

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1305U50-1



S25-1305U50-1

FRIDAY, 13 JUNE 2025 – AFTERNOON

FURTHER MATHEMATICS – A2 unit 5
FURTHER STATISTICS B

1 hour 45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	9	
2	5	
3	18	
4	14	
5	6	
6	11	
7	17	
Total	80	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a Formula Booklet;
- a calculator;
- statistical tables (RND/WJEC Publications).

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The maximum mark for this paper is 80.

The number of marks is given in brackets at the end of each question or part-question.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

Answers without working may not gain full credit.

Unless the degree of accuracy is stated in the question, answers should be rounded appropriately.

You are reminded of the necessity for good English and orderly presentation in your answers.



JUN251305U50101

1. A manufacturer produces light bulbs and claims that the average lifespan of these bulbs is 800 hours with a standard deviation of 50 hours. A sample of 100 bulbs is randomly selected and tested. The mean lifespan is found to be 785 hours.



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03

- [3]

- [1]

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- (a) Find $E(X^2)$. [4]



(b) Hence, write down an unbiased estimator for θ^2 .

[1]

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- The following results show the levels of wellbeing of the participants before and after the trial. A higher value corresponds to better wellbeing.

Participant	A	B	C	D	E	F	G	H	I
Wellbeing Before	67	72	56	49	50	90	10	75	55
Wellbeing After	75	81	57	46	60	88	30	80	59

- (a) Conduct a Wilcoxon Signed-Rank test at a significance level as close to 5% as possible. [9]





Participants are asked a series of questions and are assigned an anxiety score based on their responses.

$$\sum x = 1560 \qquad \sum y = 940$$

(b) State the hypotheses for Jeff's test. [1]

(c) Calculate the p -value and state your conclusion in context. [8]







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- [illegible]



Independently, the time taken, Y minutes, for people to complete a puzzle of Type B has the distribution $N(8, 2 \cdot 8^2)$. Mali is given, at random, a puzzle of Type A and Ela is given, at random, a puzzle of Type B.

- (c) Find the probability that Mali completes her puzzle in less time than Ela takes to complete her puzzle.

[4]

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- 164 175 177 173 174 174 178 167 171 171 177 175

- [9]



- (b) A random sample of 15 women from Country A have a mean height of 165 cm. State, with a reason, whether you think that Country A is likely to be The Netherlands. [1]

- (c) Comment on the reasonableness of the assumption that you have made in part (a). [1]



- The score X has the following probability distribution, where θ is an unknown parameter such that $0 < \theta < 0.4$.

x	-3	-1	2	4
$P(X = x)$	θ	0.2	θ	$0.8 - 2\theta$

- (a) (i) Obtain an expression for $E(X)$. [2]
- (ii) Show that $\text{Var}(X) = 4 + 35\theta - 81\theta^2$. [2]



(b) (i) Show that $T_1 = \frac{3 - \bar{X}}{9}$ is an unbiased estimator for θ . [2]

(ii) Find an expression for $\text{Var}(T_1)$ in terms of n and θ . [2]

TURN OVER FOR QUESTIONS 7(c) & 7(d)



(c) Show that $T_2 = \frac{4n-5Y}{5n}$ is an unbiased estimator for θ . [4]



- [5]



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[illegible]

[illegible]

[illegible]

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