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 12 October 2023

Afternoon (Time: 1 hour 30 minutes)

Paper reference **WST01/01**

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 your 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 ▶

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P 7 4 3 2 5 A 0 1 2 4

Pearson

1. Sally plays a game in which she can either win or lose.

A turn consists of up to 3 games. On each turn Sally plays the game up to 3 times. If she wins the first 2 games or loses the first 2 games, then she will not play the 3rd game.

- The probability that Sally wins the first game in a turn is 0.7
- If Sally wins a game the probability that she wins the next game is 0.6
- If Sally loses a game the probability that she wins the next game is 0.2

(a) Use this information to complete the tree diagram on page 3

(3)

(b) Find the probability that Sally wins the first 2 games in a turn.

(2)

(c) Find the probability that Sally wins exactly 2 games in a turn.

(2)

Given that Sally wins 2 games in a turn,

(d) find the probability that she won the first 2 games.

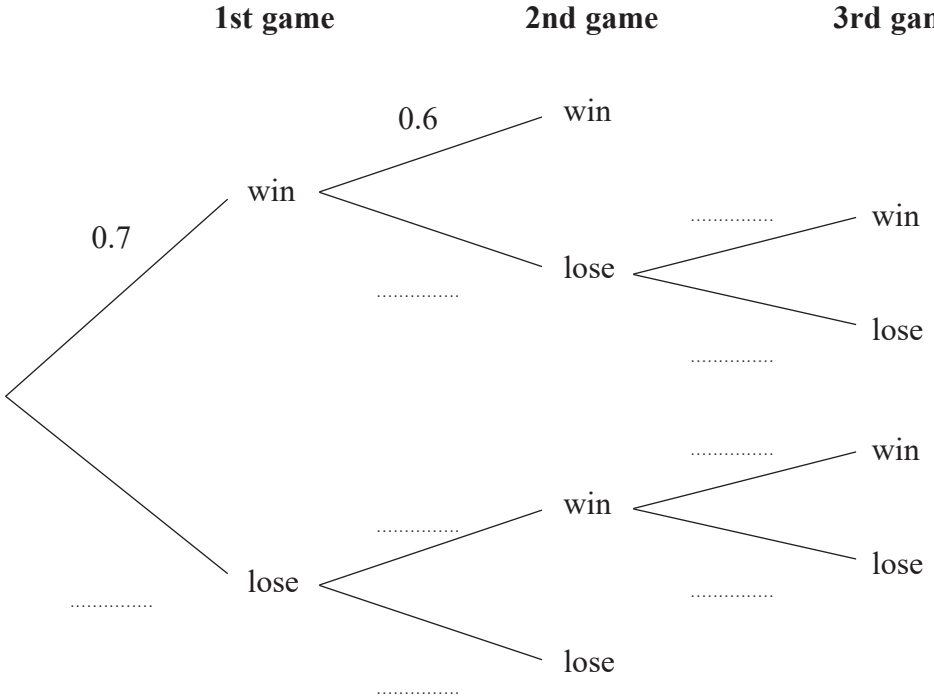
(2)

Given that Sally won the first game in a turn,

(e) find the probability that she won 2 games.

(2)

Question 1 continued



Question 1 continued

Question 1 continued

(Total for Question 1 is 11 marks)

2. The weights, to the nearest kilogram, of a sample of 33 red kangaroos taken in December are summarised in the stem and leaf diagram below.

	Weight (kg)	Totals
1	6	(1)
2	3 6	(2)
3	2 4 6	(3)
4	2 5 5 6 6 7 8	(7)
5	3 4 7 7 7 8 9 9	(8)
6	0 2 2 3 3 7 8	(7)
7	2 8	(2)
8	2 6	(2)
9	4	(1)

Key: 3 | 2 represents 32 kg

(a) Find

(i) the value of the median

(ii) the value of Q_1 and the value of Q_3

for the weights of these red kangaroos.

(3)

For these data an outlier is defined as a value that is

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

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

(b) Show that there are 2 outliers for these data.

(3)

Figure 1 on page 7 shows a box plot for the weights of the same 33 red kangaroos taken in February, earlier in the year.

(c) In the space on Figure 1, draw a box plot to represent the weights of these red kangaroos in December.

(4)

(d) Compare the distribution of the weights of red kangaroos taken in February with the distribution of the weights of red kangaroos taken in December of the same year. You should interpret your comparisons in the context of the question.

(3)

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Question 2 continued

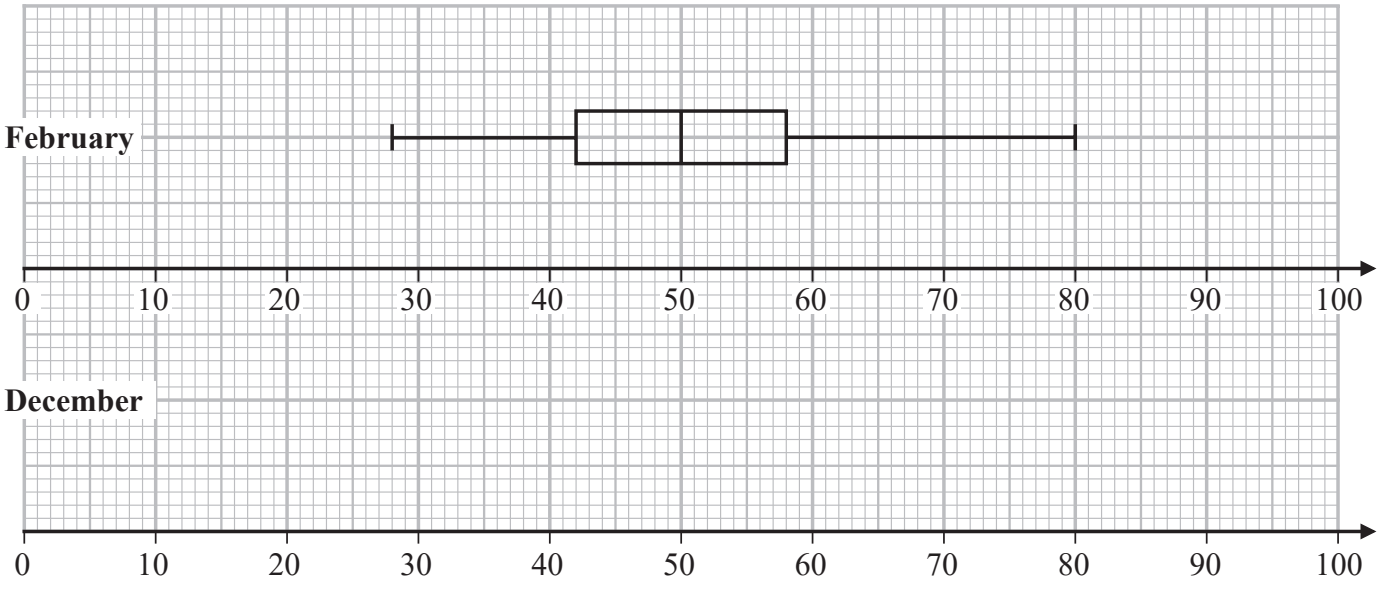


Figure 1

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

Question 2 continued

Question 2 continued

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

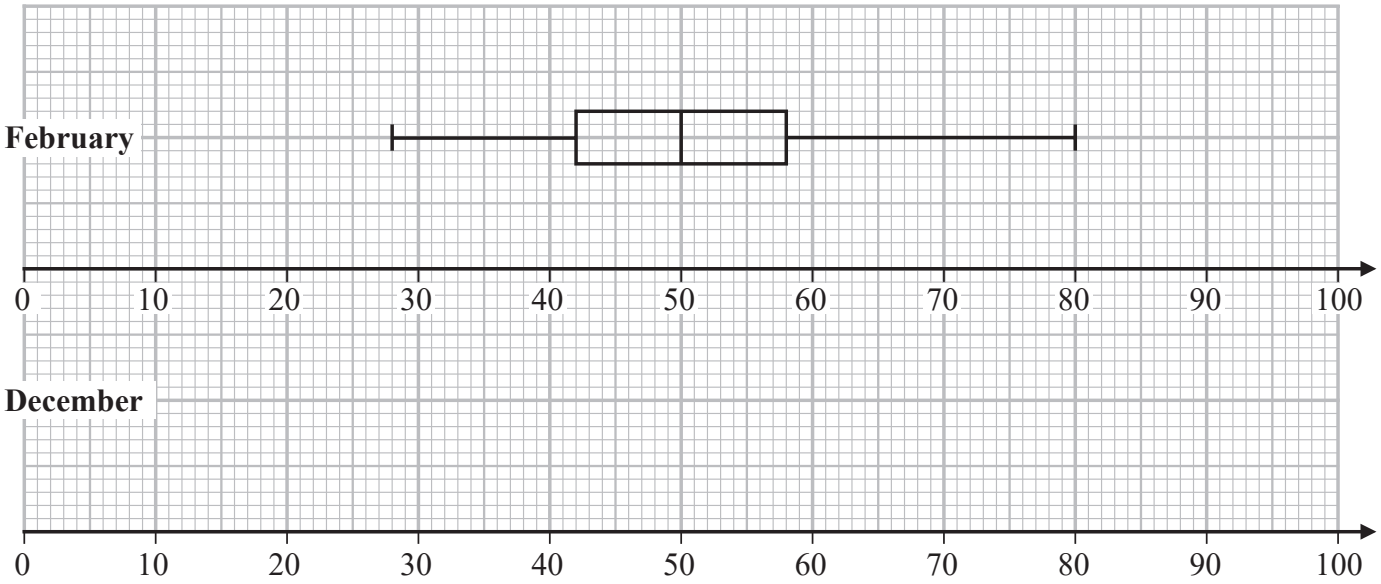


Figure 1

(Total for Question 2 is 13 marks)

3. (i) Bob shops at a market each week. The event that

Bob buys carrots is denoted by C

Bob buys onions is denoted by O

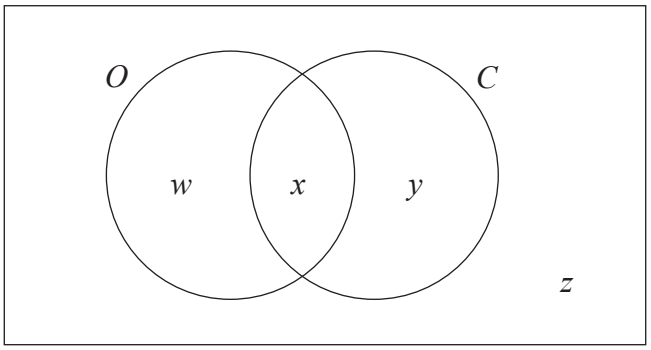
At each visit, Bob may buy neither, or one, or both of these items. The probability that

Bob buys carrots is 0.65

Bob does **not** buy onions is 0.3

Bob buys onions but not carrots is 0.15

The Venn diagram below represents the events C and O



where w, x, y and z are probabilities.

(a) Find the value of w, the value of x, the value of y and the value of z

(4)

For one visit to the market,

(b) find the probability that Bob buys either carrots or onions but not both.

(1)

(c) Show that the events C and O are **not** independent.

(2)

(ii) F, G and H are 3 events. F and H are mutually exclusive. F and G are independent.

Given that

$$\mathrm{P}(F) = \frac{2}{7} \qquad \mathrm{P}(H) = \frac{1}{4} \qquad \mathrm{P}(F \cup G) = \frac{5}{8}$$

(a) find $\mathrm{P}(F \cup H)$

(1)

(b) find $\mathrm{P}(G)$

(3)

(c) find $\mathrm{P}(F \cap G)$

(1)

Question 3 continued

Question 3 continued

Question 3 continued

(Total for Question 3 is 12 marks)

4. The discrete random variable X has the following probability distribution.

x	1	2	3	4
$P(X = x)$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$

(a) Show that $E\left(\frac{1}{X}\right) = \frac{2}{5}$

(1)

(b) Find $\text{Var}\left(\frac{1}{X}\right)$

(3)

The random variable $Y = \frac{30}{X}$

(c) Find

(i) $E(Y)$

(ii) $\text{Var}(Y)$

(3)

(d) Find $P(X < 3 \mid Y < 20)$

(5)

Question 4 continued

Question 4 continued

Question 4 continued

(Total for Question 4 is 12 marks)

5. The weights, X grams, of a particular variety of fruit are normally distributed with

$$X \sim \mathrm{N}(210, 25^2)$$

A fruit of this variety is selected at random.

(a) Show that the probability that the weight of this fruit is less than 240 grams is 0.8849

(2)

(b) Find the probability that the weight of this fruit is between 190 grams and 240 grams.

(2)

(c) Find the value of k such that $\mathrm{P}(210 - k < X < 210 + k) = 0.95$

(3)

A wholesaler buys large numbers of this variety of fruit and classifies the lightest 15% as small.

(d) Find the maximum weight of a fruit that is classified as small.
You must show your working clearly.

(3)

The weights, Y grams, of a second variety of this fruit are normally distributed with

$$Y \sim \mathrm{N}(\mu, \sigma^2)$$

Given that 5% of these fruit weigh less than 152 grams and 40% weigh more than 180 grams,

(e) calculate the mean and standard deviation of the weights of this variety of fruit.

(5)

Question 5 continued

Question 5 continued

Question 5 continued

(Total for Question 5 is 15 marks)

6. The variables x and y have the following regression equations based on the same 12 observations.

	Regression equation
y on x	$y = 1.4x + 1.5$
x on y	$x = 1.2 + 0.2y$

(a) (i) Find the point of intersection of these lines.

(ii) Hence show that $\sum x = 25$

(4)

Given that

$$\sum xy = \frac{6961}{60}$$

(b) Find S_{xy}

(4)

(c) Find the product moment correlation coefficient between x and y

(4)

Question 6 continued

Question 6 continued

(Total for Question 6 is 12 marks)

TOTAL FOR PAPER IS 75 MARKS