Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Statistics S2

Advanced/Advanced Subsidiary

Wednesday 1 November 2017 – Morning
Time: 1 hour 30 minutes

Paper Reference
WST02/01

You must have:
Mathematical Formulae and Statistical Tables (Blue)

Total Marks

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. 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). Coloured pencils and highlighter pens must not be used.
- **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. When a calculator is used, the answer should be given to an appropriate degree of accuracy.

Information

- 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.

Turn over ▶

P50806A

1/1/1/1/1/1/

P 5 0 8 0 6 A 0 1 2 4

Pearson

Leave blank

1. A shop sells rods of nominal length 200 cm. The rods are bought from a manufacturer who uses a machine to cut rods of length L cm, where $L \sim N(\mu, 0.2^2)$

The value of μ is such that there is only a 5% chance that a rod, selected at random from those supplied to the shop, will have length less than 200 cm.

(a) Find the value of μ to one decimal place.

(3)

A customer buys a random sample of 8 of these rods.

(b) Find the probability that at least 3 of these rods will have length less than 200 cm.

(3)

Another customer buys a random sample of 60 of these rods.

(c) Using a suitable approximation, find the probability that more than 5 of these rods will have length less than 200 cm.

(3)

Leave blank

Question 1 continued

Q1

(Total 9 marks)

Leave blank

2. The weekly sales, S, in thousands of pounds, of a small business has probability density function

$$f(s) = \begin{cases} k(s-2)(10-s) & 2 < s < 10 \\ 0 & \text{otherwise} \end{cases}$$

(a) Use algebraic integration to show that $k = \frac{3}{256}$

(4)

(b) Write down the value of E(S)

(1)

(c) Use algebraic integration to find the standard deviation of the weekly sales.

(6)

A week is selected at random.

(d) Showing your working, find the probability that this week's sales exceed £7100
Give your answer to one decimal place.

(2)

A quarter is defined as 12 consecutive weeks.

The discrete random variable X is the number of weeks in a quarter in which the weekly sales exceed £7100

The manager earns a bonus at the following rates:

X	**Bonus Earned**
$X \leqslant 5$	£0
$X = 6$	£1000
$X \geqslant 7$	£5000

(e) Using your answer to part (d), calculate the manager's expected bonus per quarter.

(5)

Leave blank

Question 2 continued

Leave blank

Question 2 continued

Leave blank

Question 2 continued

(Total 18 marks)

Q2

Leave blank

3. In a shop, the weekly demand for *Birdscope* cameras is modelled by a Poisson distribution with mean 8

The shop has 9 *Birdscope* cameras in stock at the start of each week.

A week is selected at random.

(a) Find the probability that the demand for *Birdscope* cameras cannot be met in **this** particular week.

(2)

In a year, there are 50 weeks in which *Birdscope* cameras can be sold.

(b) Find the expected number of weeks in the year that the shop will not be able to meet the demand for *Birdscope* cameras.

(2)

(c) Find the number of *Birdscope* cameras the shop should stock at the beginning of each week if it wants the estimated number of weeks in the year in which demand cannot be met to be less than 2

(2)

The shop increases its stock and reduces the price of *Birdscope* cameras in order to increase demand. A random sample of 10 weeks is selected and it is found that, in the 10 weeks, a total of 95 *Birdscope* cameras were sold.

Given that there were no weeks when the shop was unable to meet the demand for *Birdscope* cameras,

(d) use a suitable approximation to test whether or not the demand for *Birdscope* cameras has increased following the price reduction. You should state your hypotheses clearly and use a 5% level of significance.

(8)

Leave blank

Question 3 continued

Leave blank

Question 3 continued

Leave blank

Question 3 continued

(Total 14 marks)

Q3

Leave blank

4. In a computer game, a ship appears randomly on a rectangular screen.

The continuous random variable X cm is the distance of the centre of the ship from the bottom of the screen. The random variable X is uniformly distributed over the interval $[0, \alpha]$ where α cm is the height of the screen.

Given that $P(X > 6) = 0.6$

(a) find the value of α

(2)

(b) find $P(4 < X < 10)$

(2)

The continuous random variable Y cm is the distance of the centre of the ship from the left-hand side of the screen. The random variable Y is uniformly distributed over the interval [0, 20] where 20 cm is the width of the screen.

(c) Find the mean and the standard deviation of Y.

(2)

(d) Find $P(|Y - 4| < 2)$

(2)

(e) Given that X and Y are independent, find the probability that the centre of the ship appears

(i) in a square of side 4 cm which is at the centre of the screen,

(ii) within 5 cm of a side or the top or the bottom of the screen.

(6)

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Leave blank

Question 4 continued

(Total 14 marks)

Q4

Leave blank

5. The continuous random variable Y has cumulative distribution function $\mathrm{F}(y)$ given by

$$\mathrm{F}(y) = \begin{cases} 0 & y < 3 \\ k(y^2 - 2y - 3) & 3 \leqslant y \leqslant \alpha \\ 4k(2y - 7) & \alpha < y \leqslant 6 \\ 1 & y > 6 \end{cases}$$

where k and α are constants.

(a) Find $\mathrm{P}(4.5 < Y \leqslant 5.5)$

(7)

(b) Find the probability density function $\mathrm{f}(y)$

(3)

Leave blank

Question 5 continued

Leave blank

Question 5 continued

Leave blank

Question 5 continued

(Total 10 marks)

Q5

Leave blank

6. A fair 6-sided die is thrown n times. The number of sixes, X, is recorded. Using a normal approximation, $P(X < 50) = 0.0082$ correct to 4 decimal places.

Find the value of n.

(10)

Leave blank

Question 6 continued

Leave blank

Question 6 continued

Leave blank

Question 6 continued

Leave blank

Question 6 continued

Q6

(Total 10 marks)

TOTAL FOR PAPER: 75 MARKS

END