

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International
Advanced Level

Centre Number

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Candidate Number

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Tuesday 16 June 2020

Morning (Time: 1 hour 30 minutes)

Paper Reference **WST03/01**

Mathematics

International Advanced Subsidiary/Advanced Level
Statistics S3

You must have:

Mathematical Formulae and Statistical Tables (Blue), calculator

Total Marks

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Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.
- Values from statistical tables should be quoted in full. If a calculator is used instead of the tables the value should be given to an equivalent degree of accuracy.
- Inexact answers should be given to three significant figures unless otherwise stated.

Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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Pearson

- $$P(X = x) = \frac{1}{\alpha} \quad \text{for } x = 1, 2, \dots, \alpha$$

(a) Show that $2\bar{X}$ is a biased estimator of α (2)

8 7 3 7 2 9

- (b) Use the sample mean to estimate the value of α (2)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Question 1 continued

Handwriting practice area with 30 horizontal lines.

(Total 4 marks)

Q1

Mark box for Q1



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2. A university awards its graduates a degree in one of three categories, Distinction, Merit or Pass.

Table 1 shows information about a random sample of 200 graduates from three departments, Arts, Humanities and Sciences.

	Arts	Humanities	Sciences	Total
Distinction	22	32	38	92
Merit	15	30	13	58
Pass	18	15	17	50
Total	55	77	68	200

Table 1

Xiu wants to carry out a test of independence between the category of degree and the department.

Table 2 shows some of the values of $\frac{(O-E)^2}{E}$ for this test.

	Arts	Humanities	Sciences	Total
Distinction	0.43	0.33	1.44	2.20
Merit	0.06	2.63	2.29	4.98
Pass				

Table 2

- (a) Complete Table 2 (4)
- (b) Hence, complete Xiu's hypothesis test using a 5% level of significance. You should state the hypotheses, the degrees of freedom and the critical value used for this test. (5)

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Question 2 continued

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Question 2 continued

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Question 2 continued

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(Total 9 marks)

Q2





Question 3 continued

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Question 3 continued

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Question 3 continued

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(Total 11 marks)

Q3



4. Luka wants to carry out a survey of students at his school.

He obtains a list of all 280 students.

- (a) Explain how he can use this list to select a systematic sample of 40 students. (2)

Luka is trying to make his own random number table. He generates 400 digits to put in his table. Figure 1 shows the frequency of each digit in his table.

Digit generated	0	1	2	3	4	5	6	7	8	9
Frequency	36	42	33	41	44	43	48	38	32	43

Figure 1

A test is carried out at the 10% level of significance to see if the digits Luka generates follow a uniform distribution.

For this test $\sum \frac{(O-E)^2}{E} = 5.9$

- (b) Determine the conclusion of this test. (3)

The digits generated by Luka are taken two at a time to form two-digit numbers.

Figure 2 shows the frequency of two-digit numbers in his table.

Two-digit numbers generated	00–19	20–39	40–59	60–79	80–99
Frequency	31	49	30	42	48

Figure 2

- (c) Test, at the 10% level of significance, whether the two-digit numbers generated by Luka follow a uniform distribution. You should state the hypotheses, the degrees of freedom and the critical value used for this test. (8)

There are 70 students in Year 12 at his school.

- (d) State, giving a reason, the advice you would give to Luka regarding the use of his table of numbers for generating a simple random sample of 10 of the Year 12 students. (2)



Question 4 continued

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Question 4 continued

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(Total 15 marks)

Q4





Question 5 continued

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Question 5 continued

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Question 5 continued

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Q5

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(Total 12 marks)



- (c) Find the probability that only one of these two confidence intervals contains λ (2)

Question 6 continued

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(Total 8 marks)

Q6



Question 7 continued

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TOTAL FOR PAPER: 75 MARKS

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