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Programme : Computer Science (Level 100)
Session : Morning.

Question 1

Expenditure (x)	Sales (y)	$(x-\bar{x})$	$(y-\bar{y})$	$(x-\bar{x})(y-\bar{y})$	$(x-\bar{x})^2$
40	1250	-15.5	-79.5	1232.25	240.25
51	1225	-4.5	-104.5	470.25	20.25
43	1300	-12.5	-29.5	368.75	156.25
64	1210	8.5	-119.5	-1015.75	72.25
62	1505	6.5	175.5	1140.75	42.25
68	1425	12.5	95.5	1093.75	156.25
75	1550	19.5	220.5	4299.75	380.25
62	1400	6.5	70.5	458.25	42.25
48	1280	-7.5	-49.5	371.25	56.25
42	1150	-13.5	-179.5	2423.25	182.25

$$\bar{x} = \frac{\sum \text{ of all } x's}{10} = \frac{555}{10} = 55.5$$

$$\bar{y} = \frac{\sum \text{ of all } y's}{10} = \frac{13,295}{10} = 1,329.5$$

The diagram below is the continuation of the table.

$(y-\bar{y})^2$
6320.25
10920.25
870.25
14280.25
30800.25
9120.25
48620.25
4970.25
2450.25
32220.25

from the table :

$\sum (x-\bar{x}) = 0$

$\sum (x-\bar{x})^2 = 1348.5$

$\sum (y-\bar{y}) = 0$

$\sum (y-\bar{y})^2 = 160572.5$

$\sum (x-\bar{x})(y-\bar{y}) = 10942.5$

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a. Pearson correlation coefficient = $\dfrac{SS_{xy}}{\sqrt{SS_{xx} \, SS_{yy}}}$

$$r = \frac{10942.5}{\sqrt{(1348.5)(160572.5)}}$$

$$r = 0.7436$$

b. Coefficient of determination $= (r)^2$

$$= (0.7436)^2$$

$$= 0.5530$$

c. $\hat{y} = b_0 + b_1 n$

But b_1 (slope) $= \dfrac{SS_{xy}}{SS_{xx}} = \dfrac{10942.5}{1348.5} = 8.1146$

b_0 (y-intercept) $= \bar{y} - b_1\bar{x}$

$$= 1329.5 - 8.1146(55.5)$$

$$= 879.1397$$

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Question

$\therefore$ The estimated regression line is $\hat{y} = 879.1397 + 8.1146x$

1. if $x = 50$

but $y = 879.1397 + 8.1146x$

$\Rightarrow y = 879.1397 + (8.1146)(50)$

$y = 1284.8697$