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SEC : A

Sub : Probability and Statistics

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Q #1

→ Solution :- $a = \bar{y} - b\bar{x}$

$$\bar{x} = \frac{\sum x}{n}$$

$$y = a + bx$$

$$\bar{y} = \frac{\sum y}{n}$$

$$\sum y = na + b\sum x$$

$$\sum xy = a \sum x + b \sum x^2$$

$$b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

$$a = \bar{y} - b\bar{x}$$

x	y	xy	x ²	y ²
53	20	1060	2809	400
62	32	1984	3844	1024
57	45	2565	3249	2025
71	60	4260	5041	3600
78	80	6240	6084	6400
28	100	2800	784	10,000
86	120	10320	7396	14400
87	140	12180	7569	19600
96	160	15360	9216	25600
91	180	16380	8281	32400
94	200	18800	8836	40000
94	210	19740	8836	44100
$\sum x = 897$	$\sum y = 1347$	$\sum xy = 11689$	$\sum x^2 = 271972$	$\sum y^2 = 199549$

$$\text{Now } \bar{x} = \frac{\sum x}{n} = \frac{897}{12}$$

$$= 74.75$$

$$\text{Now } \bar{y} = \frac{\sum y}{n} = \frac{1347}{12}$$

$$= 112.25$$

$$b = \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - (\sum x)^2}$$

$$b = \frac{12(111689) - (897)(1347)}{12(71972) - (897)^2}$$

$$b = \frac{1340268 - 1208259}{863664 - 804609} = \frac{132009}{59055}$$

$$b = \boxed{2.24}$$

$$a = \bar{y} - b\bar{x}$$

$$a = 112.25 - 2.24(74.75)$$

$$= -55.19$$

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{(n \sum x^2 - (\sum x)^2)(n \sum y^2 - (\sum y)^2)}}$$

$$r = \frac{12(111689) - (897)(1347)}{\sqrt{12(71972) - (897)^2(12(199549) - (1347)^2)}}$$

$$r = \frac{1340268 - 1208259}{\sqrt{(863664 - (804609)) (2394588) - (1814409)}}$$

$$r = \frac{132009}{185101.24} \quad - \text{Ans}$$

Q # 2

part (a)

→ Solution :-

$$(i) \quad n(S) = \binom{13}{3} = 286$$

let A = Denote all balls are of different colours

$$n(A) = \binom{4}{1} \binom{4}{1} \binom{5}{1} = 4 \times 4 \times 5 = 80$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{80}{286} = 0.28$$

$2 \times 2 \times 2 = 8$, $3 \times 2 \times 2 = 12$
even \times even \times even = even , odd \times even \times even = even

$3 \times 3 \times 2 = 18$
odd \times odd \times even = even

(ii) let B = Denote all balls of same colour

$$n(B) = \binom{4}{3} \text{ Red } \text{ or } \binom{4}{3} \text{ White } \text{ or } \binom{5}{3} \text{ Green}$$

$$= \binom{4}{3} + \binom{4}{3} + \binom{5}{3} = 4 + 4 + 10 = 18$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{18}{286} = \boxed{0.063}$$

Q # 2

part (b)

→ Solution :-

$$(i) \quad n(S) = \binom{12}{4} = 495$$

let A = denote the event that only one egg is bad.

$$n(A) = \binom{2}{1} \binom{10}{3} = 2 \times 120 = 240$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{240}{495} = 0.48$$

→ (ii) let B denote that atleast one egg is bad selected.

$$n(B) = \binom{2}{1} \binom{10}{3} + \binom{2}{2} \binom{10}{2}$$

$$= 2 \times 120 + 1 \times 45 = 240 + 45 = 285$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{285}{495} = \boxed{0.58}$$

Q#3

→ Solution :-

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
28	28	28
199	37	74
36	48	52
84	13	13
29	3	4

$$\text{Range} = X_m - X_0$$

Range of ;

$$A = 199 - 6 = 193$$

$$B = 76 - 3 = 73$$

$$C = 74 - 4 = 70$$

Batsman A		Batsman B		Batsman C	
x	x ²	y	y ²	z	z ²
12	144	47	2209	15	225
15	225	12	144	23	529
6	36	76	5776	52	2704
73	5329	48	2304	4	16
7	49	4	16	24	576
28	784	22	784	28	784
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 489$	$\Sigma x^2 = 55361$	$\Sigma y = 316$	$\Sigma y^2 = 15084$	$\Sigma z = 284$	$\Sigma z^2 = 13199$

→ Batsman A : $\bar{x} = \frac{\Sigma x}{n}$ n: 10

$$= \frac{489}{10} = 48.9$$

$$S_x = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

$$= \sqrt{\frac{55361}{10} - \left(\frac{489}{10}\right)^2}$$

$$= \sqrt{5536.1 - 2391.21}$$

$$= 56.07$$

$$C.V = \frac{56.07}{48.9} \times 100$$

$$= 114.66$$

→ Batsman B :-

$$Y = \frac{\sum y}{n} = \frac{316}{10} = 31.6$$

$$S_y = \sqrt{\frac{15084}{10} - \left(\frac{316}{10}\right)^2}$$

$$= \sqrt{1508.4 - 998.56} = 22.579$$

$$C.V = \frac{22.579}{31.6} \times 100$$

$$= 71.45$$

→ Batsman C :- $\bar{z} = \frac{289}{10} = 28.9$

$$S_z = \sqrt{\frac{13199}{10} - \left(\frac{289}{10}\right)^2} = \sqrt{1319.9 - 835.21}$$

$$= 22.01$$

$$CV = \frac{22.01}{28.9} \times 100$$

$$= 76.15$$

Batsman A is more consistent as if
value C.V. is smaller