

Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

# INTERNATIONAL A-LEVEL MATHEMATICS

(9660/MA04) Unit S2 Statistics

Tuesday 21 January 2020 07:00 GMT Time allowed: 1 hour 30 minutes

## Materials

- For this paper you must have the Oxford International AQA booklet of formulae and statistical tables (enclosed).
- You may use a graphics calculator.

## 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 the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need 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 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 80.

## Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- Show all necessary working; otherwise marks may be lost.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>TOTAL</b>	



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

- 1** The continuous random variable  $X_1$  has mean 2 and variance 3  
The continuous random variable  $X_2$  has mean 5 and variance 1  
The continuous random variable  $X_3$  has mean 1 and variance 0.5  
 $X_1$ ,  $X_2$  and  $X_3$  are independent.

**1 (a)** Find  $E\left(\sum_{i=1}^3 X_i\right)$

[1 mark]

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Answer \_\_\_\_\_

**1 (b)** Find  $\text{Var}\left(\sum_{i=1}^3 X_i\right)$

[1 mark]

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Answer \_\_\_\_\_



1 (c) Find  $E(3X_1 - 4X_3)$

[2 marks]

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Answer \_\_\_\_\_

1 (d) Find  $\text{Var}(5X_1 - 2X_2)$

[2 marks]

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Answer \_\_\_\_\_

6

Turn over ►



**2** The random variable  $X$  has an exponential distribution with parameter  $\lambda$ , where  $\lambda > 0$

The variance of  $X$  is 400

**2 (a)** Find  $\lambda$ .

**[2 marks]**

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Answer \_\_\_\_\_

**2 (b)** Find the mean of  $X$ .

**[1 mark]**

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Answer \_\_\_\_\_



2 (c) Find  $P(X > 25)$ , giving your answer to three significant figures.

[3 marks]

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Answer \_\_\_\_\_

2 (d) Find  $x$  such that  $P(X < x) = 0.6$ , giving your answer to three significant figures.

[2 marks]

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Answer \_\_\_\_\_

8
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Turn over ►









**5 (b)** Describe, in the context of the test in part (a), a Type II error.

**[1 mark]**

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7
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**Turn over for the next question**

**Turn over ►**





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$$\mu = \underline{\hspace{2cm}} \quad \sigma = \underline{\hspace{2cm}}$$

**6 (c)** The maximum possible mark for the test is 85 marks.

Explain why the normal distribution model used in parts **(a)** and **(b)** may not be a valid model.

**[1 mark]**

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**8**

Turn over ►















**10 (a)** A simple random sample is taken from car owners in a town.

**10 (a) (i)** State the population for this sample.

**[1 mark]**

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**10 (a) (ii)** State a condition which must be satisfied by a simple random sample.

**[1 mark]**

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**10 (b)** State the parameter used in calculating probabilities using the Poisson distribution.

**[1 mark]**

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**10 (c)** State the parameters used in calculating probabilities using the normal distribution.

**[2 marks]**

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**END OF QUESTIONS**



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2 4



2 0 1 X M A 0 4

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