Assignment No: 03

Course: STA 201

Section: 05

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① ~~Ans to the Q No - 1~~ 19101072

Ans. to Q No - 1

f_i	x_i	f_ix_i	$(x_i-\bar{x})^2$	$f_i(x_i-\bar{x})^2$
2	13.0	26.0	3.25	6.5
16	13.5	216.0	1.70	27.2
36	14.0	504.0	0.65	23.4
60	14.5	870.0	0.09	5.4
76	15.0	1140.0	0.04	3.04
37	15.5	573.5	0.48	17.76
18	16.0	288.0	1.43	25.74
3	16.5	49.5	2.88	8.64
2	17.0	34	4.82	9.64
$\sum f_i = 250$	$\sum x_i = 135$	$\sum f_ix_i = 3701$	$\sum (x_i-\bar{x})^2 = 15.34$	$\sum f_i(x_i-\bar{x})^2 = 127.32$

Now, $\bar{x} = \dfrac{\sum f_ix_i}{\sum f_i} = \dfrac{3701}{250} = 14.804$

$\therefore$ Standard deviation $\sigma = \sqrt{\dfrac{\sum f_i(x_i-\bar{x})^2}{\sum f - 1}}$

$= 0.72$ (Approx)

∴ Largest size of the collar he should

make $= \bar{x} + 3\sigma = 14.80 + (3 \times 0.72)$

$= 16.96 + 0.5$ [∵ collars were average 0.5 inch longer]

$= 17.46$

∴ Smallest size of the collar he should

make $= \bar{x} - 3\sigma = 14.80 - (3 \times 0.72)$

$= 12.64 + 0.5$

$= 13.14$.

Ans. 17.46 (largest), 13.14 (smallest)

Ans. to Q. No - 2

Here, $\Sigma x = 180$ and $n = 24$

$\therefore \bar{x} = \frac{180}{24} = 7.5$

Now, $\Sigma(x-\bar{x})^2 = \cancel{144} \; 0.53$

The manger's decision would be to NOT take the tomatoes because though the average weight is 7.5 ounce, the standard deviation is not less than 0.5.

Ans. NOT TO RECIEVE

Ans to Q No - 3

For group 1, $CV = \frac{\sqrt{68.09}}{32.11} \times 100\% = 0.26 \times 100\%$
$= 26\%$

For group 2, $CV = \frac{\sqrt{71.14}}{19.75} \times 100\%$
$= 0.43 \times 100\% = 43\%$

$\therefore$ Group 1 has less relative variability in it's performance. (Ans.)

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Ans. to Q No - 4

For temperatures,

$$\Sigma x = 50 + 37 + 29 + 54 + 30 + 61 + 47 + 38 + 34 + 61 = 441$$

$$\therefore \bar{x} = \frac{441}{10} = 44.1$$

$$\therefore \Sigma(x-\bar{x})^2 = (5.9)^2 + (-7.1)^2 + (-15.1)^2 + (9.9)^2 + (-14.1)^2 + (16.9)^2 + (2.9)^2 + (-6.1)^2 + (-10.1)^2 + (16.9)^2 = 1328.9$$

$$\therefore \text{Standard deviation} = \sqrt{\frac{1328.9}{9}} = \sqrt{147.66} = 12.15$$

For ~~precip~~ precipitation,

$\Sigma x = 26.3$, $\bar{x} = 2.63$

$$\therefore \text{Standard deviation} = \sqrt{\frac{\cancel{11.1552}\ 16.961}{9}} = 1.37$$

$\because$ S.D of temperature > S.D of precipitation, the variable of temperature demonstrate greater variability.

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Ans. to the Q. No-5

Class Interval	Mid value (x_i)	Frequency (f_i)	$(x_i-\bar{x})^2 f_i$
1-3	2	18	587.90
4-6	5	90	663.41
7-9	8	44	3.57
10-12	11	21	226.62
13-15	14	9	355.51
16-18	17	9	775.90
19-21	20	4	603.69
22-24	23	5	1168.16
		$\Sigma f_i = 200$	$\Sigma f_i (x_i-\bar{x})^2 = 4384.76$

$\therefore \bar{x} = \frac{\Sigma f_i x_i}{n} = 7.715$

$\therefore$ Standard deviation, $SD = \sqrt{\frac{4384.76}{199}} = 4.69$

$\therefore CV = \frac{4.69}{\cancel{199}\ 7.715} \times 100\%$

$= \cancel{2.36\%}\ 60.79\%$

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Here, the median class is 4-6.

$\therefore L_0 = 4$; $F_{me} = 18$; $f_{me} = 90$;

$W_{me} = 2$; $n = 200$

$\therefore$ Median, $M_e = 4 + \frac{100-18}{90} \times 2$

$= 5.82$

$\therefore$ Pearson's coefficient of Skewness, $S_{kp} = \frac{3(7.715-5.82)}{4.69}$

$= 1.21$

Since, $S_{kp} > 0 \Rightarrow$ The distribution is positively skewed.

P.T.O

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Ans to Q No-6

a)

Sales (Tk) x	Profit (Tk) y	xy	x^2	y^2
6	1	6	36	1
7	1	7	49	1
8	3	24	64	9
11	5	55	121	25
12	6	72	144	36
10	4	40	100	16
12	5	60	144	25
$\Sigma x = 66$	$\Sigma y = 25$	$\Sigma xy = 264$	$\Sigma x^2 = 658$	$\Sigma y^2 = 113$

$\therefore \bar{x} = 9.43$ $\therefore \bar{y} = 3.57$

$\therefore$ Pearson's Corelation Coefficient, r

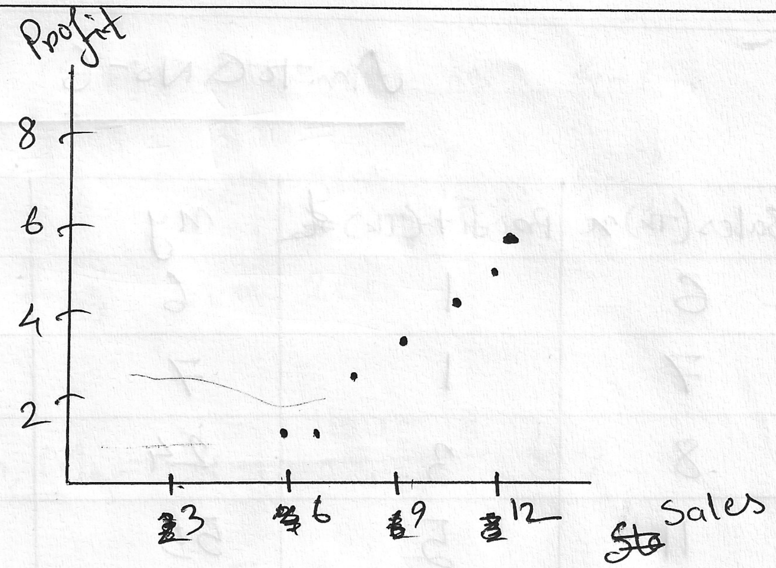
$$= \frac{7 \times 264 - (66 \times 25)}{\sqrt{(7 \times 658 - 4356)(7 \times 113 - 625)}}$$

$= \cancel{0.69}\ 0.97.$

$\because +0.7 < +0.97 < 1,$

$\therefore$ There exists a positive strong corelation.

b)



The scatter diagram shows that there exists a positive corelation. So, it means that ~~for~~ higher sales, there will be higher profit and vice-versa.

c) Here, Dependent variable, $y =$ profit

Independent variable, $x =$ sales.

By the method of OLS,

$$\hat{\beta} = \frac{\sum xy - n.\bar{x}.\bar{y}}{\sum x^2 - n(\bar{x})^2} = \frac{264-(7\times 9.43\times 3.57)}{658-(7\times(9.43)^2)}$$

$$= 0.80$$

and, $\hat{a} = \bar{y} - \hat{\beta}\bar{x} = 3.57 - (9.43 \times 0.80)$

$= -3.974$

Thus, the fitted regression model,

$\hat{y} = \hat{a} + \hat{\beta}x = -3.974 + (0.80)x$

d) If sale is 15 Tk, then,

profit $= -3.974 + (0.80) \times 15$

$= 8.026$ Tk.

(Ans)

Interpretation of fitted regression model

* $\hat{a} = -3.974$ means that, profit will be -3.974 Tk when sales is 0.

* Since, $\hat{\beta} = 0.80$ is positive, it means that with increase of sale, increase of profit occurs.