Q NO 1

A man throws two fair dice, what is Conditional probability that the Sum of the two dice will be 7 given that

1) The Sum is even
2) The Sum is greater then 8
3) The two dice had the Same outcome.

Ans :

$$
\begin{aligned}
S = \{ & (1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (1,7), (1,8) \\
& (2,1), (2,2), (2,3), (2,4), (2,5), (2,6), (2,7), (2,8) \\
& (3,1), (3,2), (3,3), (3,4), (3,5), (3,6), (3,7), (3,8) \\
& (4,1), (4,2), (4,3), (4,4), (4,5), (4,6), (4,7), (4,8) \\
& (5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (5,7), (5,8) \\
& (6,1), (6,2), (6,3), (6,4), (6,5), (6,6), (6,7), (6,8) \\
& (7,1), (7,2), (7,3), (7,4), (7,5), (7,6), (7,7), (7,8) \\
& (8,1), (8,2), (8,3), (8,4), (8,5), (8,6), (8,7), (8,8) \}
\end{aligned}
$$

Let :

A = { The Sum is 7 }

(2)

B = { The Sum is even }
C = { The Sum is greater then 8 }
D = { The two disc had the same outcome }

NOW

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

$B = \{(1,1),(1,3),(1,5),(1,7),(2,2),(2,4),(2,6),(2,8)$
$(3,1),(3,3),(3,5),(3,7),(4,2),(4,4),(4,6)$
$(4,8),(5,1),(5,3),(5,5),(5,7),(6,2)$
$(6,4),(6,6),(6,8),(7,1),(7,3)(7,5)$
$(7,7),(8,2)(8,4),(8,6),(8,8)\}$

$C = \{(1,8),(2,7),(2,8),(3,6),(3,7),(3,8)$
$(4,5),(4,6),(4,7),(4,8),(5,4)(5,5)$
$(5,6),(5,7),(5,8),(6,3),(6,4),(6,5)$
$(6,6),(6,7),(6,8),(7,2),(7,3),(7,4)$
$(7,5),(7,6),(7,7),(7,8),(8,1),(8,2)$
$(8,3),(8,4),(8,5),(8,6),(8,7)$
$8,8\}$

$D = \{(1,1),(2,2),(3,3),(4,4),(5,5$
$(6,6),(7,7),(8,8)\}$

(3)

$A \cap B = \{ \ \}$ OR ϕ

$A \cap C = \{ \ \}$

$A \cap D = \{ \ \}$

$P(A) = 6/64$, $P(B) = 32/64$

$P(C) = 36/64$, $P(D) = 8/64$

$P(A \cap B) = 0$, $P(A \cap C) = 0$, $P(A \cap D) = 0$

Hance

$$P(A/B) = \frac{P(A \cap B}{P(B)} = 0 \times 3\cancel{2}/6$$

$$P(A/B) = 0$$

$$P(A/C) = \frac{(P(A \cap C)}{P(C)} = 0 \times 36/64$$

$$P(A/D) = \frac{P(A \cap D)}{P(D)} = 0 \times 8/64$$

$$P(A/D) = 0$$

Q NO 2

Show that in a single throw of two dice the probability of throwing more then 7 is eaqual to that of throwing is less than 7, and hance find the probabilty of throwing execty 7 state clearly uear assumption you are making.

Ans :

when we are rolling two ~~device~~ dice there are 36 diffrent Combinat counting those up there are 15 possibilities are less then 7

(1,1),(1,2),(1,3),(1,4),(1,5),(2,1),(2,2) (2,3), (2,4), (3,1),(3,2),(3,3),(4,1) (4,2),(5,1) The probability of getting less than a 7 is

$$15/36 = 5/12$$

These are 6 possible combination of getting a 7 : (1,6),(2,5) (3,4) (4,3) (5,2) (6,1) which gives a Probabily of

$$6/36 = 1/6$$

This mean that 21 possibilities account for getting less then are equal to 7 this is the same as the possibilty of getting less then 7 so the probabilty must be $5/12$ as well in calculating this we must asume that each combination is equaly linked to roll as any other up therefore the dice are fair or ellso the calculation don't work.

Q NO 3

A and A play a game in wich A's probability of wining is 2/3. In a series of 8 games, what is the probability that A will win.

1. Exactly 4 games
2. at least 4 games
3. from 3 to 6 games

Ans :-

Given that $p = 2/3$ $n = 8$

$$q = 1 - P$$
$$= 1 - 2/3$$
$$q = \frac{1}{3}$$

Let "x" denotes the number of genes won by A Then

(i) $P(x=4)$

$$= \binom{8}{4}\left(\frac{2}{3}\right)^4\left(\frac{1}{3}\right)^4$$

$$= \frac{1120}{6561}$$

$$= 0.1707$$

ii) $P(x \geq 4)$

$= 1 - P(x < 4)$

$= 1 - \sum_{x=0}^{3} \binom{8}{x} \left(\frac{2}{3}\right)^{x} \left(\frac{1}{3}\right)^{8-x}$

$= 1 - \left[\left(\frac{1}{3}\right)^{8} + 8\left(\frac{2}{3}\right)\left(\frac{1}{3}\right)^{7} + 28\left(\frac{2}{3}\right)^{2}\left(\frac{1}{3}\right)^{6} + 56\left(\frac{2}{3}\right)^{3}\left(\frac{1}{3}\right)^{5} \right]$

$= 1 - \frac{1}{6561}\left[1 + 16 + 112 + 448\right]$

$= 1 - \frac{577}{6561}$

$= \frac{6561 - 577}{6561}$

$= \frac{5984}{6561}$

$= 0.9121$

(iii) $P(3 \leq x \leq 6) \sum_{x=3}^{6} \binom{8}{x} \left(\frac{2}{3}\right)^{x} \left(\frac{1}{3}\right)^{8-x}$

$= \binom{8}{3}\left(\frac{2}{3}\right)^{3}\left(\frac{1}{3}\right)^{5} + \binom{8}{4}\left(\frac{2}{3}\right)^{4}\left(\frac{1}{3}\right)^{4} + \binom{8}{5}\left(\frac{2}{3}\right)^{5}\left(\frac{1}{3}\right)^{3} + \binom{8}{6}\left(\frac{2}{3}\right)^{6}\left(\frac{1}{3}\right)^{2}$

$= \frac{8}{(3)^8}\left[56 + 140 + 224 + 224\right] \Rightarrow \frac{5152}{651}$

$= 0.7852$

Q NO 4

Let $C_1, C_2 \ldots C_M$ C1, C2.... CM be a partition of the Simple Space SS & BB be two events Supose we know that

1. A & B are Conditionally independent given C_i for all $i \in (1, 2 \ldots M)$ &

. B is independent of all C_i S

Ans:

Proof: Since the C_i's from a partition of the Sample Space we can apply the law of total probability for $A \cap B$.

$$P(A \cap B) = \sum_{i=1}^{M} P(A \cap B \mid C_i)\, P(C_i)$$

$$P(A \cap B) = \sum_{i=1}^{n} P(A \mid C_i)\, P(B / C_i)\, P(C_i)$$

(A and B are Conditionally independent.

$$P(A \cap B) = \sum_{i=1}^{n} P(A/C_i)\, P(B)\, P(C_i)$$

$\because$ (B is independent of all C_i's)

$$P(A \cap B) = P(B)\, P(A)$$

$$P(A \cap B) = P(B)\, P(A)$$

(law of total probability)

Hence A & B are independent

$\longleftrightarrow$

O

Q5

Dolve the binominal distribution and find its mean and variance.

ans

Mean and Variance of binominal Rondom variables.

The Probability function for a binomina' random variable is

$$b(x, n, P) = \binom{n}{x} p^{x} (1-P)^{n-2}$$

This is the probability of having is successes in a series of independent trails when the probability of success is any one of the trails is p. if x is a random variable with the probability distribution

$$F(x) = \sum_{2=0}^{m} n \binom{n}{x} p^{x} (1-P)^{n-x}$$

$$= \sum_{2=0}^{m} n \frac{n}{m(n-x)} P^{x} (1-P)^{n-x}$$

$$= \sum_{2=1}^{m} \frac{m}{(x-1)(n-x)} p^{x} (1-p)^{n-x}$$

Since $x=0$ term vanishes Let $y = x$ & $m = n-1$ Subbing $n = y = 1$ & $m = m+1$ into the last sum

$$E=(x)=\sum_{y=0}^{m}\frac{(m+1)!}{y!(m-y)!}p^{y+1}(1-p)^{m-y}$$

$$=(m+1)p\sum_{y=0}^{m}\frac{m!}{y!(m-y)!}a^{y}b^{m-y}$$

$$=np\sum_{y=0}^{m}\frac{m!}{y!(m-y)!}p^{y}(bp)^{m-y}$$

By Binominal theorom

$$=(a+b)^{m}=\sum_{y=0}^{m}\frac{m!}{y!(m-y)!}a^{y}b^{m-y}$$

Set $a=p$ and $b=1-P$

$$=\sum_{y=0}^{m}\frac{m!}{y!(m-y)}p^{y}(1-p)^{m-y}$$

$$=\sum_{y=0}^{m}\frac{m!}{y!(m-y)!}a^{y}b^{m-y}$$

$$=(a+b)^{m}$$

$$=(P+1-P)^{n}$$

$$=1$$

So That

$$\boxed{E(X)=np}$$

Similar but this

$y = n-2 \quad , m = n-2$

$E = (x(x-1)) , \sum_{x=0}^{n} x(x-1)\binom{n}{x} p^x (1-p)^{n-x}$

$= \sum_{x=0}^{n} x(x-1) \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$

$= n(n-1)p^2 \sum_{n=2}^{n} \frac{(n-2)!}{(x-2)(n-x)!} p^{x-2} (1-p)^{n-x}$

$= n(n-1)p^2 \sum_{y=0}^{m} \frac{m!}{y!(m-y)!} (p^y (1-p)^{m-y}$

$= n(n-1)p^2 (p+(1-p))^m$

$= n(n-1)p^2$

So the variance of six

$= (x^2) - E(x)^2 = E(x(x-1)) + E(x)$

$E(x^2) = (n(n-1)p^2 - (np)$

$= np(1-p)$

Q NO 6

Differentiate b/w Binominal frequency distribution and Bi-nominal distribution with the help of formulas?

Bi-nominal Distribution

A binominal distribution can be through of as simply the probability of a success or failure oute come in an experiment or survey that it repeated multipols time.

Bi-nominal frequency distribution

if the bi-nominal probability distribution is multiplyed by N the number of experiment or sets are resulting distribution is known as the binominal frequency distribution

$$N\binom{n}{x}p^{x}q^{n-x}$$

Q NO 7

Coefficient Of Variation:

For Data Set A

$CV = \frac{\sigma}{\mu} \times 100$

$CV = \frac{3}{45} \times 100$

$\boxed{CV = 6.7}$

For Data Set B

$CV = \frac{11}{60} \times 100$

$\boxed{C.V = 18.3}$

For Data Set C

$CV = \frac{5}{50} \times 100$

$\boxed{CV = 10}$

For Data Set D

$CV = \frac{15}{25} \times 100$

$\boxed{CV = 60}$