Year 13 Mock Set#02
Statistics Paper

- Advised to print in "A3-booklets", this will allow all questions to be on the left hand side.

- You can also print in A4, double-sided, and two staples on the left

- If instead you print in 2-in-1 settings, first print the second page up to the last page, then print the cover page separately (to allow all questions on the left)

This exam paper has 5 questions, for a total of 50 marks.

Question	Marks	Score
1	6	
2	13	
3	10	
4	12	
5	9	
Total:	50	

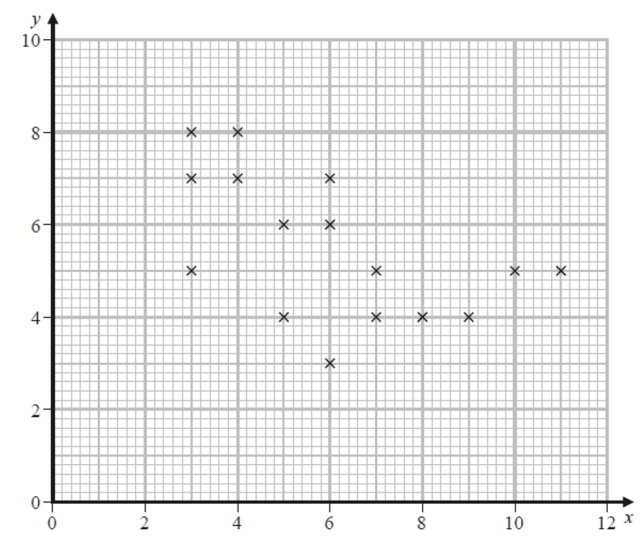Andrew Chan

Last updated: 1st March 2023

1.

Figure 1

Mr Dowling took a random sample of 16 students from his school and recorded:

- the number of letters, x in their last name
- the number of letters, y in their first name

His results are shown in the scatter diagram in Figure 1.

(a) Describe the correlation between x and y.

(1)

Mr Dowling suggests that parents with long last names tend to give their children shorter first names.

(b) Using the scatter diagram, comment on Mr Dowling's suggestion, giving a reason for your answer.

(1)

The results from Mr Dowling's random sample are given in the table below.

x	3	6	8	7	5	3	11	3	4	5	4	9	7	10	6	6
y	7	7	4	4	6	8	5	5	8	4	7	4	5	5	6	3

(c) Use your calculator to find the product moment correlation coefficient between x and y.
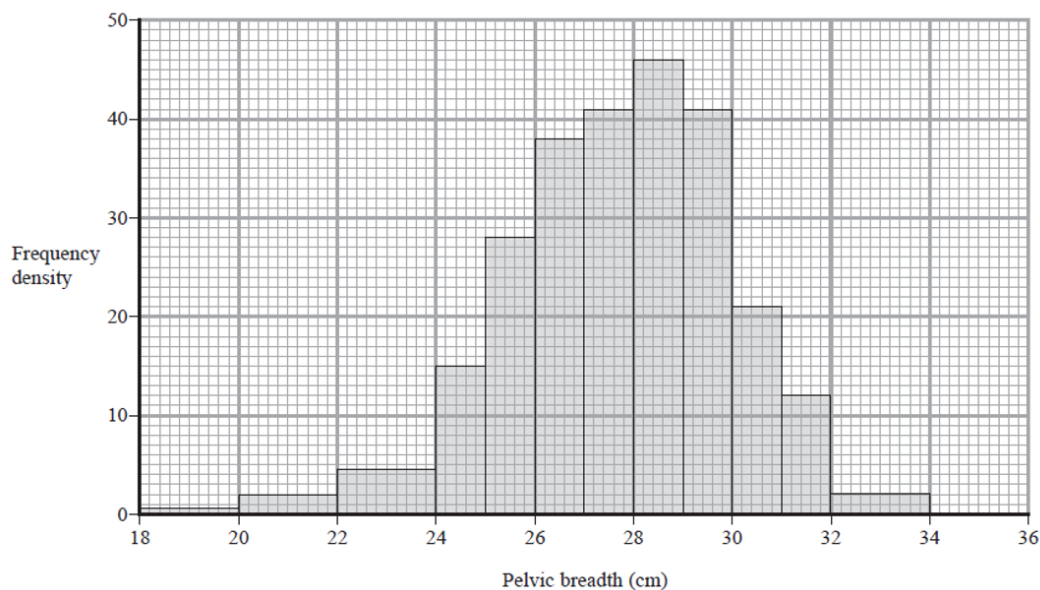
(1)

(d) Test whether or not there is evidence of a negative correlation between the number of letters in the last name and the number of letters in the first name.
You should

- state your hypotheses clearly
- use a 5% level of significance

(3)

Question 1 continued

Question 1 continued

Question 1 continued

(Total for Question 1 is 6 marks)

2.

$$n = 260 \qquad \sum x = 7171.2 \qquad S_{xx} = 1379.0$$

Miss Fahmida is collecting data about body measurements in adults.

The results for pelvic breadth, in centimetres, for **female** adults are summarised by the histogram and summary statistics above.

(a) Calculate the frequency of **female** adults with pelvic breadths above 31cm.

(2)

(b) Calculate the mean and standard deviation for the data.

(3)

An outlier is defined as a value

- more than $3 \times$ standard deviation above the mean
- more than $3 \times$ standard deviation below the mean

(c) Based on the information given, show that there is at least one outlier in the pelvic breadths for **female** adults.

(3)

Summary statistics were also produced for the pelvic breadths, in centimetres, for a similar sized sample of **male** adults.

Pelvic breadth (cm)	Mean	Standard deviation
Males	28.1	1.95

Miss Fahmida believes that **males** have a larger and more variable pelvic breadth.

(d) State, giving reasons, whether or not the statistics support Miss Fahmida's beliefs.

(2)

Question 2 continued

Given further that the data for **male** pelvic breadth contained no outliers.

(e) Without doing any further calculations

   (i) explain the effect of omitting the **female** outlier(s) on your calculations in part (b).

   (2)

   (ii) comment on the effect this may have had on your answer to part (d).

   (1)

Question 2 continued

Question 2 continued

(Total for Question 2 is 13 marks)

3. The events A, B and C occur with the probabilities shown in the Venn diagram below.

(a) Explain why events A and C cannot be independent.

(1)

(b) Find $\mathrm{P}\left(\left[A \cup C\right]'\right)$

(1)

Given that events A and B are independent,

(c) find the value of p.

(6)

(d) Find the exact value of $\mathrm{P}\left(A \,\middle|\, \left[B \cup C\right]'\right)$

(2)

Question 3 continued

Question 3 continued

Question 3 continued

(Total for Question 3 is 10 marks)

4. A biased coin has probability 0.4 of showing a head. In an experiment, the coin is spun until a head appears.

If a head has not appeared after 4 spins, the coin is not spun again.

The random variable X represents the number of times the coin is spun.

For example, $X = 3$ if the first two spins do not show a head but the third spin does show a head. The coin would not then be spun a fourth time since the coin has already shown a head.

(a) Show that $P(X = 3) = 0.144$

(1)

The table below gives some values for the probability distribution of X

x	1	2	3	4
$P(X = x)$		0.24	0.144	

(b) (i) Write down the value of $P(X = 1)$

(ii) Find $P(X = 4)$

(3)

The random variable H represents the number of heads obtained when the coin is spun in the experiment.

(c) (i) Explain why H can only take the values 0 and 1.

(ii) Find the probability distribution of H.

(2)

(d) Write down the value of

(i) $P\Big(\{X = 3\} \cap \{H = 0\}\Big)$

(ii) $P\Big(\{X = 4\} \cap \{H = 0\}\Big)$

(2)

The random variable $S = X + H$

(e) Find the probability distribution of S.

(4)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 12 marks)

5. Pieces of ribbon are cut to length L cm where $L \sim N(\mu, 0.5^2)$

    (a) Given that 30% of the pieces of ribbon have length more than 100 cm, find the value of μ to the nearest 0.1 cm.

                                                                                       (3)

Mr Chan selects 12 pieces of ribbon at random.

    (b) Find the probability that fewer than 3 of these pieces of ribbon have length more than 100 cm.

                                                                                       (3)

Mr Jolghazi selects 400 pieces of ribbon at random.

    (c) Using a suitable approximation, find the probability that more than 127 of these pieces of ribbon will have length more than 100 cm.

                                                                                     (3)

Question 5 continued

(Total for Question 5 is 9 marks)

Total for paper is 50 marks