

6. Three events A , B and C are such that

$$P(A) = \frac{2}{5}$$

$$P(C) = \frac{1}{2}$$

$$P(A \cup B) = \frac{5}{8}$$

Given that A and C are mutually exclusive find

(a) $P(A \cup C)$

(1)

Given that A and B are independent

(b) show that $P(B) = \frac{3}{8}$

(4)

(c) Find $P(A | B)$

(1)

Given that $P(C' \cap B') = 0.3$

(d) draw a Venn diagram to represent the events A , B and C

(5)

- 4: Two events C and D are such that

$$P(C \cup D) = 0.59$$

$$P(D) = 0.45$$

$$P(C | D) = 0.2$$

Find the value of

(a) $P(C \cap D)$

(2)

(b) $P(C)$

(2)

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3: Statistical models are a cheap and quick way to make predictions about real-world situations.

- (a) Give one other reason why statistical models are used.

(1)

Madison wants to develop a model to describe the relationship between the average daily temperature, t °C, and a household's daily gas consumption, d m³, in winter.

Madison takes a random sample of 12 days in winter and codes the daily gas consumption so that $w = 11.5d$

These data are summarised as follows

$$S_{tt} = 26.43 \quad S_{tw} = -91.55 \quad \sum w = 339.25 \quad \sum t = 9.1 \quad \sum w^2 = 10\,036.45$$

- (b) Show that $S_{ww} = 445.57$ to 2 decimal places.

(1)

- (c) Find the value of S_{td} and the value of S_{dd}

(3)

- (d) Find the product moment correlation coefficient between d and t

(2)

- (e) Give an interpretation, in context, of your product moment correlation coefficient.

(1)

- (f) Show that the equation of the regression line of w on t is

$$w = -3.46t + 30.9$$

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

(3)

- (g) Write down an equation of the regression line of d on t

(1)

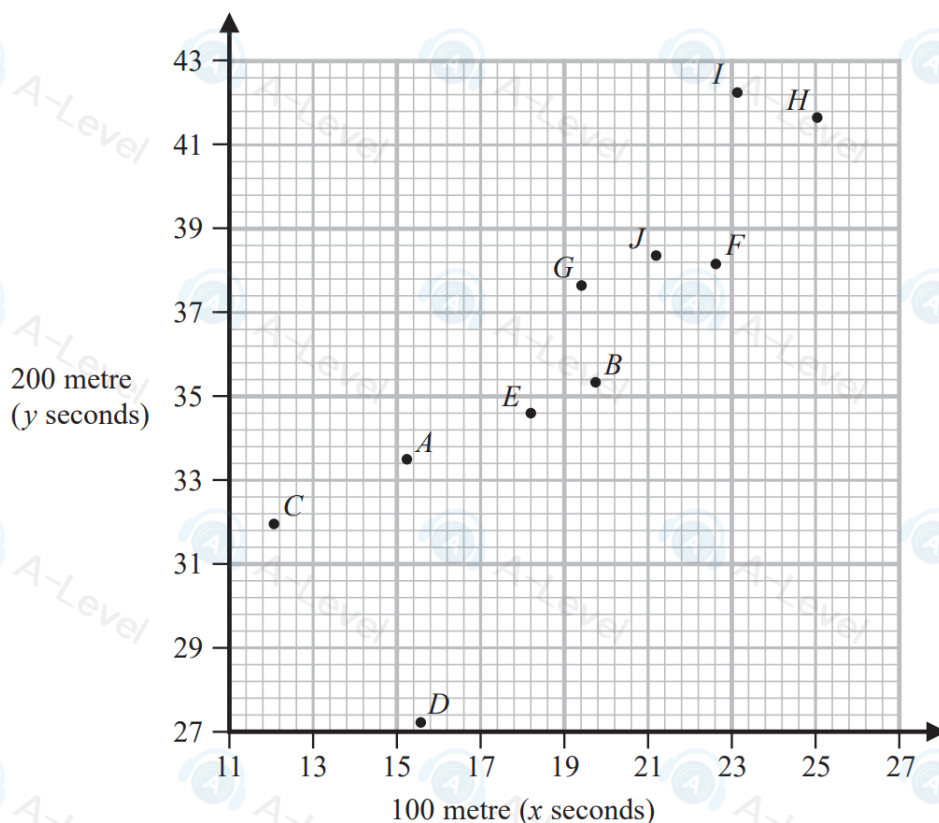
- (h) Using your equation in part (g)

(i) estimate the daily gas consumption in winter when the temperature is 2 °C

(ii) interpret the effect an increase of 1 °C in average daily temperature is expected to have on the daily gas consumption in winter.

(2)

4. A random sample of 10 boys $A, B, C, D, E, F, G, H, I$ and J is taken from a junior athletics club. Each boy selected is asked to run a 100 metre race and a 200 metre race. The time taken, x seconds, by each boy to run the 100 metre race is recorded and the time taken, y seconds, by each boy to run the 200 metre race is recorded. The results are plotted on the scatter diagram below.



- (a) State, without calculation, which of the 3 values below is most likely to be a value of the product moment correlation coefficient for the data in the scatter diagram.

0.72 0.05 0.95 (1)

In the sample of 10 boys, one is a junior champion 100 metre runner and one is a junior champion 200 metre runner.

- (b) Write down the boy who is most likely to be the 100 metre junior champion. (1)

The data for the two junior champions are removed and the remaining data are summarised below

$$\sum x^2 = 3445.26 \quad \sum x = 164.4 \quad S_{yy} = 67.52 \quad S_{xy} = 60.85$$

- (c) (i) Calculate the value of the product moment correlation coefficient for the remaining data. (3)
- (ii) Comment, in context, on the value of the product moment correlation coefficient that you obtained in part (i). (1)