

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Candidate signature

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I declare this is my own work.

# AS FURTHER MATHEMATICS

## Paper 2 Statistics

Thursday 14 May 2020

Afternoon

Time allowed: 1 hour 30 minutes

### Materials

- You must have the AQA formulae and statistical tables booklet for A-level Mathematics and A-level Further Mathematics.
- You should have a scientific calculator that meets the requirements of the specification. (You may use a graphical calculator.)
- You must ensure you have the other optional Question Paper/Answer Book for which you are entered (**either** Discrete **or** Mechanics). You will have 1 hour 30 minutes to complete **both** papers.

### Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer each question in the space provided for that question. If you require extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do **not** write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 40.

### Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.

| For Examiner's Use |      |
|--------------------|------|
| Question           | Mark |
| 1                  |      |
| 2                  |      |
| 3                  |      |
| 4                  |      |
| 5                  |      |
| 6                  |      |
| 7                  |      |
| 8                  |      |
| <b>TOTAL</b>       |      |



Answer **all** questions in the spaces provided.

- 1** The discrete random variable  $X$  has the following probability distribution function.

$$P(X = x) = \begin{cases} 0.2 & x = 1 \\ 0.3 & x = 2 \\ 0.1 & x = 3, 4 \\ 0.25 & x = 5 \\ 0.05 & x = 6 \\ 0 & \text{otherwise} \end{cases}$$

Find the mode of  $X$ .

Circle your answer.

**[1 mark]**

0.1

0.25

2

3



**2**

A  $\chi^2$  test is carried out in a school to test for association between the class a student belongs to and the number of times they are late to school in a week.

The contingency table below gives the expected values for the test.

|       |          | Number of times late |      |       |      |      |
|-------|----------|----------------------|------|-------|------|------|
|       |          | 0                    | 1    | 2     | 3    | 4    |
| Class | <b>A</b> | 8.12                 | 14   | 15.12 | 14   | 4.76 |
|       | <b>B</b> | 8.99                 | 15.5 | 16.74 | 15.5 | 5.27 |
|       | <b>C</b> | 11.89                | 20.5 | 22.14 | 20.5 | 6.97 |

Find a possible value for the degrees of freedom for the test.

Circle your answer.

**[1 mark]**

6

8

12

15

**Turn over for the next question**

**Turn over ►**



**3** The random variable  $X$  represents the value on the upper face of an eight-sided dice after it has been rolled. The faces are numbered 1 to 8

The random variable  $X$  is modelled by a discrete uniform distribution with  $n = 8$

**3 (a)** Find  $E(X)$

[1 mark]

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**3 (b)** Find  $\text{Var}(X)$

[1 mark]

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**3 (c)** Find  $P(X \geq 6)$

[1 mark]

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**3 (d)** The dice was rolled 800 times and the results below were obtained.

| $x$       | 1   | 2  | 3  | 4   | 5  | 6  | 7  | 8   |
|-----------|-----|----|----|-----|----|----|----|-----|
| Frequency | 103 | 63 | 84 | 110 | 74 | 41 | 85 | 240 |

State, with a reason, how you would refine the model for the random variable  $X$ .

**[2 marks]**

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Murni is investigating the annual salary of people from a particular town.

The mean annual salary is £28 500 and the standard deviation is £5100

**[3 marks]**

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- 5** The discrete random variable  $X$  has the following probability distribution.

|            |          |          |          |          |
|------------|----------|----------|----------|----------|
| $x$        | <b>2</b> | <b>4</b> | <b>6</b> | <b>9</b> |
| $P(X = x)$ | 0.2      | 0.6      | 0.1      | 0.1      |

- 5 (a)** Find  $P(X \leq 6)$

**[1 mark]**

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- 5 (b)** Let  $Y = 3X + 2$

Show that  $\text{Var}(Y) = 32.49$

**[5 marks]**

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**5 (c)** The continuous random variable  $T$  is independent of  $Y$ .

Given that  $\text{Var}(T) = 5$ , find  $\text{Var}(T + Y)$

**[1 mark]**

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**6** The continuous random variable  $X$  has probability density function

$$f(x) = \begin{cases} \frac{4}{45}(x^3 - 10x^2 + 29x - 20) & 1 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

**6 (a)** Find  $P(X < 2)$

**[2 marks]**

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**6 (b)** Verify that the median of  $X$  is 2.3, correct to two significant figures.

**[4 marks]**

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**6 (c)** Find the mean of  $X$ .

**[2 marks]**

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**[1 mark]**

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**[4 marks]**

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**7 (c)** State in context the correct conclusion to Sylvia's test.

**[1 mark]**

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On a randomly chosen day, he records a total of 16 births from the two hospitals.

**[6 marks]**

[illegible]

**[3 marks]**

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