$^{6}P_{3} = \frac{6!}{(6-3)!}$$

$$= \frac{6 \times 5 \times 4 \times \cancel{3 \times 2 \times 1}}{\cancel{3 \times 2 \times 1}}$$

$^{6}P_{3} \Rightarrow 120$

Combination

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

$$= \frac{^{3}\cancel{6} \times 5 \times \cancel{4}^{2} \times \cancel{3 \times 2 \times 1}}{\cancel{3 \times 2 \times 1} \times \cancel{3 \times 2 \times 1}} \Rightarrow 20$$

1, 2, 3, 4, 5, 6

1,2,3
1,3,4
1,5,6
2,4,5
2,3,4

1,2,3
3,2,1
2,1 3
3,1,2
2,3,1
1,3,2

20 x 6

120

✡ pearson correlation coffiecint

Eco. growth	Nifty 50 index
2.1	8
2.5	12
3.6	10
4.0	14

Formula – $\rho_{(x,y)} = \frac{Cov(x,y)}{\sigma_x * \sigma_y}$

Standard devi $\sigma_x = \sqrt{\sum_{i=1}^{n} \frac{(x_i - \bar{x})^2}{n-1}}$

$= \frac{(-1)^2 + (-0.6)^2 + (0.9)^2 + (0.5)^2}{4-1}$

$= \frac{1 + 0.36 + 0.81 + 0.25}{3}$

$= \sqrt{0.8060} = \boxed{0.8978}$

$\sigma_y = \sqrt{\sum_{i=1}^{n} \frac{(y_i - \bar{y})^2}{n-1}}$

$= \frac{(-3)^2 + (1)^2 + (3)^2 + (-1)^2}{4-1}$

$\Rightarrow \frac{9 + 1 + 9 + 1}{3} = \sqrt{\frac{20}{3}}$

$\Rightarrow \sqrt{6.66} = \boxed{2.58}$

$$\rho_{(x,y)} = \frac{Cov(x,y)}{\sigma_x \sigma_y}$$

$$= \frac{1.533}{(0.89)(2.58)}$$

$$= 0.66$$

Correlation = 66%