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Centre number

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Candidate number

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Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

INTERNATIONAL A-LEVEL MATHEMATICS

(9660/MA04) Unit S2 Statistics

Thursday 4 June 2026

08:00 UK Time

Time allowed: 1 hour 30 minutes

Materials

- For this paper you must have the OxfordAQA Booklet of Formulae and Statistical Tables (enclosed).
- You may use a graphical 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	
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5	
6	
7	
8	
9	
TOTAL	



J U N 2 6 M A 0 4 0 1

IB/M/Jun26/G4006/V5

MA04

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

1 It is given that $\bar{X} \sim N\left(120, \frac{20^2}{n}\right)$

1 (a) (i) In the case when $n = 30$, state $P(\bar{X} = 120)$

[1 mark]

Answer _____

1 (a) (ii) In the case when $n = 30$, find $P(\bar{X} > 115)$

Give your answer to four significant figures.

[3 marks]

Answer _____



- 1 (b)** In the case when $n = 50$, it is given that $P(\bar{X} < k) = 0.9$ where k is a constant.

Find the value of k

Give your answer to four significant figures.

[3 marks]

$k =$ _____

7

Turn over for the next question

Turn over ►



$$f(x) = \begin{cases} \frac{45}{(3+2x)^2} & 3 \leq x \leq b \\ 0 & \text{otherwise} \end{cases}$$

[4 marks]

[illegible]

2 (b) The cumulative distribution function of X is $F(x)$

Find $F(3.5)$

[2 marks]

Answer _____

6

Turn over for the next question

Turn over ►



[10 marks]

[illegible]

- 3 (b) Give a reason why it is **not** necessary to assume that X is normally distributed to carry out the test in **part (a)**.

[1 mark]

11

Turn over for the next question

Turn over ►



4 A technology business makes smartphones.

It is known that 1.5% of the smartphones they make are faulty.

Faults in the smartphones they make occur independently and randomly.

4 (a) A small company buys 20 smartphones from the technology business.

Find the probability that exactly 2 of the 20 smartphones are faulty.

Give your answer to three significant figures.

[2 marks]

Answer _____

4 (b) (i) State the conditions when a Poisson distribution is suitable to approximate a binomial distribution.

[2 marks]



4 (b) (ii) A large company buys 120 smartphones from the technology business.

Use a Poisson approximation to find the probability that fewer than 3 of the 120 smartphones are faulty.

Give your answer to three significant figures.

[3 marks]

Answer _____

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Turn over for the next question

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5 The continuous random variables X and Y are independent.

It is given that

$$E(X) = a + b$$

$$E(Y) = \frac{1}{a}$$

$$\text{Var}(X) = \frac{a}{5}$$

$$\text{Var}(Y) = \frac{a}{4}$$

where a and b are constants.

5 (a) Find an expression for $E(5X - 3Y)$

Give your answer in terms of a and b

[2 marks]

Answer _____

5 (b) Find an expression for $\text{Var}(5X - 3Y)$

Give your answer in the form ka where k is a constant.

[2 marks]

Answer _____



5 (c) Find an expression for $E(Y^2)$

Give your answer in terms of a

[2 marks]

Answer _____

5 (d) It is given that $E(Y^2) > \text{Var}(5X - 3Y)$

Find the range of possible values for a

[3 marks]

Answer _____



The lifetimes of the batteries they produce are normally distributed with a population mean of 480 hours.

A random sample of 8 batteries is taken.

This sample has a mean lifetime of 475 hours and has an unbiased estimate of the population standard deviation of 10 hours.

[7 marks]

[illegible]

6 (b) Describe a Type I error in the context of the test in **part (a)**.

[1 mark]

6 (c) State the probability of making a Type I error in **part (a)**.

[1 mark]

Answer _____

9

Turn over for the next question

Turn over ►



- 7** A company manufactures a device called a hot wire cutter which is used for cutting plastics.

The time T hours until these devices break down is modelled by an exponential distribution with $\lambda = 0.05$

- 7 (a)** Find the mean and the variance of T

[2 marks]

Mean _____

Variance _____

- 7 (b)** Find the probability that a hot wire cutter has a break down within 30 hours.
Give your answer to three significant figures.

[2 marks]

Answer _____



- 7 (c)** It is given that $P(T < k) = 0.98$ where k is a constant.

Find the value of k

Give your answer to three significant figures.

[2 marks]

$k =$ _____

- 7 (d)** A small business owns four hot wire cutters.

The time taken for a hot wire cutter to break down is independent of the time taken for any other hot wire cutter to break down.

All four of the hot wire cutters are used simultaneously.

Find the probability that none of the hot wire cutters break down within 30 hours.

Give your answer to three significant figures.

[2 marks]

Answer _____



- 8** The continuous random variable X has a cumulative distribution function $F(x)$ defined by

$$F(x) = \begin{cases} 0 & x < 1 \\ \frac{2x^3 + 3x}{90} + g & 1 \leq x < 3 \\ \frac{207x - 25x^2 - 338}{h} & 3 \leq x < 4 \\ 1 & x \geq 4 \end{cases}$$

where g and h are constants.

- 8 (a)** Find the value of h

[2 marks]

$h =$ _____

- 8 (b)** Find the value of g

[2 marks]

$g =$ _____



[3 marks]

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$$f(x) = \left\{ \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \end{array} \right.$$

Turn over ►



8 (d)

Find the exact value of

Give your answer in the form $p \ln 3 + q \ln 4 - \frac{13}{45}$ where p and q are constants.

[7 marks]

[illegible]

Answer

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- 9** The discrete random variables X and Y follow independent Poisson distributions such that

$$X \sim \text{Po}(\lambda) \quad \text{and} \quad Y \sim \text{Po}(3\lambda)$$

where $\lambda > 0$

It is given that $T = X + Y$

- 9 (a)** Find the mean of T in terms of λ

[1 mark]

Answer _____

- 9 (b)** It is given that $P(T = 5) = 20 \times P(T = 3)$

Find $P(Y \geq 10)$

Give your answer to three significant figures.

[6 marks]



Answer _____

9 (c) Find $P(T < 8 \mid Y = 5)$

Give your answer to three significant figures.

[2 marks]

Answer _____

9

END OF QUESTIONS



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