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Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International Advanced Level

Friday 19 January 2024

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 (Yellow), calculator

Total Marks

Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebraic 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 the 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.

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3. The table shows the annual tea consumption, t (kg/person), and population, p (millions), for a random sample of 7 European countries.

Country	A	B	C	D	E	F	G
Annual tea consumption, t (kg/person)	0.27	0.15	0.42	0.06	1.94	0.78	0.44
Population, p (millions)	5.4	5.8	9	10.2	67.9	17.1	8.7

(You may use $S_{tt} = 2.486$ $S_{pp} = 3026.234$ $S_{pt} = 83.634$)

Angela suggests using the product moment correlation coefficient to calculate the correlation between annual tea consumption and population.

- (a) Use Angela's suggestion to test, at the 5% level of significance, whether or not there is evidence of any correlation between annual tea consumption and population. State your hypotheses clearly and the critical value used.

(5)

Johan suggests using Spearman's rank correlation coefficient to calculate the correlation between the rank of annual tea consumption and the rank of population.

- (b) Calculate Spearman's rank correlation coefficient between the rank of annual tea consumption and the rank of population.

(4)

- (c) Use Johan's suggestion to test, at the 5% level of significance, whether or not there is evidence of a positive correlation between annual tea consumption and population. State your hypotheses clearly and the critical value used.

(3)



7. Small containers and large containers are independently filled with fruit juice.

The amounts of fruit juice in small containers are normally distributed with mean 180 ml and standard deviation 4.5 ml

The amounts of fruit juice in large containers are normally distributed with mean 330 ml and standard deviation 6.7 ml

The random variable W represents the total amount of fruit juice in a random sample of 2 small containers minus the amount of fruit juice in 1 randomly selected large container.

$W \sim N(a, b)$ where a and b are positive constants.

- (a) Find the value of a and the value of b (3)
- (b) Find the probability that a randomly chosen large container of fruit juice contains more than 1.8 times the amount of fruit juice in a randomly chosen small container. (5)

A random sample of 3 small containers of fruit juice is taken.

- (c) Find the probability that the first container of fruit juice in this sample contains at least 5 ml more than the mean amount of fruit juice in all 3 small containers. (6)

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