Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

考前模拟卷 - A Level Clouds出品

Morning (Time: 1 hour 30 minutes)

Paper reference **WST01/02**

Mathematics

International Advanced Subsidiary/Advanced Level
Statistics S1

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 6 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 ▶

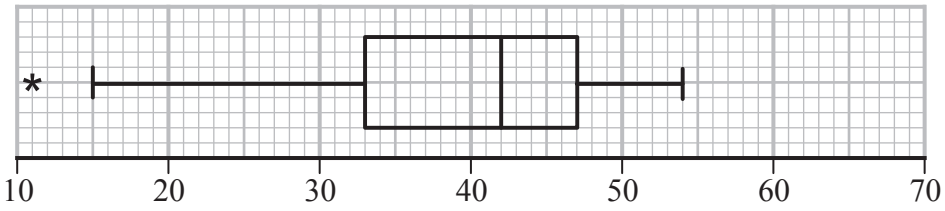
Pearson

1. Chi wanted to summarise the scores of the 39 competitors in a village quiz. He started to produce the following stem and leaf diagram

Score	
1	1 5 8 9
2	0 2 5 8 9
3	3 5 5 7 8 9 …

Key: 2|5 is a score of 25

He did not complete the stem and leaf diagram but instead produced the following box plot.



Chi defined an outlier as a value that is

greater than $Q_3 + 1.5 \times (Q_3 - Q_1)$

or less than $Q_1 - 1.5 \times (Q_3 - Q_1)$

(a) Find

(i) the interquartile range

(ii) the range.

(2)

(b) Describe, giving a reason, the skewness of the distribution of scores.

(2)

Albert and Beth asked for their scores to be checked.

Albert's score was changed from 25 to 37
Beth's score was changed from 54 to 60

(c) On the grid on page 5, draw an updated box plot.
Show clearly any calculations that you used.

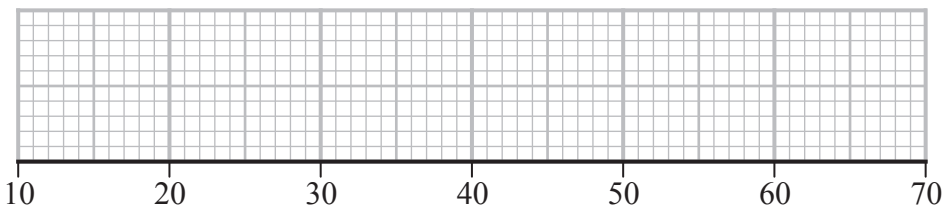
(7)

Some of the competitors complained that the questions were biased towards the younger generation. The product moment correlation coefficient between the age of the competitors and their score in the quiz is -0.187

(d) State, giving a reason, whether or not the complaint is supported by this statistic.

(2)

Question 1 continued

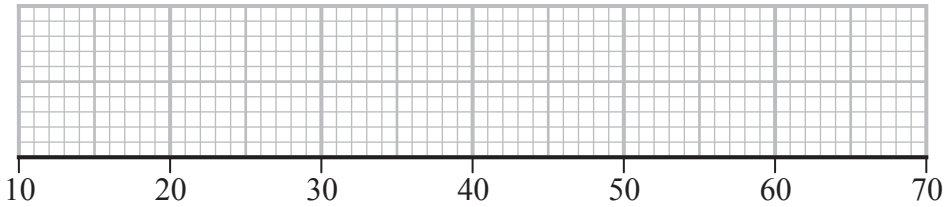


Turn over for a spare grid if you need to redraw your box plot.

Question 1 continued

Question 1 continued

Only use this grid if you need to redraw your box plot.



(Total for Question 1 is 13 marks)

2. Hugo recorded the purchases of 80 customers in the ladies fashion department of a large store. His results were as follows

20 customers bought a coat
12 customers bought a coat and a scarf
23 customers bought a pair of gloves
13 customers bought a pair of gloves and a scarf
no customer bought a coat and a pair of gloves
14 customers did not buy a coat nor a scarf nor a pair of gloves.

(a) Draw a Venn diagram to represent all of this information.

(4)

(b) One of the 80 customers is selected at random.

(i) Find the probability that the customer bought a scarf.

(1)

(ii) Given that the customer bought a coat, find the probability that the customer also bought a scarf.

(2)

(iii) State, giving a reason, whether or not the event 'the customer bought a coat' and the event 'the customer bought a scarf ' are statistically independent.

(2)

Hugo had asked the member of staff selling coats and the member of staff selling gloves to encourage customers also to buy a scarf.

(c) By considering suitable conditional probabilities, determine whether the member of staff selling coats or the member of staff selling gloves has the better performance at selling scarves to their customers. Give a reason for your answer.

(3)

Question 2 continued

Question 2 continued

Question 2 continued

(Total for Question 2 is 12 marks)

3. The discrete random variable D with the following probability distribution represents the score when a 4-sided die is rolled.

d	1	2	3	4
$P(D = d)$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

(a) Write down the name of this distribution.

(1)

The die is used to play a game and the random variable X represents the number of points scored. The die is rolled once and if $D = 2$, 3 or 4 then $X = D$. If $D = 1$ the die is rolled a second time and $X = 0$ if $D = 1$ again, otherwise X is the sum of the two scores on the die.

(b) Show that the probability of scoring 3 points in this game is $\frac{5}{16}$

(2)

(c) Find the probability of scoring 0 in this game.

(1)

The table below shows the probability distribution for the remaining values of X.

x	0	2	3	4	5
$P(X = x)$		$\frac{1}{4}$		$\frac{5}{16}$	$\frac{1}{16}$

(d) Find $E(X)$

(2)

(e) Find $\text{Var}(X)$

(3)

The discrete random variable R represents the number of times the die is rolled in the game.

(f) Write down the probability distribution of R.

(2)

The random variable $Y = 2R + 0.5$

(g) Show that $E(Y) = E(X)$

(3)

The game is played once.

(h) Find $P(X > Y)$

(3)

Question 3 continued

Question 3 continued

Question 3 continued

(Total for Question 3 is 17 marks)

4. The heights, x metres, of 40 children were recorded by a teacher. The results are summarised as follows

$$\sum x = 58 \qquad \sum x^2 = 84.829$$

(a) Find the mean and the variance of the heights of these 40 children.

(3)

The teacher decided that these statistics would be more useful in centimetres.

(b) Find

(i) the mean of these heights in centimetres,

(ii) the standard deviation of these heights in centimetres.

(2)

Two more children join the group. Their heights are 130 cm and 160 cm.

(c) (i) State, giving a reason, the mean height of the 42 children.

(ii) Without recalculating the standard deviation, state, giving a reason, whether the standard deviation of the heights of the 42 children will be greater than, less than or the same as the standard deviation of the heights of the group of 40 children.

(4)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 9 marks)

5. 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)

Question 5 continued

Question 5 continued

Question 5 continued

(Total for Question 5 is 8 marks)

6. A machine makes bolts such that the length, L cm, of a bolt has distribution $L \sim N(4.1, 0.125^2)$

A bolt is selected at random.

(a) Find the probability that the length of this bolt is more than 4.3 cm.

(3)

(b) Show that $P(3.9 < L < 4.3)$ is 0.890 correct to 3 decimal places.

(1)

The machine makes 500 bolts.
The cost to make each bolt is 5 pence.
Only bolts with length between 3.9 cm and 4.3 cm can be used.
These are sold for 9 pence each.
All the bolts that cannot be used are recycled with a scrap value of 1 pence each.

(c) Calculate an estimate for the profit made on these 500 bolts.

(4)

Following adjustments to the machine, the length of a bolt, B cm, made by the machine is such that $B \sim N(\mu, \sigma^2)$

Given that $P(B > 4.198) = 0.025$ and $P(B < 4.065) = 0.242$

(d) find the value of μ and the value of σ

(6)

(e) State, giving a reason, whether the adjustments to the machine will result in a decrease or an increase in the profit made on 500 bolts.

(2)

Question 6 continued

Question 6 continued

(Total for Question 6 is 16 marks)

TOTAL FOR PAPER IS 75 MARKS