

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
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 **WST01/01**

**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 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.*

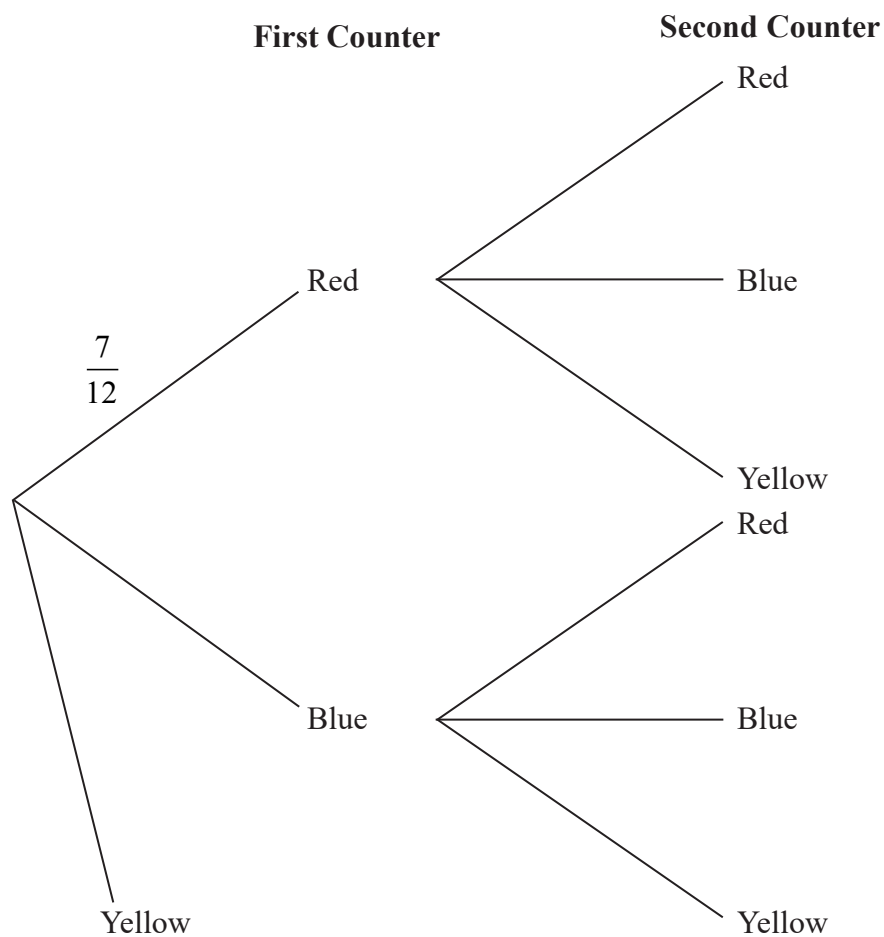
### Advice

- 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. There are 7 red counters, 3 blue counters and 2 yellow counters in a bag. Gina selects a counter at random from the bag and keeps it. If the counter is yellow she does not select any more counters. If the counter is not yellow she randomly selects a second counter from the bag.

(a) Complete the tree diagram.



(2)

Given that Gina has selected a yellow counter,

(b) find the probability that she has 2 counters.

(3)

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Question 1 continued

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**Question 1 continued**

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**(Total for Question 1 is 5 marks)**

2. The random variable  $X \sim N(\mu, \sigma^2)$

Given that  $P(X > \mu + a) = 0.35$  where  $a$  is a constant, find

(a)  $P(X > \mu - a)$  (1)

(b)  $P(\mu - a < X < \mu + a)$  (2)

(c)  $P(X < \mu + a \mid X > \mu - a)$  (2)

**Question 2 continued**

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**(Total for Question 2 is 5 marks)**

3. The stem and leaf diagram shows the ages of the 35 male passengers on a cruise.

Age		Key: 1   3 represents an age of 13 years
1	3	(1)
2	7 9	(2)
3	1 2 8 8	(4)
4	5 5 6 7 8 8 9	(7)
5	2 2 3 3 4 4 5 6 6 8	(10)
6	0 1 1 4 4 4 7	(7)
7	3 6	(2)
8	7 8	(2)

- (a) Find the median age of the male passengers. (1)
- (b) Show that the interquartile range (IQR) of these ages is 16 (2)

An outlier is defined as a value that is more than

$1.5 \times \text{IQR}$  above the upper quartile

or

$1.5 \times \text{IQR}$  below the lower quartile

- (c) Show that there are 3 outliers amongst these ages. (3)
- (d) On the grid in Figure 1 on page 8, draw a box plot for the ages of the male passengers on the cruise. (4)

Figure 1 on page 8 also shows a box plot for the ages of the female passengers on the cruise.

- (e) Comment on any difference in the distributions of ages of male and female passengers on the cruise.  
State the values of any statistics you have used to support your comment. (1)

Anja, along with her 2 daughters and a granddaughter, now join the cruise.

Anja's granddaughter is younger than both of Anja's daughters.

Anja had her 23rd birthday on the day her eldest daughter was born.

When their 4 ages are included with the other female passengers on the cruise, the box plot does not change.

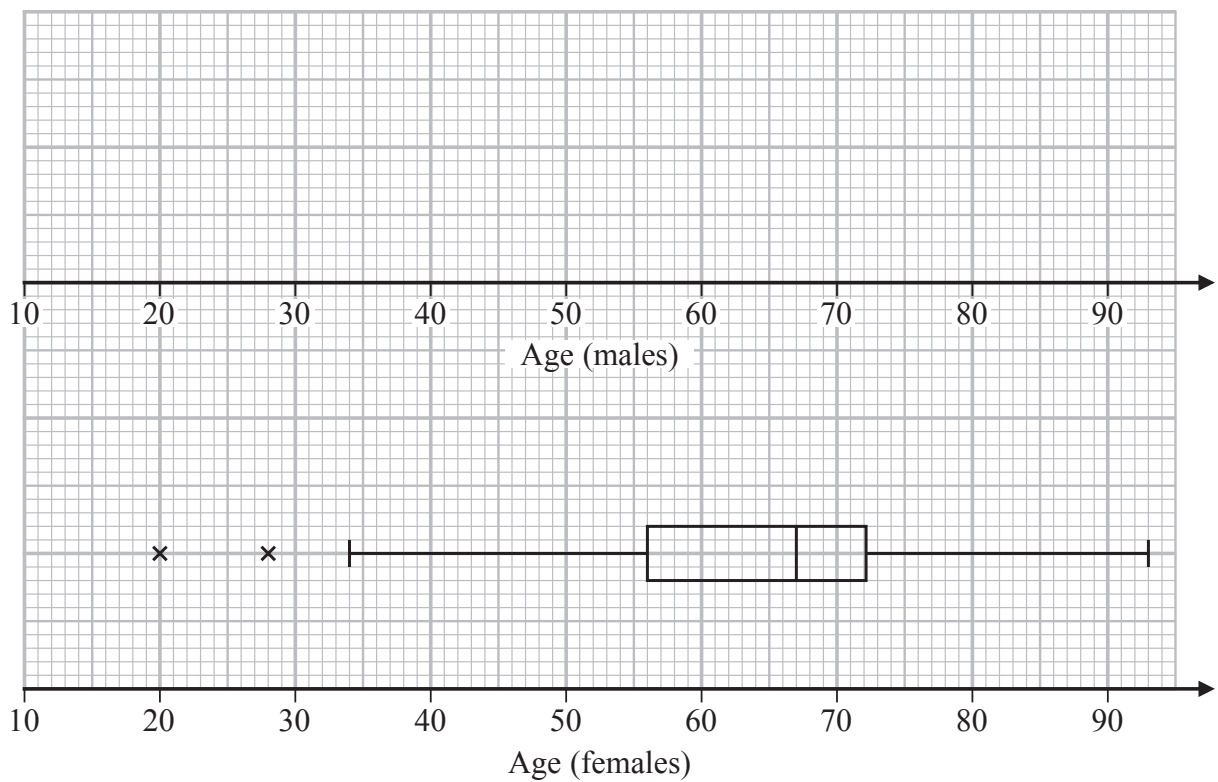
- (f) State, giving reasons, what you can say about  
(i) the granddaughter's age  
(ii) Anja's age. (3)

**Question 3 continued**

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**Figure 1**

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



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Question 3 continued

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Question 3 continued

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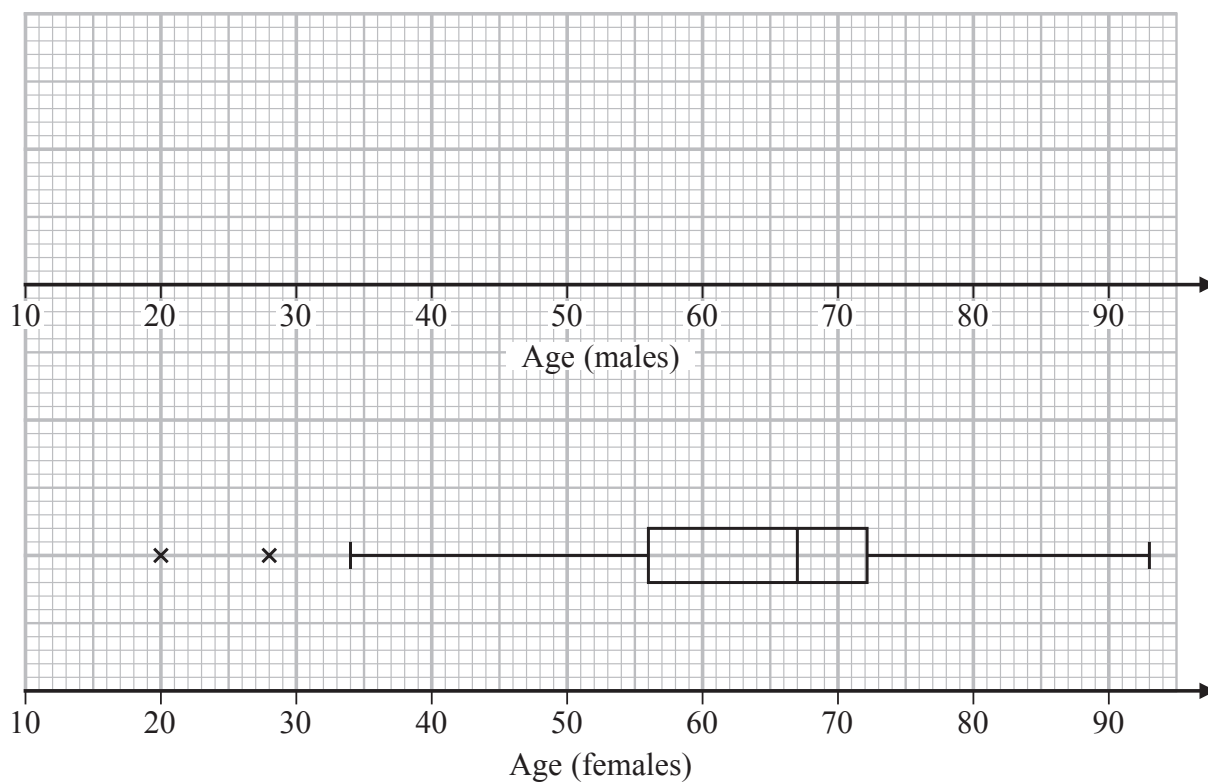


Figure 1

(Total for Question 3 is 14 marks)

4. The discrete random variable  $X$  has probability function  $p(x)$  and cumulative distribution function  $F(x)$  given in the table below.

$x$	1	2	3	4	5
p(x)	0.10	$a$	0.28	$c$	0.24
F(x)	0.10	0.26	$b$	0.76	$d$

- (a) Write down the value of  $d$
- (1)**

- (b) Find the values of  $a$ ,  $b$  and  $c$  (3)

- (c) Write down the value of  $P(X > 4)$  **(1)**

Two independent observations,  $X_1$  and  $X_2$ , are taken from the distribution of  $X$ .

- (d) Find the probability that  $X_1$  and  $X_2$  are both odd. (2)

Given that  $X_1$  and  $X_2$  are both odd,

- (e) find the probability that the sum of  $X_1$  and  $X_2$  is 6  
Give your answer to 3 significant figures.
- (3)**

**Question 4 continued**

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**(Total for Question 4 is 10 marks)**

5. A scientist measured the salinity of water,  $x$  g/kg, and recorded the temperature at which the water froze,  $y$  °C, for 12 different water samples. The summary statistics are listed below.

$$\sum x = 504 \quad \sum y = -27 \quad \sum x^2 = 22842 \quad \sum y^2 = 62.98$$

$$\sum xy = -1190.7 \quad S_{xx} = 1674 \quad S_{yy} = 2.23$$

- (a) Find the mean and variance of the recorded temperatures. (3)

Priya believes that the higher the salinity of water, the higher the temperature at which the water freezes.

- (b) (i) Calculate the product moment correlation coefficient between  $x$  and  $y$   
(ii) State, with a reason, whether or not this value supports Priya's belief. (4)

- (c) Find the least squares regression line of  $y$  on  $x$  in the form  $y = a + bx$   
Give the value of  $a$  and the value of  $b$  to 3 significant figures. (4)

- (d) Estimate the temperature at which water freezes when the salinity is 32 g/kg (1)

The coding  $w = 1.8y + 32$  is used to convert the recorded temperatures from °C to °F

- (e) Find an equation of the least squares regression line of  $w$  on  $x$  in the form  $w = c + dx$  (2)

- (f) Find  
(i) the variance of the recorded temperatures when converted to °F  
(ii) the product moment correlation coefficient between  $w$  and  $x$  (3)

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Question 5 continued

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**Question 5 continued**

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**(Total for Question 5 is 17 marks)**

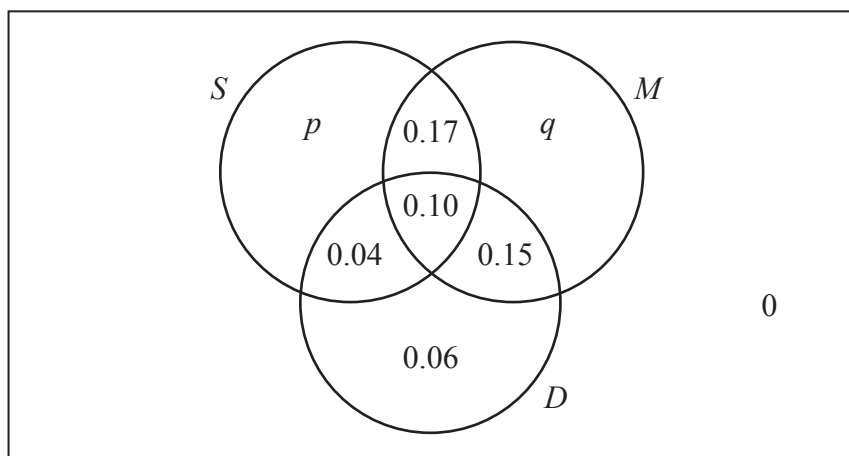


6. The Venn diagram below shows the probabilities of customers having various combinations of a starter, main course or dessert at Polly's restaurant.

$S$  = the event a customer has a starter.

$M$  = the event a customer has a main course.

$D$  = the event a customer has a dessert.



Given that the events  $S$  and  $D$  are statistically independent

- (a) find the value of  $p$ . (4)
- (b) Hence find the value of  $q$ . (2)
- (c) Find
- (i)  $P(D | M \cap S)$
- (ii)  $P(D | M \cap S')$  (4)

One evening 63 customers are booked into Polly's restaurant for an office party. Polly has asked for their starter and main course orders before they arrive.

Of these 63 customers

27 ordered a main course and a starter,

36 ordered a main course without a starter.

- (d) Estimate the number of desserts that these 63 customers will have. (2)

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Question 6 continued

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**Question 6 continued**

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**(Total for Question 6 is 12 marks)**

7. At a school athletics day, the distances, in metres, achieved by students in the long jump are modelled by the normal distribution with mean 3.3 m and standard deviation 0.6 m

- (a) Find an estimate for the proportion of students who jump less than 2.5 m (3)

The long jump competition consists of 2 jumps. All the students can take part in the first jump and the 40% who jump the greatest distance in their first jump qualify for the second jump.

- (b) Find an estimate for the minimum distance achieved in the first jump in order to qualify for the second jump.  
Give your answer correct to 4 significant figures. (3)

- (c) Find an estimate for the median distance achieved in the first jump by those who qualify for the second jump. (3)

The distance of the second jump is independent of the distance of the first jump and is modelled with the same normal distribution. Students who jump a distance greater than 4.1 m in their second jump receive a certificate.

At the start of the long jump competition, a student is selected at random.

- (d) Find the probability that this student will receive a certificate. (3)

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Question 7 continued

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**Question 7 continued**

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**(Total for Question 7 is 12 marks)**

**TOTAL FOR PAPER IS 75 MARKS**