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5. A large company rents shops in different parts of the country. A random sample of 10 shops was taken and the floor area, x in $10\,m^2$, and the annual rent, y in thousands of dollars, were recorded.
The data are summarised by the following statistics

$$\sum x = 900 \quad \sum x^2 = 84\,818 \quad \sum y = 183 \quad \sum y^2 = 3434$$

and the regression line of y on x has equation $y = 6.066 + 0.136x$

(a) Use the regression line to estimate the annual rent in dollars for a shop with a floor area of $800\,m^2$

(2)

(b) Find S_{yy} and S_{xx}

(3)

(c) Find the product moment correlation coefficient between y and x.

(4)

An 11th shop is added to the sample. The floor area is $900\,m^2$ and the annual rent is 15 000 dollars.

(d) Use the formula $S_{xy} = \sum(x - \bar{x})(y - \bar{y})$ to show that the value of S_{xy} for the 11 shops will be the same as it was for the original 10 shops.

(2)

(e) Find the new equation of the regression line of y on x for the 11 shops.

(3)

The company is considering renting a larger shop with area of $3000\,m^2$

(f) Comment on the suitability of using the new regression line to estimate the annual rent. Give a reason for your answer.

(1)

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Question 5 continued

(Total 15 marks)

Q5