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Q1: ANS: **Solution:-** Sample space for Too fair dice.

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

Let
A = the sum is 7
B = Sum is odd
C = Sum is greater than 8
D = Two dice had same outcome.

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

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

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

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

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

$A \cap C = \phi$

$A \cap D = \phi$

i): $P(A/B) = ?$

$P(A) = 6/36, \quad P(B) = 18/36, \quad P(C) = 10/36, \quad P(D) = 6/36$

$P(A \cap B) = 6/36, \quad P(A \cap C) = 0, \quad P(A \cap D) = 0$

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Now $P(A/B) = \frac{P(A \cap B)}{P(B)} = \frac{6/36}{18/36} = 6/18 = \frac{1}{3}$

$\boxed{P(A/B) = 1/3}$

ii): $P(A/C) = \frac{P(A \cap C)}{P(C)} = \frac{0}{10/36} = 0$

$\boxed{P(A/C) = 0}$

iii): $P(A/D) = \frac{P(A \cap D)}{P(D)} = \frac{0}{6/36} = 0$

$\boxed{P(A/D) = 0}$

X———X

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Q2:-

ANS:-)

i) A = more than 7 ?

ii) B = Less than 7?

iii) C = Exactly 7?

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

$(6,3)(6,4)(6,5)(6,6)\}$

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

$(4,1)(4,2)(5,1)\}$

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

$P(A) = \frac{n(A)}{n(S)} = \frac{15}{36}$

$P(A) = \frac{15}{36}$

$P(B) \frac{n(B)}{n(S)} = \frac{15}{36}$

Hence proved

$\boxed{P(A) = P(B) = \frac{15}{36}}$

Now

P(c) exactly 7

$P(c) \frac{n(c)}{n(S)} = \cancel{\frac{6}{36}} \frac{1}{6}$

$\boxed{P(c) = 1/6}$

P.T.O

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Q #1 2 **Assumption:-** By throwing a Simgple of two dice there are 36 possibilities. It can give us 7, more than 7, & also Less than 7 So we pick from the Combination Series for only & exactly 7, more than 7 & also less than 7 & then Find there possibilities Through which we find that probability for mor than 7 & less than 7 are equal which are $15/36$ & probility for exactly 7 are $6/36$ or $1/6$.

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Q3 :
ANS :

By binomial distribution

$$P(X=x) = \binom{n}{x} p^x q^{n-x}$$

$P(A) = 2/3$

$p = 2/3$, $q = 1/3$, $n = 8$

i) exactly four games $x=4$

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

$$= 70(0.1975)(0.01234)$$

$$\boxed{P(x=4) = 0.1706}$$

ii) At least 4 games.

$$P(x \geq 4) = \binom{8}{4}\left(\frac{2}{3}\right)^4\left(\frac{1}{3}\right)^4 + \binom{8}{5}\left(\frac{2}{3}\right)^5\left(\frac{1}{3}\right)^3 + \binom{8}{6}\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^2 + \binom{8}{7}\left(\frac{2}{3}\right)^7\left(\frac{1}{3}\right) + \binom{8}{8}\left(\frac{2}{2}\right)^8\left(\frac{1}{3}\right)^0$$

$$= 0.1706 + 0.2731 + 0.2731 + 0.156 + 0.039.$$

$$\boxed{P(x \geq 4) = 0.9118}$$

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

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

$$= 0.06828 + 0.1706 + 0.2731 + 0.2731$$

$$\boxed{P(3 \leq X \leq 6) = 0.78508}$$ → Completed.

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Q5.

ANS:- Bionomial Distribution:→ The no. of Successes "x" in "n" Trials of a bionomial experiment is called binomial Random variable. The prob. distribution of the binomial random variable is called binomial dist.

Definition:- If X is a binomial random variable then its probi. function is.

$$f(x) = \left(C^n_x p^x q^{n-x} \right) \quad n = 0,1,2,\dots n$$

other wise

Where n & p are two parameters of the binomial distⁿ.

& $p+q=1$

$\Rightarrow q = 1-p.$

1) Mean:- by def:

$\Rightarrow E(x) = \sum_{x=0}^{n} x f(x) = \sum_{x=0}^{n} x . C^n_x . p^x q^{n-x}.$

$\Rightarrow E(x) = 0.C^n_0 p^0 q^{n-0} + 1.C^n_1 p^1 q^{n-1} + 2.C^n_2 . p^2 q^{n-2} + \dots\dots n C^n_n p^n q^{n-n}.$

$\Rightarrow E(x) = 0.1.1.q^n + 1.n.pq^{n-1} + \cancel{2}\frac{n(n-1)}{\cancel{2}} p^2 q^{n-2} + \dots\dots + n.1.p^n q^0.$

$\Rightarrow E(x) = 0 + npq^{n-1} + 1 n(n-1) p^2 q^{n-2} + \dots\dots + np^{n-1}$

$\Rightarrow E(x) = npq^{n-1} + 1n(n-1) p^2 q^{n-2} + \dots\dots + np^{n-1+1}$

$\Rightarrow E(x) = npq^{n-1} + 1n(n-1) p^2 q^{n-2} + \dots\dots + np^{n-1}.p^1$

$\Rightarrow E(x) = np[q^{n-1} + 1.(n-1) pq^{n-2} + \dots\dots + p^{n-1}]$

$\Rightarrow E(x) = np[q+p]^{n-1}$ where $q+p=1$

$\Rightarrow E(x) = np(1)^{n-1}$

$\Rightarrow E(x) = np.$

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Q# 5 ii) Variance :- by def

$$V(x) = E(x^2) - (E(x))^2 \quad -(1)$$

$\Rightarrow E(x^2) = E[x + x(x-1)]$

$\Rightarrow E(x^2) = E(x) + E(x(x-1)) - (a)$

$\Rightarrow E(x^2) = np + \sum_{x=0}^{n} x(x-1)\, {}^nC_x\, p^x q^{n-x}$

$\Rightarrow E(x^2) = np + \left[0.(0-1)\, {}^nC_0\, p^0 q^{n-0} + 1.(1-1)\, {}^nC_1\, p^1 q^{n-1} + 2(2-1)\, {}^nC_2\, p^2 q^{n-2} + \cdots\cdots n(n-1)\, {}^nC_n\, p^n\right]$

NOTE :- In discrete ~~is~~ case x^2 cannot find directly Therefore $x^2 = x(x-1) + x$

$\Rightarrow E(x^2) = np + [0 + 0 + 2\, {}^nC_2\, p^2 q^{n-2} + 3(3-1)\, {}^nC_3\, p^3 q^{n-3} + \cdots\cdots + n(n-1) 1.p^n]$

$\Rightarrow E(x^2) = np + [\cancel{2}.\frac{n(n-1)}{\cancel{2}} p^2 q^{n-2} + \frac{\cancel{3}.n(n-1)(n-2)}{\cancel{3}} p^3 q^{n-3} + \cdots + n(n-1)p^n$

$\Rightarrow E(x^2) = np + [n(n-1)p^2 q^{n-2} + n(n-1)(n-2)p^3 q^{n-3} + n(n-1)(n-2)p^3 q^{n-3}$

$+ \cdots\cdots + n(n-1)\, p^{n-2+2}]$

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Q6:

ANS:-

If $p = q = \frac{1}{2}$ Then dist^n is Symmetrical
if $p > q$ then dist^n is $-$vely Skewed
If $p < q$ Then dist^n is $+$vely Skewed

Binomial frequency dist^n:- If a binomial experiment is repeated "N" times Then it is called binomial frequency dist^n. It is denoted by

$\Rightarrow$ bi, freq; dist^n $= Nf(x)$

$\Rightarrow$ bi, freq; dist^n $= N\,{}^nC_x\, p^x q^{n-x}$ $x = 0, 1, 2, 3 \cdots n$

Practical Topic:- Fitting of binomial dist^n:

For the fitting of binomial dist^n.

1) To find the parameters of binomial dist^n. i-e "p" & "n"

2) Mean $= \bar{x} = np$

3) Find the expected frequency by the Formula

$$Ef = Nf(x)$$

$$\Rightarrow Ef = N\,{}^nC_x\, p^x q^{n-x} \qquad x = 0, 1, 2, 3 \cdots n$$

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Q7:

Ans:-

Measure	A	B	C	D
Mean	45	60	50	25
S.D	3	11	5	15
Sample size	1500	3,200	500	2,700
C.V	$= \frac{3}{45} \times 100$	$\frac{11}{60} \times 100$	$\frac{5}{50} \times 100$	$\frac{15}{25} \times 100$
	$= 6.6$	$= 18.3$	$= 10$	$= 60$
	$\approx 7\%$	$\approx 18\%$	$\approx 10\%$	$\approx 60\%$

Group "A" Coefficient variation is just 7% which is Low forum group "B, C & D." which mean group "A" is best from B, C & D.

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Q4
ANS:

Sol: As we known that two events A & B in the same sample space are defined to be independent if the probability that one event occurs not effected by weather the other event.

As $P(A/B) = P(A)$?

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

Then it will be indepedent only if

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

As it given then

$c \in (1, 2, \cdots M)$

& B is independent of all C.

$A \cap B = \{C_3, C_2, C_1\}$

$P(A) = 3/5, \; P(B) = 3/5, \; P(A \cap B) = 3/3 = 1$

Let A = red die show an even

B = green " " 5 & 6.

$A \cap B$ = red die show an even number & give show a 6.

A = 18 out comes

B = 12 "

$A \cap B = 6$

$P(A) = \frac{18}{36} = 1/2$

$P(B) = 12/36 = 1/3$

$P(A \cap B) = \frac{6}{36} = 1/6$

$P(A \cap B) = P(A) \cdot P(B) = 1/6 = 1/6$

$1/6 = \frac{1}{2} \cdot \frac{1}{3}$

Hense proved A & B is independent.

The end