Pearson Edexcel International Advanced Level

Thursday 22 January 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WST03/01A**

▲ △

Mathematics

International Advanced Subsidiary/Advanced Level
Statistics S3
Question Paper

You must have:
Answer book (sent separately).
Do not return this question paper with the answer book.

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1. The table below shows the distance travelled by car and the amount of commission earned by each of 8 salespersons in 2015

Salesperson	Distance travelled (in 1000s of km)	Commission earned (in $1000s)
A	20.4	17.7
B	22.2	24.1
C	29.9	20.3
D	37.8	28.3
E	25.5	34.9
F	30.2	29.3
G	35.3	23.6
H	16.5	26.8

(a) Find Spearman's rank correlation coefficient for these data.

(4)

(b) Stating your hypotheses clearly, test, at the 5% level of significance, whether or not there is evidence of a positive correlation between the distance travelled by car and the amount of commission earned.

(4)

(Total for Question 1 is 8 marks)

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2. The random variable X follows a continuous uniform distribution over the interval $[\alpha - 3, 2\alpha + 3]$ where α is a constant.

The mean of a random sample of size n is denoted by $\overline{X}$

(a) Show that $\overline{X}$ is a biased estimator of α, and state the bias.

(3)

Given that $Y = k\overline{X}$ is an unbiased estimator for α

(b) find the value of k.

(1)

A random sample of 10 values of X is taken and the results are as follows

3 5 8 12 4 13 10 8 5 12

(c) Hence estimate the maximum value of X

(3)

(Total for Question 2 is 7 marks)

3. A researcher investigates the results of candidates who took their driving test at one of three driving test centres.

A random sample of 620 candidates gave the following results.

		Driving test centre			Total
		A	***B***	***C***	
Result	**Pass**	99	110	68	277
	Fail	108	116	119	343
Total		207	226	187	620

(a) Test, at the 5% level of significance, whether there is an association between the results of candidates' driving tests and the driving test centre. Show your working clearly. You should state your hypotheses, expected frequencies, test statistic and the critical value for this test.

(10)

The researcher decides to conduct a further investigation into the results of candidates' driving tests.

(b) State which driving test centre you would recommend for further investigation. Give a reason for your answer.

(2)

(Total for Question 3 is 12 marks)

4. A company produces a certain type of mug. The masses of these mugs are normally distributed with mean μ and standard deviation 1.2 grams. A random sample of 5 mugs is taken and the mass, in grams, of each mug is measured. The results are given below.

229.1 229.6 230.9 231.2 231.7

(a) Find a 95% confidence interval for μ, giving your limits correct to 1 decimal place.

(4)

Sonia plans to take 20 random samples, each of 5 mugs. A 95% confidence interval for μ is to be determined for each sample.

(b) Find the probability that more than 3 of these intervals will not contain μ.

(3)

(Total for Question 4 is 7 marks)

5. Jeff records the number of births announced in his local weekly newspaper each week for n consecutive weeks, where n is an integer. He decides the resulting data can be modelled as independent samples from a Poisson distribution with mean 2.8 and calculates the expected frequencies using this model.

The following table shows the observed frequencies and the expected frequencies, to 2 decimal places.

The observed and expected frequencies for 5 births are not given.

Number of births	Observed frequency (O)	Expected frequency (E)
0	8	5.84
1	27	16.35
2	25	22.88
3	16	21.36
4	12	14.95
5	a	b
6	2	3.91
$\geqslant 7$	1	2.34

(a) Find the value of a and the value of b

(2)

The value of $\sum \frac{(O-E)^2}{E}$ for the given values for the number of births 0, 1, 2, 3 and 4 is 9.86

(b) Using a 5% significance level, test whether or not this Poisson model is suitable. Show your working clearly, stating your hypotheses, test statistic and critical value.

(7)

(Total for Question 5 is 9 marks)

6. A large company surveyed its staff to investigate the awareness of company policy. The company employs 6000 full-time staff and 4000 part-time staff.

(a) Describe how a stratified sample of 200 staff could be taken.

(3)

(b) Explain an advantage of using a stratified sample rather than a simple random sample.

(1)

A random sample of 80 full-time staff and an independent random sample of 80 part-time staff were given a test of policy awareness. The results are summarised in the table below.

	Mean score ($\bar{x}$)	**Variance of scores** (s^2)
Full-time staff	52	21
Part-time staff	50	19

(c) Stating your hypotheses clearly, test, at the 1% level of significance, whether or not the mean policy awareness scores for full-time and part-time staff are different.

(7)

(d) Explain the significance of the Central Limit Theorem to the test in part (c).

(2)

(e) State an assumption you have made in carrying out the test in part (c).

(1)

After all the staff had completed a training course the 80 full-time staff and the 80 part-time staff were given another test of policy awareness. The value of the test statistic z was 2.53

(f) Comment on the awareness of company policy for the full-time and part-time staff in light of this result. Use a 1% level of significance.

(2)

(g) Interpret your answers to part (c) and part (f).

(1)

(Total for Question 6 is 17 marks)

7. (i) As part of a recruitment exercise candidates are required to complete three separate tasks. The times taken, A, B and C, in minutes, for candidates to complete the three tasks are such that

$$A \sim \text{N}(21, 2^2),\ B \sim \text{N}(32, 7^2) \text{ and } C \sim \text{N}(45, 9^2)$$

The time taken by an individual candidate to complete each task is assumed to be independent of the time taken to complete each of the other tasks.

A candidate is selected at random.

(a) Find the probability that the candidate takes a total time of more than 90 minutes to complete all three tasks.

(4)

(b) Find $\text{P}(A > B)$

(4)

(ii) A simple random sample, X_1, X_2, X_3, X_4, is taken from a normal population with mean μ and standard deviation σ

Given that

$$\overline{X} = \frac{X_1 + X_2 + X_3 + X_4}{4}$$

and that

$$\text{P}(X_1 > \overline{X} + k\sigma) = 0.1$$

where k is a constant,

find the value of k, giving your answer correct to 3 significant figures.
You should show all stages of your working.

(7)

(Total for Question 7 is 15 marks)

TOTAL FOR PAPER IS 75 MARKS

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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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Mathematics

International Advanced Subsidiary/Advanced Level
Statistics S3
Answer Book

You must have:
Mathematical Formulae and Statistical Tables (Yellow), calculator, Question paper (sent separately)

Total Marks

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 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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Question 1

Write the answer to Question 1 on these 2 pages

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Question 1 continued

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(Total for Question 1 is 8 marks)

Question 2

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Question 2 continued

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(Total for Question 2 is 7 marks)

Question 3

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Question 3 continued

Question 3 continued

Question 3 continued

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(Total for Question 3 is 12 marks)

Question 4

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Question 4 continued

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(Total for Question 4 is 7 marks)

Question 5

Write the answer to Question 5 on these 4 pages

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Question 5 continued

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(Total for Question 5 is 9 marks)

Question 6

Write the answer to Question 6 on these 4 pages

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Question 6 continued

Question 6 continued

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Question 6 continued

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(Total for Question 6 is 17 marks)

Question 7

Write the answer to Question 7 on these 5 pages

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Question 7 continued

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Question 7 continued

Question 7 continued

(Total for Question 7 is 15 marks)

TOTAL FOR PAPER IS 75 MARKS