Linear Regression – 2022 GCE AS Statistics Further Mathematics A

1. June/2022/Paper_Y532/01/No.1

A geography student chose a certain point in a stream and took measurements of the speed of flow, $v\,\text{ms}^{-1}$, of water at various depths, $d\,\text{m}$, below the surface at that point. The results are shown in the table.

d	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5
v	0.8	0.5	0.7	1.2	1.1	1.3	1.6	1.4	0.4

$n = 9 \qquad \Sigma d = 2.7 \qquad \Sigma v = 9.0 \qquad \Sigma d^2 = 0.96 \qquad \Sigma v^2 = 10.4 \qquad \Sigma dv = 2.85$

(a) (i) Explain why d is an example of an independent, controlled variable. **[1]**

(ii) Use **two** relevant terms to describe the variable v in a similar way. **[1]**

A statistician believes that the point (0.5, 0.4) may be an anomaly.

(b) Calculate the equation of the least squares regression line of v on d for all the points in the table **apart from** (0.5, 0.4). **[2]**

(c) Use the equation of the line found in part **(b)** to estimate the value of v when $d = 0.5$. **[1]**

(d) Use your answer to part **(c)** to comment on the statistician's belief. **[1]**

(e) Use the diagram in the Printed Answer Booklet (which does **not** illustrate the data in this question) to explain what is meant by "least squares regression line". **[2]**