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Dept # BS (cs) 4th Semester.
Submitted To Daud khan khalil
Subject :

QNO 1:-

Answer:- 1:-

{(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)}

Set

A = { The sum is 7 }.

B: B = {The sum is even}

C = {The sum is greater than 8}

D = {The two disc had the same outcomes}

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)}

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$A \cap B = \{ \}$ OR $\emptyset$

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

$P(A) = 6/64$, $P(B) = 32/64$
$P(C) = 36/64$, $P(D) = 8/64$

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

Hence, $P(A/B) = \dfrac{P\ A \cap B}{P(B)} = 0 \times 32/6$

$P(A/B) = 0$

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

$P(A/C) = 0$

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

$P(A/D) = 0$

Question No 3:

Answer:

1:- Exactly 4 games.

2:- At least 4 games

3:- From 3 to 6 games.

Sol:

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

$$q = 1 - p$$
$$= 1 - 2/3$$
$$q = 1/3$$

Let "x" denotes the number of games won by A, Then

(i) $P(x = 4)$

$$= \binom{8}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^4$$
$$= \frac{1120}{6561}$$
$$= 0.1707$$

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(ii) $P(x \geq 4)$

$$= 1 - (P(x < 4))$$

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

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

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

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

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

$$= \frac{5984}{6561}$$

$$(= 0.9121)$$

iii) $P(3 \leq x \leq 6)$

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

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

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

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

$$= \frac{8 \times 644}{6561}$$

$$= \frac{5152}{6561}$$

$$\boxed{= 0.7852}$$

Q No 4:

Answer:

Proof:

Since the C_i's form a partition of the sample space, we can apply the law of total probability for $A \cap B$

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

∵ (A and B are conditionally independant

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

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

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

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

$\therefore$ (law of total probability)

Hence A and B are independant.

QNo5:-

Ans:-

Mean and variance of Binomial Random variables

The probability function for a binomial random variable is

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

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

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

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

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

Since $x=0$ term vanishes let $y = x-1$ and $m = n-1$, subbing $x = y+1$ and $n = m+1$ into the last sum

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

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

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

By Binomial theorm

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

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

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

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

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

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

$$= 1$$

So that

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

Similarly but this time using

$y = x-2$ and $m = n-2$.

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

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

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

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

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

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

$$= n(n-1)p^{2}.$$

So the variance of X is

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

$$= \boxed{np(1-p)}$$

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Q No 08

Ans:- Binomial Distribution.

A binomial distribution can be though of as simply the probability of a success or Failure outcome in an experiment or survey that is repeated multiple times.

$$p(x-x) \quad f(x) = {}^{n}C_{x} \, p^{x} q^{n-x}$$

Bi-nomial frequency Distribution:-

if the binomial probability distribution is multiplied by N, the number of experiments or sets. the resulting distributing is known as the Bi-nomial frequency distribution.

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

QNo 2:-

Answer:- When we are rolling two dice, there are 36 different combination counting those up, there are 15 possibilities less than 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), ~~(3,~~(4,1), (4,2), (5,1).

The probability of getting less than a 7 is

$$\frac{15}{36} = \frac{5}{12}$$

There are 6 possible combinations of getting a 7: (1,6), (2,5), (3,4), (4,3), (5,2), (6,1). which gives a probability of $6/36 = 1/6$

This means that 21 possibilities account for getting less than or equal to 7, so there are 15 remaining possibilities of getting less than 7. This is the same as the probability of getting less than 7. so the probability must be 5/12 as well. In calculating this, we must assume that each combination is equally likely to roll as any other and therefore the dice are fair or else the calculating don't work.

Q No 7:

Answer:-

Coefficient of variation:-

For Data Set A:-

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

$$CV = 3/45 \times 100$$

$$CV = 6.7$$

For Data set B:-

$CV = 11/60 \times 100$

$\boxed{CV = 18.3}$

For Data Set C:

$CV = 5/50 \times 100$

$\boxed{CV = 10}$

For Data Set D:

$CV = 15/25 \times 100$

$\boxed{CV = 60}$