

Please write clearly in block capitals.

Centre number

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Candidate number

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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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8	
9	
TOTAL	



J U N 1 9 M A 0 4 0 1

1

[4 marks]

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Answer

4



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ANSWER IN THE SPACES PROVIDED**

Turn over ►



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 _____



- Of the male adults in the city, 5% have a height greater than 185 cm

- [4 marks]**

[illegible]

- Describe the distribution of $X + Y$.

[2 marks]

[illegible]

- 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

Turn over for the next question

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- 4** The length, L cm, of bolts produced by a machine can be modelled by $L \sim N(3.5, 0.3^2)$
A random sample of n bolts is taken.

- 4 (a)** Given that $n = 20$, find $P(\bar{L} > 3.65)$

[4 marks]

Answer _____



4 (b) Given that $P(\bar{L} < 3.6) > 0.99$, find the minimum possible value of n .

[4 marks]

Answer _____

8

Turn over for the next question

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There is a new version of the computer game. The scores of a random sample of 100 players are recorded and are found to have a mean of 492 and a standard deviation of 38.2

[7 marks]

[illegible]

- 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]

Turn over for the next question

9

Turn over ►



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 marks]

[illegible]

10



- 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 _____



[6 marks]

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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



$$f(x) = \begin{cases} \frac{1}{32}x^3 & 0 < x \leq 2 \\ \frac{1}{8}x + \frac{1}{16} & 2 < x \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

[3 marks]

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[5 marks]

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Answer _____

[2 marks]

Answer _____



[7 marks]

[illegible]

Answer _____

Turn over for the next question

17

Turn over ►



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



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Question number	Additional page, if required. Write the question numbers in the left-hand margin.
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