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Subject Probability & Stat

Dept BS(CS)

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Q1 $\{(1,1),(1,2) \ldots (6,5),(6,6)\}$

A = {The sum is 7}

B = {The sum is even}

C = {The sum is greater than 8}

D = {Same outcome}

Then,

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

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

$C = \{(3,6),(4,5),(4,6),(5,4),(5,5)$
$(5,6),(6,3),(6,4),(6,5),(6,6)\}$

$D = \{(1,1), (2,2), (3,3), (4,4)$ Q2
$(5,5), (6,6)\}$ Ans:

$A \cap B = 0$
$A \cap C = 0$
$A \cap D = 0$

$P(A) = \frac{6}{36}$, $P(B) = \frac{18}{36}$, $P(C) = \frac{10}{36}$

$P(D) = \frac{6}{36}$

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

Hence

$P(A|B) = 0$

$P(A|C) = P\frac{(A \cap C)}{P(B)} = 0$

$P(A|D) = 0$

Q2

Ans When we are rolting two dice there are 36 different Combination Counting those up there are 15 Possibility 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), (4,1), (4,2), (5,1) than Probability of gatting less than a 7 is

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

There are 6 possible Combination of gatting a 7 : (1,6) (2,5), (3,4) (4,3), (5,2), (6,1) which gives a $\frac{6}{36} = \frac{1}{6}$

This mean that 21 Posibilities account for getting less than or equal to 7. so there are 15 reming Possibilities of gatting more than 7.

This is the same as Posibility of getting less than 7. So the prabability must be $\frac{5}{12}$ as well.
In calculating this we must assume that each combination is equal likely to all as any other and therefure the dice are fair.
or else the calculation don't work.

Q3

Ans.

$$P = \frac{2}{3}$$

$$n = 8$$

$$q = 1 - P$$

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

$$q = \frac{1}{3}$$

i) $P(x=4)$

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

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

$$= 0.1707$$

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Q5

Ans:

Means and varience of Binomial Random variable.

The Probability function for a binomial random variable is

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

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

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

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

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

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

By Binomial theorm.

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

Set $a = d$ & $b = 1-p$

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

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

$(a+b)^m$

$(p+1-p)^m$

$= 1$

So that

$f(x) = np$

$y = x-2$ & $m = n-2$

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

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

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So the variance of x is

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

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

$= np(1-p).$

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(law of total Probability)

Hence A & B are independent.

Q6

Bi-nomial Distribution:
A Bi-nomial distribution Can be though of as simply the Probability of a Success or failure Outcome in an expirement or Survey that is repeated multiple time.

$$P(n\text{-}v)\ f(x) = {}^{n}C_{x}\, P^{x}\, q^{n-x}$$

Bi-nomial frequency Distribution:-
If the Bi-nomial probability distribution is multiplied by N; number of experiment or sets the resulting

or Survey distribute is
is know as the bi-nomial
frequency distribution.

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

Q7

Coefficient of Variation.

Data Set A:-

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

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

$$CV = 6.7$$

Data Set B:-

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

$$CV = 18.3$$

Or Survey distribute is is know as the bi-normal frequency distribution.

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

Q7

Coefficient of Variation

Data Set A:-

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

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

$$CV = 6.7$$

Data Set B:-

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

$$CV = 18.3$$

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Data Set C:

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

$$CV = 10$$

Data Set D:-

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

$$CV = 60$$

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

$1 - P(x < 4)$

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

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

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

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

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

$$= 0.9121$$

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

$$\sum_{x=3}^{6} \binom{8}{x} \left(\frac{2}{3}\right)^{x} \left(\frac{1}{3}\right)^{8-4}$$

$-x$

$\left(\frac{2}{3}\right)^3$

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

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

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

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

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

$$= 0.7852$$