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QUESTION

Given that

$\Rightarrow$ $p = 2/3$ $n = 8$

$\Rightarrow$ $q = 1 - p$

$\Rightarrow$ $= 1 - 2/3$

$\Rightarrow$ $q = 1/3$

$\Rightarrow$ Let "x" denotes the number of games won by it. Then

P(x = 4)

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

$\Rightarrow$ $1120/6561$

$\Rightarrow$ 0.1707

P(x ≥ 4)

$\Rightarrow$ $1 - P(x < 4)$

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

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

$$\Rightarrow 1-\tfrac{1}{6561}\left[1+16+112+448\right]$$

$$\Rightarrow 1-\tfrac{577}{6561}$$

$$\Rightarrow \tfrac{6561-577}{6561}$$

$$\Rightarrow \tfrac{5984}{6561}$$

$$\Rightarrow 0.9121$$

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

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

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

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

$\Rightarrow 8 \times 644 / 6561$

$\Rightarrow 5152 / 6561$

$\Rightarrow 0.7852$

QUESTION

Binomial distribuation

A Binomial distribuation can be through of as simply the probability of a success or failure outcome in an experiment or survey that is repeated multiple times

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

Binomial frequency dist

if the binomial probability distribution is multiplied by N the number of experiments or sets. The resulting distribution is know as the binomial frequency dist

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

QUESTION

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

$$P(A \cap B) = \sum_{i} P(A \cap B) C \, P(C)$$

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

$\therefore$ A and B are conditionally independant.

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

$\therefore$ 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 indepen dent

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QUESTION

Mean and variance of Binomial variables-

The probability function for a binomial random variable is

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

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

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

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

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

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

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

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

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

By Binomial theoram

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

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

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

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

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

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

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

$$= 1$$

$E(x) = np$

Simialarly.

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

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

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

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

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

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

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

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

So the variance of x is

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

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

$$= np(1-p)$$

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QUESTION

when we are ratting two ~~device~~ dice there are 36 diff 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) (4,1) (4,) (5,1) probability of gatting less than $15/36 = 5/12$ There are 6 possible Combination of getting a 7: (1,6) (2,5), (3,4) (4,3) (5,2) (6,1) which gives a prob of

$$6/36 = 1/6$$

This mean that 21 possibilities account for getting less than or equal to 7. This is the same as the Prob of getting less than 7. So the prob must be 5/12 as well. Calculating this we must assume each Combination is equa lly and therefore the dice are fair or else the calculation don't work.

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QUESTION

For Data Set A

$CV = \sigma/\mu \times 100$

$CV = 3/45 \times 100$

$CV = 6.7$

For Data Set B

$CV = 11/60 \times 100$

$CV = 18.3$

For Data Set C

$CV = 5/50 \times 100$

$CV = 10$

For Data Set D

$CV = 15/25 \times 100$

$CV = 60$

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QUESTION

B = { The sum is even }

C = { The sum is greater then 8 }

D = { The ~~two~~ two dise had the same outcomes }

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

det

$A = \{$ The sum is 7 $\}$

$A \cap B = \{ \}$

$A \cap C = \{ \}$

$A \cap D = \{ \}$

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

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

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(12)

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

Hence

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

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

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

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

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

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