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Centre number

Candidate number

Surname _____

Forename(s) _____

Candidate signature _____

INTERNATIONAL A-LEVEL MATHEMATICS

(9660/MA04) Unit S2 – Statistics

Monday 10 June 2019

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 for method may be lost.

For Examiner's Use	
Question	Mark
1	
2	
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6	
7	
8	
9	
TOTAL	



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2 The height, X , of the female adults in a city can be modelled by a normal distribution with mean 162 cm and standard deviation 5 cm

2 (a) Find the probability that a randomly selected female adult from the city has a height less than 152 cm

[2 marks]

Answer _____



3 The continuous random variable T has cumulative distribution function

$$F(t) = \begin{cases} 0 & t \leq 0 \\ kt^4 & 0 < t \leq 5 \\ 1 & t > 5 \end{cases}$$

3 (a) Show that $k = \frac{1}{625}$

[2 marks]

3 (b) State $P(T = 3)$

[1 mark]

Answer _____



3 (c) The constant c is such that $P(T \leq c) = 0.75$

Find c .

Give your answer to four significant figures.

[2 marks]

Answer _____

5

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- 5 (b)** Explain why it is not necessary to assume that the scores have a normal distribution to carry out the test in part (a).

[2 marks]

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9

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6 A manufacturer produces light bulbs.

The lifetimes, in years, of six light bulbs in a random sample were

3.21 3.42 3.84 3.91 4.11 4.85

6 (a) Calculate:

6 (a) (i) the sample mean;

[1 mark]

Answer _____

6 (a) (ii) the sample variance.

[2 marks]

Answer _____



- 7** Emily counts the number of cars, X , going past her house during a 10-minute interval.
Emily believes that the distribution of X can be modelled by a Poisson distribution with mean 6.5

7 (a) Find $P(X = 4)$

[2 marks]

Answer _____

- 7 (b)** Emily also counts the number of lorries, Y , going past her house during a 10-minute interval.
Emily believes that the distribution of Y can be modelled by a Poisson distribution with mean 0.5

Assume X and Y are independent.

7 (b) (i) Find the probability that the total number of cars and lorries going past Emily's house in 10 minutes is less than 3

[3 marks]

Answer _____



7 (b) (iii) Explain, in the context of the test in part (b)(ii), the meaning of a Type I error.

[2 marks]

7 (b) (iv) Calculate the probability of making a Type I error in the test in part (b)(ii).

[2 marks]

Answer _____

15



9 A random sample X_1, X_2, X_3 and X_4 , is taken from a population with unknown mean μ .

9 (a) State whether or not

$$X_1 + 2X_2 + 3X_3 + 4X_4$$

is a statistic, giving a reason for your answer.

[2 marks]

9 (b) State whether or not

$$\frac{\sum_{i=1}^4 X_i^2}{4} - \mu^2$$

is a statistic, giving a reason for your answer.

[2 marks]

END OF QUESTIONS

4



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