

Please check the examination details below before entering your candidate information

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Centre Number		Candidate Number	
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Pearson Edexcel International Advanced Level

A Level Clouds 出品

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 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 ►

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

x	-2	-1	1	3	4
$P(X=x)$	0.15	a	b	c	0.15

where a , b and c are probabilities.

The mean value of X is 1 and $F(1) = 0.63$

Find the value of a , the value of b and the value of c .

(5)

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2. A company employs 90 administrators. The length of time that they have been employed by the company and their gender are summarised in the table below.

Length of time employed, x years	Female	Male
$x < 4$	9	16
$4 \leq x < 10$	14	20
$10 \leq x$	7	24

One of the 90 administrators is selected at random.

- (a) Find the probability that the administrator is female. (1)
- (b) Given that the administrator has been employed by the company for less than 4 years, find the probability that this administrator is male. (2)
- (c) Given that the administrator has been employed by the company for less than 10 years, find the probability that this administrator is male. (2)
- (d) State, with a reason, whether or not the event 'selecting a male' is independent of the event 'selecting an administrator who has been employed by the company for less than 4 years'. (3)

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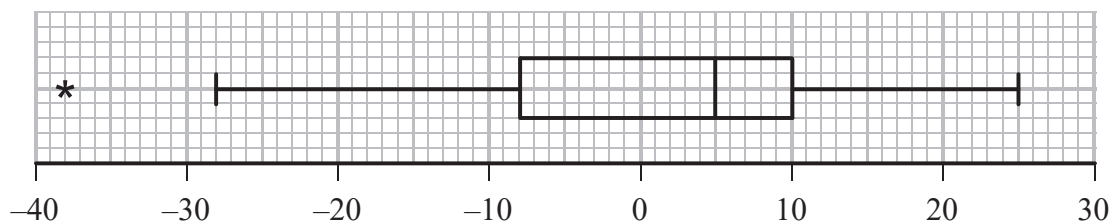
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Question 2 continued

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(Total for Question 2 is 8 marks)

3. At the start of a course, an instructor asked a group of 80 apprentices to estimate the length of a piece of pipe. The error (true length – estimated length) was recorded in centimetres. The results are summarised in the box plot below.



- (a) Find the range for these data. (1)
- (b) Find the interquartile range for these data. (1)

One month later, the instructor asked the 80 apprentices to estimate the length of a different piece of pipe and recorded their errors. The results are summarised in the table below.

Error (e cm)	Number of apprentices
$-40 < e \leq -16$	2
$-16 < e \leq -8$	18
$-8 < e \leq 0$	33
$0 < e \leq 8$	14
$8 < e \leq 16$	10
$16 < e \leq 40$	3

- (c) Use linear interpolation to estimate the median error for these data. (2)
- (d) Show that the upper quartile for these data, to the nearest centimetre, is 4. (1)

For these data, the lower quartile is -8 and the five worst errors were $-25, -21, 18, 23, 28$

An outlier is a value that falls either

more than $1.5 \times$ (interquartile range) above the upper quartile or
more than $1.5 \times$ (interquartile range) below the lower quartile.

- (e) (i) Show that there are only 2 outliers for these data.
- (ii) Draw a box plot for these data on the grid on page 3. (6)
- (f) State, giving reasons, whether or not the apprentices' ability to estimate the length of a piece of pipe has improved over the first month of the course. (3)

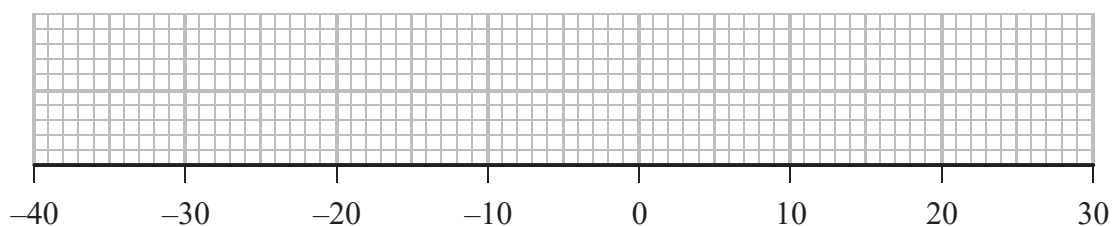
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Question 3 continued

Lined area for writing answers.



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

Question 3 continued

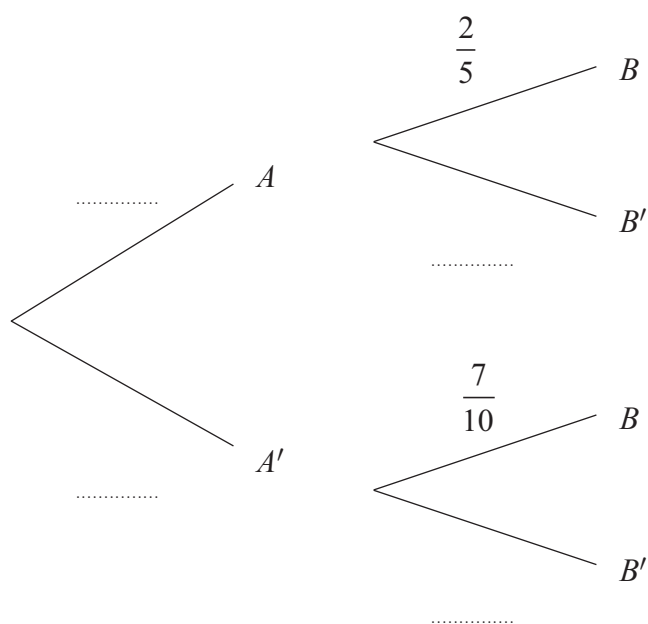
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4. The following incomplete tree diagram shows the relationships between the event A and the event B .



Given that $P(B) = \frac{9}{20}$

- (a) find $P(A)$ and complete the tree diagram,

(6)

- (b) find $P(A' | B')$.

(2)

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Question 4 continued

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(Total for Question 4 is 8 marks)

5. The resting heart rate, h beats per minute (bpm), and average length of daily exercise, t minutes, of a random sample of 8 teachers are shown in the table below.

t	20	35	40	25	45	70	75	90
h	88	85	77	75	71	66	60	54

- (a) State, with a reason, which variable is the response variable. (2)

The equation of the least squares regression line of h on t is

$$h = 93.5 - 0.43t$$

- (b) Give an interpretation of the gradient of this regression line. (1)

- (c) Find the value of \bar{t} and the value of \bar{h} (2)

- (d) Show that the point (\bar{t}, \bar{h}) lies on the regression line. (1)

- (e) Estimate the resting heart rate of a teacher with an average length of daily exercise of 1 hour. (1)

- (f) Comment, giving a reason, on the reliability of the estimate in part (e). (2)

The resting heart rate of teachers is assumed to be normally distributed with mean 73 bpm and standard deviation 8 bpm.

The middle 95% of resting heart rates of teachers lies between a and b

- (g) Find the value of a and the value of b . (4)

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Question 5 continued

Lined area for writing the answer to Question 5.

Question 5 continued

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Question 5 continued

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(Total for Question 5 is 13 marks)

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Question 6 continued

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Question 6 continued

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Question 6 continued

Handwriting practice area with horizontal lines.

(Total for Question 6 is 10 marks)

7. 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)

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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

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(Total for Question 7 is 17 marks)

TOTAL FOR PAPER IS 75 MARKS