

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

--	--	--	--	--

--	--	--	--	--

## 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.

**Turn over ►**

P71201A

©2022 Pearson Education Ltd.

L:1/1/1/



P 7 1 2 0 1 A 0 1 2 8



**Pearson**

- 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)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**DO NOT WRITE IN THIS AREA**

**Question 1 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 3 2 8

3

**Turn over ▶**

**Question 1 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



DO NOT WRITE IN THIS AREA

**Question 1 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank

Q1

**(Total 11 marks)**



P 7 1 2 0 1 A 0 5 2 8

- 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)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



**DO NOT WRITE IN THIS AREA**

**Question 2 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 7 2 8

**Question 2 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



DO NOT WRITE IN THIS AREA

**Question 2 continued**

Answer area for Question 2, consisting of 20 blank horizontal lines for writing.

Leave  
blank

**Q2**

**(Total 8 marks)**



P 7 1 2 0 1 A 0 9 2 8

- 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)



**DO NOT WRITE IN THIS AREA**

**Question 3 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 1 1 2 8

**Question 3 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



**Question 3 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank

**Q3**

**(Total 9 marks)**



P 7 1 2 0 1 A 0 1 3 2 8

- 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)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



**DO NOT WRITE IN THIS AREA**

**Question 4 continued**

Leave  
blank

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



P 7 1 2 0 1 A 0 1 5 2 8

**15**

**Turn over ▶**

**Question 4 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



DO NOT WRITE IN THIS AREA

**Question 4 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank

Q4

(Total 15 marks)



- 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)



**DO NOT WRITE IN THIS AREA**

**Question 5 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

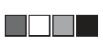
---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 1 9 2 8

**Question 5 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



**DO NOT WRITE IN THIS AREA**

**Question 5 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank

**Q5**

**(Total 14 marks)**



P 7 1 2 0 1 A 0 2 1 2 8

- 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)

---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---

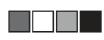


---

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**DO NOT WRITE IN THIS AREA**

**Question 6 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 2 3 2 8

**Question 6 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**



**Question 6 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank

**Q6**

**(Total 10 marks)**



P 7 1 2 0 1 A 0 2 5 2 8

- 7 The sides of a square are each of length  $L$  cm and its area is  $A$  cm<sup>2</sup>

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)

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

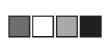
---

---

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**DO NOT WRITE IN THIS AREA**

**Question 7 continued**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Leave  
blank



P 7 1 2 0 1 A 0 2 7 2 8

**Question 7 continued**

Leave  
blank

**DO NOT WRITE IN THIS AREA**

**DO NOT WRITE IN THIS AREA**

**Q7**

**(Total 8 marks)**

**END**

**TOTAL FOR PAPER: 75 MARKS**

