

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

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Pearson Edexcel International Advanced Level

Time 1 hour 30 minutes

Paper
reference

WST02/01



Mathematics

International Advanced Subsidiary/Advanced Level Statistics S2

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 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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- 1 A local pottery makes cups. The number of faulty cups made by the pottery in a week follows a Poisson distribution with a mean of 6

In a randomly chosen week, the probability that there will be at least x faulty cups made is 0.1528

- (a) Find the value of x (3)

- (b) Use a normal approximation to find the probability that in 6 randomly chosen weeks the total number of faulty cups made is fewer than 32 (4)

A week is called a “*poor week*” if at least x faulty cups are made, where x is the value found in part (a).

- (c) Find the probability that in 50 randomly chosen weeks, more than 1 is a “*poor week*”. (4)



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Question 1 continued

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Question 1 continued

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Q1

(Total 11 marks)



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- 2 The continuous random variable X has cumulative distribution function given by

$$F(x) = \begin{cases} 0 & x < -k \\ \frac{x+k}{4k} & -k \leq x \leq 3k \\ 1 & x > 3k \end{cases}$$

where k is a positive constant.

(a) Specify fully, in terms of k , the probability density function of X

(2)

(b) Write down, in terms of k , the value of $E(X)$

(1)

(c) Show that $\text{Var}(X) = \frac{4}{3}k^2$

(2)

(d) Find, in terms of k , the value of $E(3X^2)$

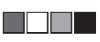
(3)



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Q2

(Total 8 marks)



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- 3 A photocopier in a school is known to break down at random at a mean rate of 8 times per week.
- (a) Give a reason why a Poisson distribution could be used to model the number of breakdowns. (1)
- The headteacher of the school replaces the photocopier with a refurbished one and wants to find out if the rate of breakdowns has increased or decreased.
- (b) Write down suitable null and alternative hypotheses that the headteacher should use. (1)
- The refurbished photocopier was monitored for the first week after it was installed.
- (c) Using a 5% level of significance, find the critical region to test whether the rate of breakdowns has now changed. (3)
- (d) Find the actual significance level of a test based on the critical region from part (c). (2)
- During the first week after it was installed there were 4 breakdowns.
- (e) Comment on this finding in the light of the critical region found in part (c). (2)



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Q3

(Total 9 marks)



- 4 The continuous random variable X has a probability density function given by

$$f(x) = \begin{cases} \frac{1}{2}k(x-1) & 1 \leqslant x \leqslant 3 \\ k & 3 < x \leqslant 6 \\ \frac{1}{4}k(10-x) & 6 < x \leqslant 10 \\ 0 & \text{otherwise} \end{cases}$$

where k is a positive constant.

- (a) Sketch $f(x)$ for all values of x

(2)

- (b) Show that $k = \frac{1}{6}$

(2)

- (c) Specify fully the cumulative distribution function $F(x)$ of X

(7)

Given that $E(X) = \frac{61}{12}$

- (d) find $P(X > E(X))$

(2)

- (e) Describe the skewness of the distribution, giving a reason for your answer.

(2)



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Question 4 continued

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Question 4 continued

Q4

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- 5 Applicants for a pilot training programme with a passenger airline are screened for colour blindness. Past records show that the proportion of applicants identified as colour blind is 0.045

(a) Write down a suitable model for the distribution of the number of applicants identified as colour blind from a total of n applicants.

(1)

(b) State one assumption necessary for this distribution to be a suitable model of this situation.

(1)

(c) Using a suitable approximation, find the probability that exactly 5 out of 120 applicants are identified as colour blind.

(3)

(d) Explain why the approximation that you used in part (c) is appropriate.

(2)

Jaymini claims that 75% of all applicants for this training programme go on to become pilots.

From a random sample of 96 applicants for this training programme 67 go on to become pilots.

(e) Using a suitable approximation, test Jaymini's claim at the 5% level of significance.
State your hypotheses clearly.

(7)



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Q5

(Total 14 marks)



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- 6 (a) Explain what you understand by the sampling distribution of a statistic. (1)

At Sam's cafe a standard breakfast consists of 6 breakfast items. Customers can then choose to upgrade to a medium breakfast by adding 1 extra breakfast item or they can upgrade to a large breakfast by adding 2 extra breakfast items. Standard, medium and large breakfasts are sold in the ratio 6 : 3 : 2 respectively.

A random sample of 2 customers is taken from customers who have bought a breakfast from Sam's cafe on a particular day.

- (b) Find the sampling distribution for the total number, T , of breakfast items bought by these 2 customers. Show your working clearly. (7)

- (c) Find $E(T)$ (2)



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Q6

(Total 10 marks)



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- 7 The sides of a square are each of length L cm and its area is A cm²

Given that A is uniformly distributed on the interval [10, 30]

(a) find $P(L \geq 4.5)$

(2)

(b) find $\text{Var}(L)$

(6)



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Question 7 continued

Q7

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END

TOTAL FOR PAPER: 75 MARKS



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