

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 16 January 2025**

Afternoon (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 ►

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2. (i) Nima wants to investigate the distribution of a discrete random variable  $X$

The unknown mean of the distribution is  $\mu$

Nima takes a sample and finds the sample mean,  $\bar{x}$

For **each** of the following, state whether or not it is a statistic. Give a reason for your answer in each case.

(a)  $\mu$

(b)  $\bar{x}$

(2)

- (ii) A discrete random variable  $Y$  has the sampling distribution given in the table below.

$y$	2	5	6
$P(Y = y)$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{5}{12}$

Two random independent observations of  $Y$  are taken.

Find the probability that the value of the first observation of  $Y$  is smaller than the value of the second observation of  $Y$

(3)

- (iii) A bag contains three counters, numbered 3, 4 and 5 respectively. Two counters are drawn at random, one after the other without replacement.

(a) List all the possible combinations of the scores on the two counters.

(1)

The random variable  $T$  is defined as

$$T = \text{number on the first counter} + (2 \times \text{number on the second counter})$$

(b) List all the possible values of  $T$

(2)

(c) Find the sampling distribution of  $T$

(3)

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3. The random variable  $X$  has a continuous uniform distribution over the interval  $[-k, 5k]$  where  $k > 0$

(a) Find, in terms of  $k$ , the probability density function of  $X$  for all values of  $x$  (2)

(b) Sketch the graph of the probability density function of  $X$  (2)

(c) Find the mean of  $X$  in terms of  $k$  (1)

(d) Find, in terms of  $k$ , the cumulative distribution function of  $X$  for all values of  $x$  (4)

The random variable  $Y$  is defined by  $Y = X^2$

(e) Find  $E(Y)$  in terms of  $k$  (3)

(f) Find the exact probability that  $Y < 2k^2$   
Show your working clearly. (3)

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6. The discrete random variable  $R$  has the distribution  $R \sim B(n, p)$

The mean of  $R$  is 200

- (a) State the variance of  $R$  in terms of  $p$

(1)

A normal distribution is used as an approximation for  $R$

Using this approximation,  $P(R < 180) = 0.0307$  to 3 significant figures.

- (b) Show that  $\sqrt{200 - 200p} = 10.96$  to 4 significant figures.

(5)

- (c) Hence find the value of  $p$ , giving your answer to 2 significant figures.

(2)

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7. A continuous random variable  $X$  has probability density function defined as

$$f(x) = \begin{cases} k(x-3)^2 & 2 \leq x \leq 6 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Sketch the graph of  $y = f(x)$  (2)
- (b) Hence write down the mode of  $X$  (1)
- (c) Using algebraic integration and showing your working clearly
- (i) show that  $k = \frac{3}{28}$  (4)
- (ii) verify that the upper quartile of  $X$  lies between 5.71 and 5.72 (3)

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