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ID 7862

SEC B

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Qno # 1

Solution:-

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
62	100	6200	3844	10000
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	11280	8836	44100
£931	£1347	£106629	£75005	£199549

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$$y = a + bx \quad \text{— (i)}$$

$$a = \bar{y} - b\bar{x} \quad \text{— (ii)}$$

So $$\bar{y} = \frac{\Sigma y}{n} = \frac{1347}{12} = 112.25 \quad \text{— (iii)}$$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{931}{12} = 77.58 \quad \text{— (iv)}$$

where

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

$$b = \frac{12[106629] - [1254057]}{12[75005] - [866761]}$$

$$\boxed{b = 0.765} \quad \text{— (v)}$$

Putting eq (iii), (iv) & (v) in eq (ii)

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

$$a = 112.25 - 0.765(77.58)$$

$$\boxed{a = 52.90}$$

Hence the desired estimated regression line Y on x is

$$\hat{Y} = 52.90 + 0.765x$$

The estimated regression Co-efficient, $b = 0.765$, which indicates that the values of Y increases by 0.765 units for a unit increase in x

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Now Co-efficient for Co-relation

As we know

$$r = \frac{\Sigma XY - (\Sigma X)(\Sigma Y)/n}{\sqrt{\left[(\Sigma X^2) - (\Sigma X)^2/n\right]\left[\Sigma Y^2 - (\Sigma Y)^2/n\right]}}$$

$$\gamma = \frac{(106629) - \frac{(931)(1347)}{12}}{\sqrt{(75005) - \left[\frac{(931)^2}{12}\right]\left[199549 - \frac{(1347)^2}{12}\right]}}$$

$$\gamma = \frac{2124.25}{\sqrt{(75005) - (72230.3)(199549 - 151200.75)}}$$

$$\gamma = \frac{2124.25}{13415189.3} \Rightarrow \boxed{\gamma = 1.58 \times 10^{-5}}$$

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Qno # 2 (Part -a-)

Solution:-

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

Let A = Denote all balls are of different Colour.

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

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

There are 28% chances that all balls are of different Colours.

Let B = Denote all balls of Same Colour

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

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

$$= 4 + 4 + 10$$

$$= 18$$

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

$$P(B) = \frac{18}{286}$$

$$P(B) = 0.063$$

There are 63 % chances that all balls of same colour.

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Qno # 2 [Part : b]

Solution:-

$$n[S] = \binom{12}{4} = 495$$

Let A = denote the event that exactly one egg is bad.

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

$$P(A) = \frac{n(A)}{n(S)} = \frac{240}{495} = 0.48 \text{ or } 48\%$$

Interpretation:- There are 48 % chance that exactly one egg is bad.

(ii) Let B = be the event that at least one bad egg is seleded.

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

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

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

⇨ There are 58 % chance that atleast one bad egg is seleded.

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Q no # 3

Solution:-

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
62	62	62
199	37	74
36	48	52
84	13	13
29	3	4

(Part a)

Range of A.

As range $= X_m - X_0$

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So Range of $A = X_m - X_0$

$A = 199 - 6$

$A = 193$

Range of 'B'

$B = X_m - X_0$

$B = 82 - 3$

$B = 59$

Range of 'C'

$C = X_m - X_0$

$C = 74 - 4$

$C = 70$

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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
62	3844	62	3844	62	3844
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	9	9	4	16
$\Sigma 523$	$\Sigma 58421$	$\Sigma 350$	$\Sigma 18144$	$\Sigma 323$	$\Sigma 16259$

Batsman 'A'

$\therefore n = 10$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{523}{10} = 52.3$$

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$$\sigma_x = \sqrt{\frac{\Sigma x^2}{n} - \left[\frac{\Sigma x}{n}\right]^2}$$

$$\sigma_x = \sqrt{\frac{58421}{10} - \left[\frac{523}{10}\right]^2}$$

$$\boxed{\sigma_x = 55.738}$$

$$C.V = \frac{55.738}{\bar{X}} \times 100 = \frac{55.738}{52.3}$$

$$C.V = 1.06 \times 100$$

$$\boxed{C.V = 106.5}$$

Batsman 'B'

$$Y = \frac{\Sigma Y}{n} = \frac{350}{10} = 35.0$$

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$$S_y = \sqrt{\frac{\Sigma y^2}{n} - \left[\frac{\Sigma y}{n}\right]^2}$$

$$S_y = \sqrt{\frac{18144}{10} - \left[\frac{350}{10}\right]^2}$$

$$\boxed{S_y = 24.27}$$

$$C.V = \frac{24.27}{35.0} \times 100 = 0.69 \times 100$$

$$\boxed{C.V = 69.3\%}$$

Batsman 'C'

$$\bar{Z} = \frac{\Sigma z}{n} = \frac{323}{10} = 32.3$$

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$$\sigma_x = \sqrt{\frac{\Sigma x^2}{n} - \left[\frac{\Sigma x}{n}\right]^2}$$

$$\sigma_x = \sqrt{\frac{16259}{10} - \left[\frac{323}{10}\right]^2}$$

$$\boxed{\sigma_x = 24.13}$$

$$C.V = \frac{24.13}{32.3} \times 100 = 0.747 \times 100$$

$$\boxed{C.V = 74.7\ \%}$$

Batsman 'B' is more Consistant because its value of Co-efficient of variance is small.

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Part (c)

Compare A with B

B is more Consistant

Compare B with A

B is more Consistant

Compare A with C

C is more Consistant

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