4. A biologist is studying bears. The biologist records the length, d cm, and the girth, g cm, of 8 bears. The biologist summarises the data as follows

$$\sum d = 1456.8 \qquad \sum g = 713.2 \qquad \sum dg = 141\,978.84 \qquad \sum g^2 = 72\,675.98$$

$$S_{dd} = 16\,769.78$$

(a) Calculate the exact value of S_{dg} and the exact value of S_{gg}

(3)

(b) Calculate the value of the product moment correlation coefficient between d and g

(2)

(c) Show that the equation of the regression line of g on d can be written as

$$g = -42.3 + 0.722d$$

where the values of the intercept and gradient are given to 3 significant figures.

(3)

(d) Give an interpretation, in context, of the gradient of the regression line.

(1)

Using the equation of the regression line given in part (c)

(e) (i) estimate the girth of a bear with a length of 2.5 metres,

(ii) explain why an estimate for the girth of a bear with a length of 0.5 metres is not reliable.

(2)

Using the regression line from part (c), the biologist estimates that for each x cm increase in the length of a bear there will be a 17.3 cm increase in the girth.

(f) Find the value of x

(2)

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Question 4 continued

(Total for Question 4 is 13 marks)