| Centre No. | | | | | | Paper Reference | | | | | | | Surname | Initial(s) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Candidate No. | | | | | | 6 | 6 | 8 | 3 | / | 0 | 1 | Signature | |

Paper Reference(s)

**6683/01**

# Edexcel GCE

## Statistics S1

## Advanced/Advanced Subsidiary

Friday 14 January 2011 – Afternoon

Time: 1 hour 30 minutes

Examiner's use only

| | | |
|---|---|---|
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Team Leader's use only

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| Question Number | Leave Blank |
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**Materials required for examination**
Mathematical Formulae (Pink)

**Items included with question papers**
Nil

**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 to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.
Check that you have the correct question paper.
Answer ALL the questions.
You must write your answer to each question in the space following the question.
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 for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 8 questions in this question paper. The total mark for this paper is 75.
There are 24 pages in this question paper. Any blank pages are indicated.

### Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You should show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

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**1.** A random sample of 50 salmon was caught by a scientist. He recorded the length $l$ cm and weight $w$ kg of each salmon.

The following summary statistics were calculated from these data.

$\sum l = 4027 \quad \sum l^2 = 327\,754.5 \quad \sum w = 357.1 \quad \sum lw = 29\,330.5 \quad S_{ww} = 289.6$

(a) Find $S_{ll}$ and $S_{lw}$

**(3)**

(b) Calculate, to 3 significant figures, the product moment correlation coefficient between $l$ and $w$.

**(2)**

(c) Give an interpretation of your coefficient.

**(1)**

Leave blank

**Question 1 continued**

**Q1**

**(Total 6 marks)**

Leave blank

**2.** Keith records the amount of rainfall, in mm, at his school, each day for a week. The results are given below.

2.8 5.6 2.3 9.4 0.0 0.5 1.8

Jenny then records the amount of rainfall, $x$ mm, at the school each day for the following 21 days. The results for the 21 days are summarised below.

$$\sum x = 84.6$$

(a) Calculate the mean amount of rainfall during the whole 28 days.

**(2)**

Keith realises that he has transposed two of his figures. The number 9.4 should have been 4.9 and the number 0.5 should have been 5.0
Keith corrects these figures.

(b) State, giving your reason, the effect this will have on the mean.

**(2)**

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**Question 2 continued**

**Q2**

**(Total 4 marks)**

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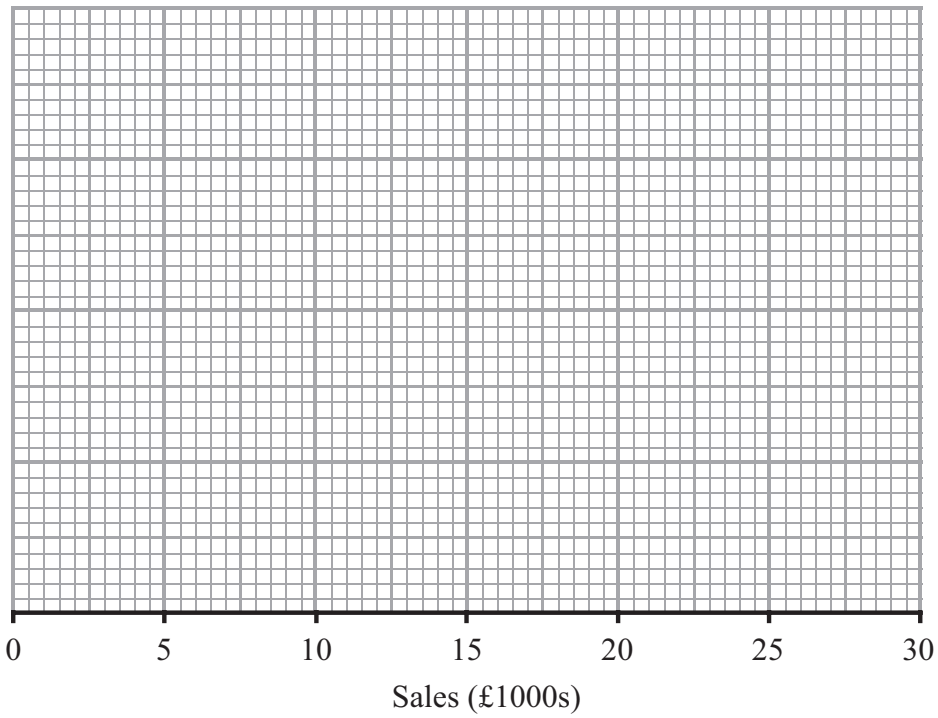
**3.** Over a long period of time a small company recorded the amount it received in sales per month. The results are summarised below.

| | Amount received in sales (£1000s) |
|---|---|
| Two lowest values | 3, 4 |
| Lower quartile | 7 |
| Median | 12 |
| Upper quartile | 14 |
| Two highest values | 20, 25 |

An outlier is an observation that falls
either 1.5 × interquartile range above the upper quartile
or 1.5 × interquartile range below the lower quartile.

(a) On the graph paper below, draw a box plot to represent these data, indicating clearly any outliers.

**(5)**




(b) State the skewness of the distribution of the amount of sales received. Justify your answer.

**(2)**

(c) The company claims that for 75 % of the months, the amount received per month is greater than £10 000. Comment on this claim, giving a reason for your answer.

**(2)**

Leave blank

**Question 3 continued**

**Q3**

**(Total 9 marks)**

Leave blank

**4.** A farmer collected data on the annual rainfall, $x$ cm, and the annual yield of peas, $p$ tonnes per acre.

The data for annual rainfall was coded using $v = \frac{x-5}{10}$ and the following statistics were found.

$$S_{vv} = 5.753 \qquad S_{pv} = 1.688 \qquad S_{pp} = 1.168 \qquad \overline{p} = 3.22 \qquad \overline{v} = 4.42$$

(a) Find the equation of the regression line of $p$ on $v$ in the form $p = a + bv$.

**(4)**

(b) Using your regression line estimate the annual yield of peas per acre when the annual rainfall is 85 cm.

**(2)**

Leave blank

**Question 4 continued**

**Q4**

**(Total 6 marks)**

Leave blank

**5.** On a randomly chosen day, each of the 32 students in a class recorded the time, $t$ minutes to the nearest minute, they spent on their homework. The data for the class is summarised in the following table.

| Time, $t$ | Number of students |
|---|---|
| 10 – 19 | 2 |
| 20 – 29 | 4 |
| 30 – 39 | 8 |
| 40 – 49 | 11 |
| 50 – 69 | 5 |
| 70 – 79 | 2 |

(a) Use interpolation to estimate the value of the median.

**(2)**

Given that

$$\sum t = 1414 \qquad \text{and} \qquad \sum t^2 = 69\,378$$

(b) find the mean and the standard deviation of the times spent by the students on their homework.

**(3)**

(c) Comment on the skewness of the distribution of the times spent by the students on their homework. Give a reason for your answer.

**(2)**

Leave blank

**Question 5 continued**

**Q5**

**(Total 7 marks)**

Leave blank

**6.** The discrete random variable $X$ has the probability distribution

| $x$ | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| $P(X = x)$ | $k$ | $2k$ | $3k$ | $4k$ |

(a) Show that $k = 0.1$

**(1)**

Find

(b) $E(X)$

**(2)**

(c) $E(X^2)$

**(2)**

(d) $\text{Var}(2-5X)$

**(3)**

Two independent observations $X_1$ and $X_2$ are made of $X$.

(e) Show that $P(X_1 + X_2 = 4) = 0.1$

**(2)**

(f) Complete the probability distribution table for $X_1 + X_2$

**(2)**

| $y$ | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| $P(X_1 + X_2 = y)$ | 0.01 | 0.04 | 0.10 | | 0.25 | 0.24 | |

(g) Find $P(1.5 < X_1 + X_2 \leqslant 3.5)$

**(2)**

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**Question 6 continued**

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**Question 6 continued**

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**Question 6 continued**

**Q6**

**(Total 14 marks)**

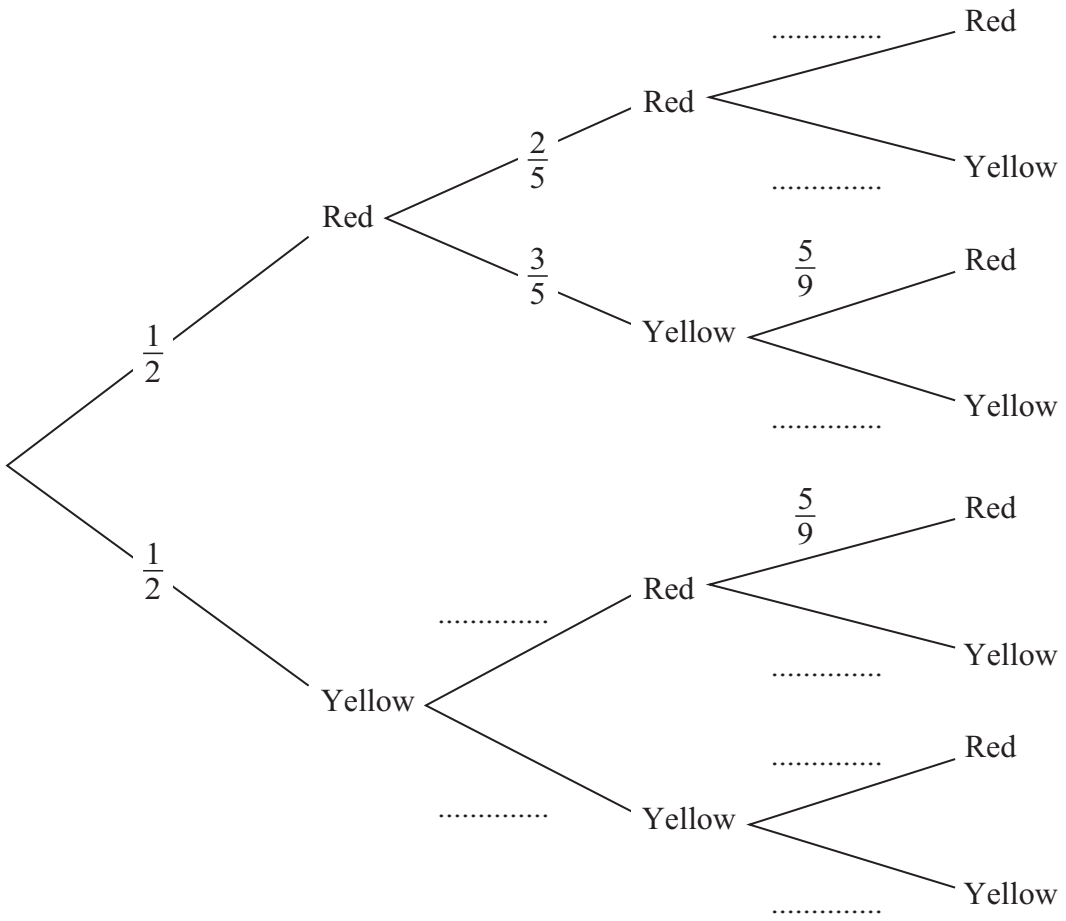
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**7.** The bag $P$ contains 6 balls of which 3 are red and 3 are yellow.
The bag $Q$ contains 7 balls of which 4 are red and 3 are yellow.
A ball is drawn at random from bag $P$ and placed in bag $Q$. A second ball is drawn at random from bag $P$ and placed in bag $Q$.
A third ball is then drawn at random from the 9 balls in bag $Q$.

The event $A$ occurs when the 2 balls drawn from bag $P$ are of the same colour.
The event $B$ occurs when the ball drawn from bag $Q$ is red.

(a) Complete the tree diagram shown below.

**(4)**




(b) Find P($A$)

**(3)**

(c) Show that $P(B) = \frac{5}{9}$

**(3)**

(d) Show that $P(A \cap B) = \frac{2}{9}$

**(2)**

(e) Hence find $P(A \cup B)$

**(2)**

(f) Given that all three balls drawn are the same colour, find the probability that they are all red.

**(3)**

Leave blank

**Question 7 continued**

Leave blank

**Question 7 continued**

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**Question 7 continued**

**Q7**

**(Total 17 marks)**

Leave blank

**8.** The weight, $X$ grams, of soup put in a tin by machine $A$ is normally distributed with a mean of 160 g and a standard deviation of 5 g.
A tin is selected at random.

(a) Find the probability that this tin contains more than 168 g.

**(3)**

The weight stated on the tin is $w$ grams.

(b) Find $w$ such that $P(X < w) = 0.01$

**(3)**

The weight, $Y$ grams, of soup put into a carton by machine $B$ is normally distributed with mean $\mu$ grams and standard deviation $\sigma$ grams.

(c) Given that $P(Y < 160) = 0.99$ and $P(Y > 152) = 0.90$ find the value of $\mu$ and the value of $\sigma$.

**(6)**

Leave blank

**Question 8 continued**

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**Question 8 continued**

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**Question 8 continued**

**Q8**

**(Total 12 marks)**

**TOTAL FOR PAPER: 75 MARKS**

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