Write your name here

Surname		Other names

Centre Number

Candidate Number

Mathematics
Advanced Subsidiary
Paper 2: Statistics and Mechanics

Wednesday 23 May 2018 – Morning	Paper Reference
Time: 1 hour 15 minutes	**8MA0/02**

You must have:
Mathematical Formulae and Statistical Tables, calculator

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- There are **two** sections in this question paper. Answer **all** the questions in Section A and **all** the questions in Section B.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 9 questions in this question paper. The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P 5 8 3 4 7 A 0 1 2 8

Pearson

Answer ALL questions. Write your answers in the spaces provided.

1. A company is introducing a job evaluation scheme. Points (x) will be awarded to each job based on the qualifications and skills needed and the level of responsibility. Pay (£y) will then be allocated to each job according to the number of points awarded.

    Before the scheme is introduced, a random sample of 8 employees was taken and the linear regression equation of pay on points was $y = 4.5x - 47$

    (a) Describe the correlation between points and pay.

    (1)

    (b) Give an interpretation of the gradient of this regression line.

    (1)

    (c) Explain why this model might not be appropriate for all jobs in the company.

    (1)

Question 1 continued

(Total for Question 1 is 3 marks)

2. A factory buys 10% of its components from supplier A, 30% from supplier B and the rest from supplier C. It is known that 6% of the components it buys are faulty.

Of the components bought from supplier A, 9% are faulty and of the components bought from supplier B, 3% are faulty.

(a) Find the percentage of components bought from supplier C that are faulty.

<div align="right">(3)</div>

A component is selected at random.

(b) Explain why the event "the component was bought from supplier B" is not statistically independent from the event "the component is faulty".

<div align="right">(1)</div>

Question 2 continued

(Total for Question 2 is 4 marks)

3. Naasir is playing a game with two friends. The game is designed to be a game of chance

so that the probability of Naasir winning each game is $\frac{1}{3}$

Naasir and his friends play the game 15 times.

(a) Find the probability that Naasir wins

   (i) exactly 2 games,

   (ii) more than 5 games.

<div align="right">(3)</div>

Naasir claims he has a method to help him win more than $\frac{1}{3}$ of the games. To test this claim,

the three of them played the game again 32 times and Naasir won 16 of these games.

(b) Stating your hypotheses clearly, test Naasir's claim at the 5% level of significance.

<div align="right">(4)</div>

Question 3 continued

(Total for Question 3 is 7 marks)

P 5 8 3 4 7 A 0 9 2 8

4. Helen is studying the daily mean wind speed for Camborne using the large data set from 1987. The data for one month are summarised in Table 1 below.

Windspeed	n/a	6	7	8	9	11	12	13	14	16
Frequency	13	2	3	2	2	3	1	2	1	2

Table 1

(a) Calculate the mean for these data.

(1)

(b) Calculate the standard deviation for these data and state the units.

(2)

The means and standard deviations of the daily mean wind speed for the other months from the large data set for Camborne in 1987 are given in Table 2 below. The data are not in month order.

| Month	A	B	C	D	E
Mean	7.58	8.26	8.57	8.57	11.57
Standard Deviation	2.93	3.89	3.46	3.87	4.64

Table 2

(c) Using your knowledge of the large data set, suggest, giving a reason, which month had a mean of 11.57

(2)

The data for these months are summarised in the box plots on the opposite page. They are not in month order or the same order as in Table 2.

(d) (i) State the meaning of the * symbol on some of the box plots.

(ii) Suggest, giving your reasons, which of the months in Table 2 is most likely to be summarised in the box plot marked *Y*.

(3)

_____
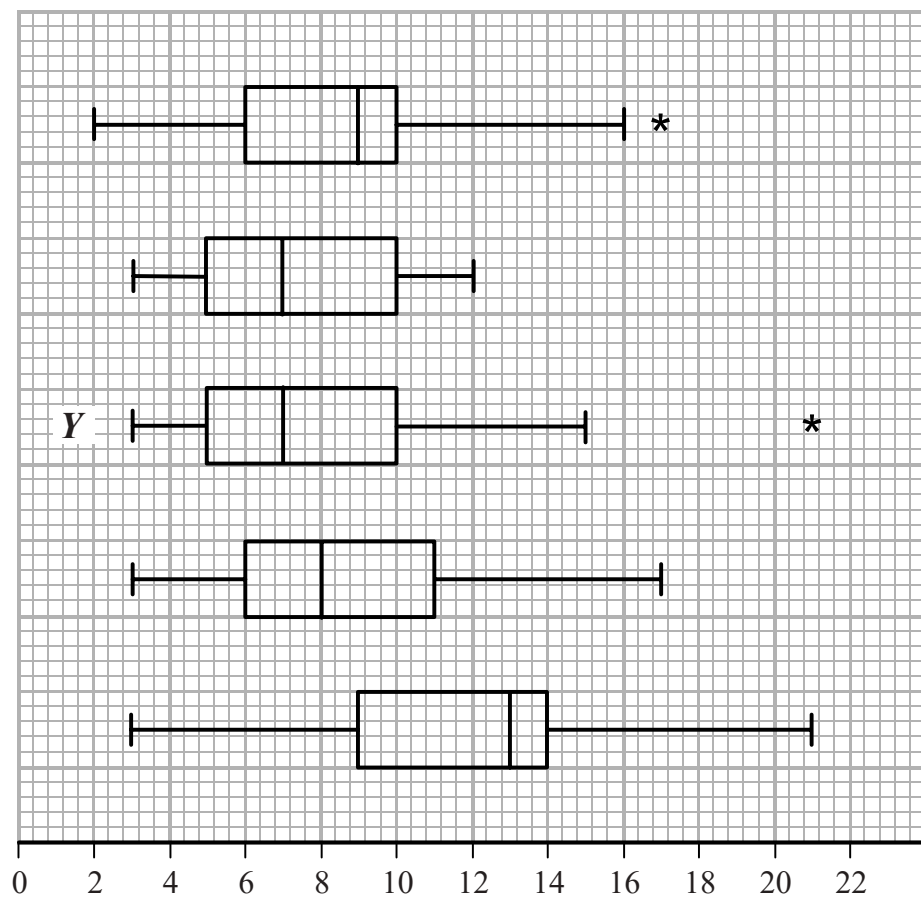
(Total for Question 4 is 8 marks)

P 5 8 3 4 7 A 0 1 1 2 8

Turn over ▶

5. A biased spinner can only land on one of the numbers 1, 2, 3 or 4. The random variable X represents the number that the spinner lands on after a single spin and $P(X = r) = P(X = r + 2)$ for $r = 1, 2$

Given that $P(X = 2) = 0.35$

(a) find the complete probability distribution of X.

(2)

Ambroh spins the spinner 60 times.

(b) Find the probability that more than half of the spins land on the number 4
Give your answer to 3 significant figures.

(3)

The random variable $Y = \dfrac{12}{X}$

(c) Find $P(Y - X \leqslant 4)$

(3)

Question 5 continued

(Total for Question 5 is 8 marks)

TOTAL FOR SECTION A IS 30 MARKS

P 5 8 3 4 7 A 0 1 5 2 8