Write your name here

Surname	Other names

Pearson Edexcel
International
Advanced Level

Centre Number | | | | | |

Candidate Number | | | | |

Statistics S1

Advanced/Advanced Subsidiary

Thursday 18 January 2018 – Afternoon
Time: 1 hour 30 minutes

Paper Reference
WST01/01

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 ▶

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1. Two classes of students, class *A* and class *B*, sat a test.

Class *A* has 10 students. Class *B* has 15 students.

Each student achieved a score, x, on the test and their scores are summarised in the table below.

	n	$\sum x$	$\sum x^2$
Class *A*	10	770	59610
Class *B*	15	t	58035

The mean score for Class *A* is 77 and the mean score for Class *B* is 61

(a) Find the value of t

(1)

(b) Calculate the variance of the test scores for each class.

(3)

The highest score on the test was 95 and the lowest score was 45

These were each scored by students from the same class.

(c) State, with a reason, which class you believe they were from.

(1)

The two classes are combined into one group of 25 students.

(d) (i) Find the mean test score for all 25 students.

(ii) Find the variance of the test scores for all 25 students.

(4)

The teacher of class *A* later realises that he added up the test scores for his class incorrectly. Each student's test score in class *A* should be increased by 3

(e) Without further calculations, state, with a reason, the effect this will have on

(i) the variance of the test scores for class *A*

(ii) the mean test score for all 25 students

(iii) the variance of the test scores for all 25 students.

(3)

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Question 1 continued

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Question 1 continued

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Question 1 continued

(Total 12 marks)

Q1

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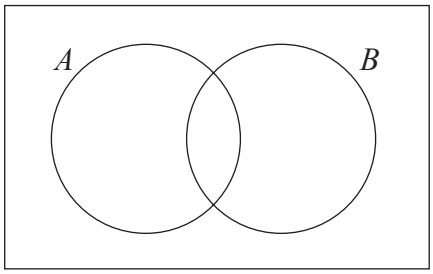
2. (a) Shade the region representing the event $A \cup B'$ on the Venn diagram below.



(1)

The two events C and D are mutually exclusive.

Given that $\mathrm{P}(C) = \frac{1}{5}$ and $\mathrm{P}(D) = \frac{3}{10}$

find

(b) (i) $\mathrm{P}(C \cup D)$

(ii) $\mathrm{P}(C \mid D)$

(3)

The two events F and G are independent.

Given that $\mathrm{P}(F) = \frac{1}{6}$ and $\mathrm{P}(F \cup G) = \frac{3}{8}$

find

(c) (i) $\mathrm{P}(G)$

(ii) $\mathrm{P}(F \mid G')$

(4)

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Question 2 continued

Q2

(Total 8 marks)

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3. Martin is investigating the relationship between a person's daily caffeine consumption, c milligrams, and the amount of sleep they get, h hours, per night. He collected this information from 20 people and the results are summarised below.

$$\sum c = 3660 \qquad \sum h = 126 \qquad \sum c^2 = 973\,228$$

$$\sum ch = 20\,023.4 \qquad S_{cc} = 303\,448 \qquad S_{ch} = -3034.6$$

Martin calculates the product moment correlation coefficient for these data and obtains –0.833

(a) Give a reason why this value supports a linear relationship between c and h

(1)

The amount of sleep per night is the response variable.

(b) Explain what you understand by the term 'response variable'.

(1)

Martin says that for each additional 100 mg of caffeine consumed, the expected number of hours of sleep decreases by 1

(c) Determine, by calculation, whether or not the data support this statement.

(3)

(d) Use the data to calculate an estimate for the expected number of hours of sleep per night when no caffeine is consumed.

(3)

Leave blank

Question 3 continued

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Question 3 continued

Leave blank

Question 3 continued

Q3

(Total 8 marks)

Leave blank

4. The discrete random variable X has probability distribution

x	–4	–3	1	2	5
$P(X = x)$	a	b	a	b	0.2

(a) Find $E(X)$ in terms of a and b

(1)

For this probability distribution, $Var(X) = E(X^2)$

(b) (i) Write down the value of $E(X)$

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

(5)

(c) Find $Var(1 - 3X)$

(3)

Given that $Y = 1 - X$, find

(d) (i) $P(Y < 0)$

(ii) the largest possible value of k such that $P(Y < k) = 0.2$

(4)

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Leave blank

Question 4 continued

Q4

(Total 13 marks)

Leave blank

5. Franca is the manager of an accountancy firm. She is investigating the relationship between the salary, £x, and the length of commute, y minutes, for employees at the firm. She collected this information from 9 randomly selected employees.

The salary of each employee was then coded using $w = \dfrac{x - 20\,000}{1000}$

The table shows the values of w and y for the 9 employees.

w	6	8	8	–1	25	15	3	–2	19
y	45	50	35	65	25	40	50	75	20

(You may use $\sum w = 81$ $\sum y = 405$ $\sum wy = 2490$ $S_{ww} = 660$ $S_{yy} = 2500$)

(a) Calculate the salary of the employee with $w = -2$

(1)

(b) Show that, to 3 significant figures, the value of the product moment correlation coefficient between w and y is –0.899

(3)

(c) State, giving a reason, the value of the product moment correlation coefficient between x and y

(1)

The least squares regression line of y on w is $y = 60.75 - 1.75w$

(d) Find the equation of the least squares regression line of y on x giving your answer in the form $y = a + bx$

(3)

(e) Estimate the length of commute for an employee with a salary of £21 000

(2)

Franca uses the regression line to estimate the length of commute for employees with salaries between £25 000 and £40 000

(f) State, giving a reason, whether or not these estimates are reliable.

(2)

Leave blank

Question 5 continued

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Question 5 continued

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Question 5 continued

Q5

(Total 12 marks)

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6. Anju has a bag that contains 5 socks of which 2 are blue.

Anju randomly selects socks from the bag, one sock at a time. She does not replace any socks but continues to select socks at random until she has both blue socks.

The discrete random variable S represents the total number of socks that Anju has selected.

(a) Write down the value of $P(S = 1)$

(1)

(b) Find $P(S > 2)$

(3)

(c) Find $P(S = 3)$

(2)

(d) Given that the second sock selected is blue, find the probability that Anju selects exactly 3 socks.

(2)

(e) Find $P(S = 5)$

(3)

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Question 6 continued

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Question 6 continued

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Question 6 continued

(Total 11 marks)

Q6

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7. The weights, G, of a particular breed of gorilla are normally distributed with mean 180 kg and standard deviation 15 kg.

(a) Find the proportion of these gorillas whose weights exceed 174 kg.

(2)

(b) Find, to 1 decimal place, the value of k such that $P(k < G < 174) = 0.3196$

(4)

The weights, B, of a particular breed of buffalo are normally distributed with mean 216 kg and standard deviation 30 kg.

Given that $P(G > w) = P(B < w) = p$

(c) (i) find the value of w

(ii) find the value of p

(5)

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Question 7 continued

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Question 7 continued

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Question 7 continued

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Question 7 continued

Q7

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

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