Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Thursday 22 January 2026

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WST03/01**

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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 8 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

1. Zimo wants to apply for a job with a large international company.

All applicants must take an aptitude test to see if they are suitable for the job.

There are two centres where Zimo can take the test, centre A and centre B

Zimo found out that last month

- 90 people took the test at centre A and 60 passed
- 110 people took the test at centre B and 80 passed

Test, at the 5% level of significance, whether or not the aptitude test result is independent of the test centre.

Show your working clearly. You must state your hypotheses, expected frequencies, test statistic and critical value.

(8)

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Question 1 continued

Question 1 continued

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Question 1 continued

(Total for Question 1 is 8 marks)

2. At a dog show, 5 Great Dane dogs were ranked by two judges, judge X and judge Y

Spearman's rank correlation coefficient between the judges' ranks is calculated and a test for positive correlation is carried out at the 5% significance level.

(a) State suitable hypotheses for the test.

(1)

Given that the result of the hypothesis test was to reject H_0

(b) show that the largest possible value of $\sum d^2$ is 2

(3)

The table below gives the rank order for judge X

Dog	*A*	*B*	*C*	*D*	*E*
Judge X	1	2	3	4	5

Given that $\sum d^2$ takes its largest possible value,

(c) find a possible order for judge Y's rankings.

(2)

Question 2 continued

(Total for Question 2 is 6 marks)

3. A machine produces packets of cereal with weights, Xkg, such that $X \sim N(\mu, \sigma^2)$

A random sample of these packets is taken and a 95% confidence interval for μ is found to be (509.1572, 510.8428)

(a) Find a 90% confidence interval for μ based on the same sample of packets.
You must show your working and give your confidence limits to one decimal place.

(6)

Using three different random samples, three 90% confidence intervals are to be found.

(b) Calculate the probability that at least 1 of these intervals will contain μ

(2)

Question 3 continued

(Total for Question 3 is 8 marks)

4. A supermarket sells apples in trays. Each tray contains 10 apples.

Trays are inspected for rotten apples daily.

The following table shows the numbers of rotten apples in a random sample of 150 trays on one day.

Number of rotten apples	0	1	2	3	4	5	6
Frequency	25	47	37	24	8	6	3

The manager believes that these data can be modelled by a binomial distribution B(10, p)

(a) Use these data to estimate the value of the parameter p for this model.
Give your answer to 2 decimal places.

(2)

The manager uses the estimated value of p to 2 decimal places and calculates expected frequencies to 2 decimal places as follows.

Number of rotten apples	0	1	2	3	4	5	$\geqslant 6$
Expected frequency	20.62	45.26	44.71	26.17	10.05	r	s

(b) Show that the value of r is 2.65 to 2 decimal places.

(1)

(c) Find the value of s to 2 decimal places.

(1)

The manager says that the cells for 4, 5 and $\geqslant 6$ need to be combined into a single cell.

(d) Explain why it is necessary for the manager to do this.

(1)

The value of $\sum \frac{(O-E)^2}{E}$ for the first 4 frequencies given in each table is 2.51

(e) Using a 10% significance level, test whether or not a binomial distribution is a suitable model.
You must state your hypotheses, test statistic and the critical value used.

(7)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 12 marks)

5. A statistics course was taught by two professors. Students attend either all lectures given by professor A or all lectures given by professor B

Students who took this course all sat the same examination at the end of the course and their mark, x, was recorded.

The results of the examination for a random sample of students taught by each professor are summarised in the table below.

	n	$\sum x$	$\sum x^2$	**Unbiased estimate of the mean**	**Unbiased estimate of the variance**
Students taught by professor A	50	3610	260 955.6	72.2	6.4
Students taught by professor B	50	3085	190 457.2	m	v

(a) Find the value of m and the value of v

(3)

The head of department claims that the mean mark of the students taught by professor A is more than 10 marks greater than the mean mark of the students taught by professor B

(b) Use a suitable test, at the 5% level of significance, to investigate the claim made by the head of department.

(7)

(c) State two assumptions you have made in carrying out the test in part (b).

(2)

Question 5 continued

Question 5 continued

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Question 5 continued

(Total for Question 5 is 12 marks)

6. The random variable $H \sim N(\mu, 6^2)$

The mean of a random sample of n observations of H is denoted by $\bar{H}$

Given that $P(\bar{H} < 55.08) = 0.1151$ and $P(\bar{H} > 56.976) = 0.0250$ using the tables provided

(a) show that $n = 100$

(6)

(b) hence, find the value of μ

(2)

Question 6 continued

(Total for Question 6 is 8 marks)

7. The random variable X has a continuous uniform distribution over the interval $[a - 1, a + 5]$ where a is a constant.

The mean of a random sample of size 9, taken from this distribution, is denoted by $\bar{X}$

(a) Find, in terms of $\bar{X}$, an unbiased estimator for a

(3)

(b) Hence find the standard error of the unbiased estimator for a

(5)

Question 7 continued

(Total for Question 7 is 8 marks)

8. A market stall sells cauliflowers classified by three different weights, small (S), medium (M) and large (L)

The weights, in grams, of these cauliflowers are modelled by independent normal distributions as shown below.

$$S \sim \mathrm{N}(265, 78^2) \qquad M \sim \mathrm{N}(625, 42^2) \qquad L \sim \mathrm{N}(886, 45^2)$$

The random variable T represents the total weight of 2 randomly selected medium cauliflowers minus the weight of 1 randomly selected large cauliflower.

$$T \sim \mathrm{N}(a, b)$$

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

(3)

(b) Using standardisation, find the probability that a randomly selected large cauliflower weighs more than 3 times the weight of a randomly selected small cauliflower.

(5)

A random sample of 2 small cauliflowers is taken.

(c) Using standardisation, find the probability that the first cauliflower in this sample weighs at least 100 grams more than the mean weight of both cauliflowers.

(5)

Question 8 continued

Question 8 continued

(Total for Question 8 is 13 marks)

TOTAL FOR PAPER IS 75 MARKS

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