

Surname	Centre Number	Candidate Number
First name(s)		2



GCE AS/A LEVEL

2305U20-1



FRIDAY, 16 MAY 2025 – AFTERNOON

FURTHER MATHEMATICS – AS unit 2
FURTHER STATISTICS A

1 hour 30 minutes

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 70.

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.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	11	
2	7	
3	9	
4	11	
5	17	
6	15	
Total	70	



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[6]



The random variable Y has the binomial distribution $B(12, 0.3)$. Given that X and Y are independent variables,

(b) calculate $E(3XY)$,

[2]

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(c) calculate $\text{Var}(6X - 5Y + 1)$.

[3]

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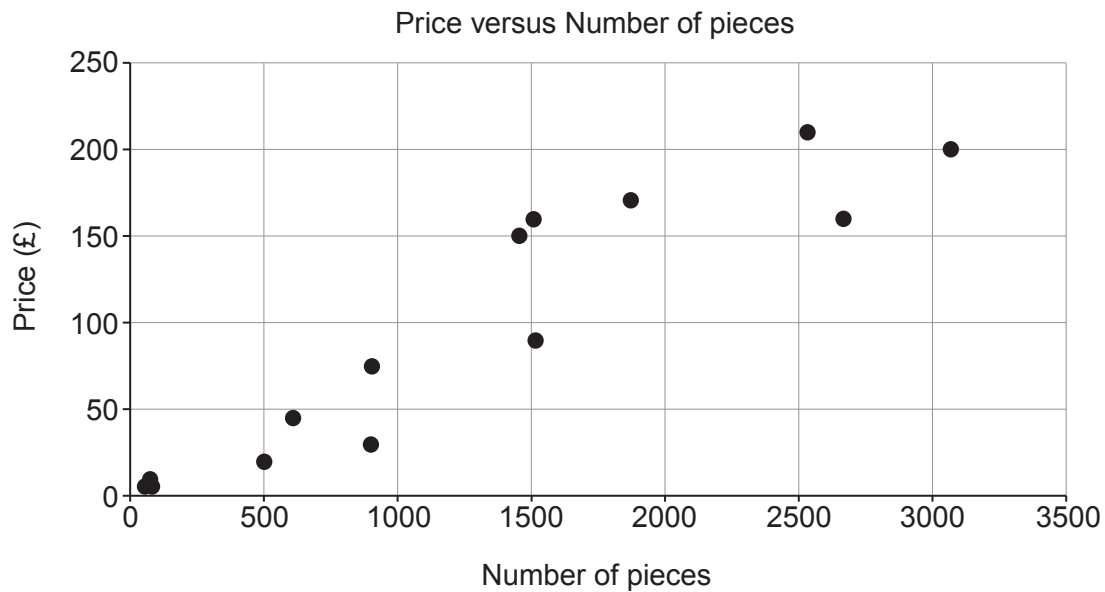
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The summary statistics for these data are shown below.

$$n = 14$$

- (a) Calculate the equation of the least squares regression line for the price on the number of pieces. [5]



- (b) Calculate an estimate for the price of a building-block set that has 1200 pieces.
Comment on the reliability of your answer.

[2]



- (iii) Find $\text{Var}(X)$. [2]



- (b) Find the amount to which the £10 prize would have to be changed in order to make the player's expected profit £0. [1]



- (a) State a pair of appropriate hypotheses for such a test. [1]

Athlete	A	B	C	D	E	F	G
Height (m)	1.91	1.92	1.80	1.81	1.85	1.90	1.93
Distance jumped (m)	17.18	17.57	17.47	17.44	17.98	17.25	17.43

- (b) Calculate Spearman's rank correlation coefficient for this data set. [5]



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5. Mark is a fan of 'Gaming Extreme', which is a multidisciplinary sport in which there are four ways of winning. Athletes compete in different age categories.

The table below shows the age category and manner of victory for 3829 randomly selected contests from the global population of Gaming Extreme contests.

Age Category	Outlasting	Timing out	Zoning	Goaling
Men Senior	391	211	7	3
Men U18	335	368	7	3
Men U16	391	578	10	5
Men U14	343	598	12	1
Women Senior	71	159	1	0
Women U18	9	17	0	0
Women U16	47	111	1	0
Women U14	34	116	0	0

Mark wants to investigate whether age category is independent of manner of victory. He produces the following computer output for a chi-squared test for independence.

```
> chisq.test(Gaming)

Chi-squared test

data: Gaming
X-squared = 203.93, df = 21, p-value < 2.2e-16
```

- (a) (i) Comment on the p -value. [1]
- (ii) Comment on the validity of the test in light of the last two columns. [2]

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TURN OVER FOR QUESTION 5(b)



The following table shows manner of victory and gender.

Gender	Outlasting	Timing Out	Total
Men	1460	1755	3215
Women	161	403	564
Total	1621	2158	3779

- (b) Carry out a chi-squared test for independence at the 5% level of significance. [12]



- (c) State, with a reason, whether men or women most affect the outcome of the test.
Comment on your answer.

[2]



- $$f(x) = \begin{cases} ke^{-kx} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

- (i) What is the name of the distribution that X follows? [1]
- (ii) Show that $P(X \leq x) = 1 - e^{-kx}$, for $x \geq 0$. [2]
- (iii) State $F(x)$, the cumulative distribution function for X , for all values of x . [1]
- (iv) Find an expression, in terms of k , for the exact value of the interquartile range of X . Simplify your answer. [5]







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