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

Paper Reference(s)

**6683/01R**

# Edexcel GCE

## Statistics S1

## Advanced/Advanced Subsidiary

Tuesday 10 June 2014 – Morning

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

| Question Number | Leave Blank |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| Total | |

**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 or symbolic differentiation/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 7 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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PEARSON

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**1.** The discrete random variable $X$ has probability distribution

| $x$ | $-4$ | $-2$ | $1$ | $3$ | $5$ |
|---|---|---|---|---|---|
| $\mathrm{P}(X = x)$ | $0.4$ | $p$ | $0.05$ | $0.15$ | $p$ |

(a) Show that $p = 0.2$

**(2)**

Find

(b) $\mathrm{E}(X)$

**(2)**

(c) $\mathrm{F}(0)$

**(1)**

(d) $\mathrm{P}(3X + 2 > 5)$

**(2)**

Given that $\mathrm{Var}(X) = 13.35$

(e) find the possible values of $a$ such that $\mathrm{Var}(aX + 3) = 53.4$

**(2)**

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**Question 1 continued**

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**Question 1 continued**

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**Question 1 continued**

**Q1**

**(Total 9 marks)**

Leave blank

**2.** The discrete random variable $X$ has probability distribution

$$P(X = x) = \frac{1}{10} \qquad x = 1, 2, 3, \ldots 10$$

(a) Write down the name given to this distribution.

**(1)**

(b) Write down the value of

(i) $P(X = 10)$

(ii) $P(X < 10)$

**(2)**

The continuous random variable $Y$ has the normal distribution $N(10, 2^2)$

(c) Write down the value of

(i) $P(Y = 10)$

(ii) $P(Y < 10)$

**(2)**

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**Question 2 continued**

**Q2**

**(Total 5 marks)**

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**3.** A large company is analysing how much money it spends on paper in its offices every year. The number of employees, $x$, and the amount of money spent on paper, $p$ (£ hundreds), in 8 randomly selected offices are given in the table below.

| $x$ | 8 | 9 | 12 | 14 | 7 | 3 | 16 | 19 |
|---|---|---|---|---|---|---|---|---|
| $p$ (£ hundreds) | 40.5 | 36.1 | 30.4 | 39.4 | 32.6 | 31.1 | 43.4 | 45.7 |

(You may use $\sum x^2 = 1160$ $\sum p = 299.2$ $\sum p^2 = 11\,422$ $\sum xp = 3449.5$)

(a) Show that $S_{pp} = 231.92$ and find the value of $S_{xx}$ and the value of $S_{xp}$

**(5)**

(b) Calculate the product moment correlation coefficient between $x$ and $p$.

**(2)**

The equation of the regression line of $p$ on $x$ is given in the form $p = a + bx$.

(c) Show that, to 3 significant figures, $b = 0.824$ and find the value of $a$.

**(4)**

(d) Estimate the amount of money spent on paper in an office with 10 employees.

**(2)**

(e) Explain the effect each additional employee has on the amount of money spent on paper.

**(1)**

Later the company realised it had made a mistake in adding up its costs, $p$. The true costs were actually half of the values recorded. The product moment correlation coefficient and the equation of the linear regression line are recalculated using this information.

(f) Write down the new value of

(i) the product moment correlation coefficient,

(ii) the gradient of the regression line.

**(2)**

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**Question 3 continued**

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**Question 3 continued**

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**Question 3 continued**

**(Total 16 marks)**

**Q3**

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**4.** $A$ and $B$ are two events such that

$$\mathrm{P}(B) = \frac{1}{2} \qquad \mathrm{P}(A \mid B) = \frac{2}{5} \qquad \mathrm{P}(A \cup B) = \frac{13}{20}$$

(a) Find $\mathrm{P}(A \cap B)$.

**(2)**

(b) Draw a Venn diagram to show the events $A$, $B$ and all the associated probabilities.

**(3)**

Find

(c) $\mathrm{P}(A)$

**(1)**

(d) $\mathrm{P}(B \mid A)$

**(2)**

(e) $\mathrm{P}(A' \cap B)$

**(1)**

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**Question 4 continued**

**Q4**

**(Total 9 marks)**

Leave blank

**5.** The table shows the time, to the nearest minute, spent waiting for a taxi by each of 80 people one Sunday afternoon.

| **Waiting time (in minutes)** | **Frequency** |
|---|---|
| 2–4 | 15 |
| 5–6 | 9 |
| 7 | 6 |
| 8 | 24 |
| 9–10 | 14 |
| 11–15 | 12 |

(a) Write down the upper class boundary for the 2–4 minute interval.

**(1)**

A histogram is drawn to represent these data. The height of the tallest bar is 6 cm.

(b) Calculate the height of the second tallest bar.

**(3)**

(c) Estimate the number of people with a waiting time between 3.5 minutes and 7 minutes.

**(2)**

(d) Use linear interpolation to estimate the median, the lower quartile and the upper quartile of the waiting times.

**(4)**

(e) Describe the skewness of these data, giving a reason for your answer.

**(2)**

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**Question 5 continued**

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**Question 5 continued**

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**Question 5 continued**

**(Total 12 marks)**

**Q5**

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**6.** The time taken, in minutes, by children to complete a mathematical puzzle is assumed to be normally distributed with mean $\mu$ and standard deviation $\sigma$. The puzzle can be completed in less than 24 minutes by 80% of the children. For 5% of the children it takes more than 28 minutes to complete the puzzle.

(a) Show this information on the Normal curve below.

**(2)**

(b) Write down the percentage of children who take between 24 minutes and 28 minutes to complete the puzzle.

**(1)**

(c) (i) Find two equations in $\mu$ and $\sigma$.

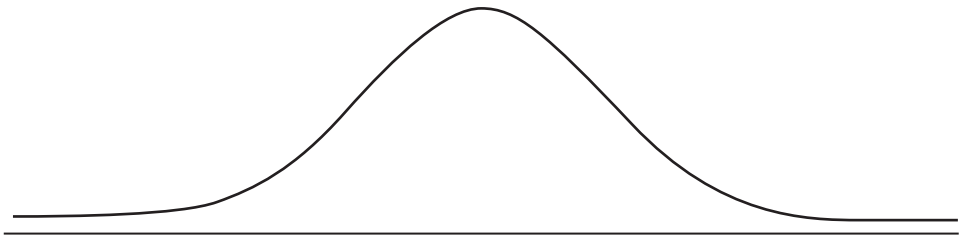
(ii) Hence find, to 3 significant figures, the value of $\mu$ and the value of $\sigma$.

**(7)**

A child is selected at random.

(d) Find the probability that the child takes less than 12 minutes to complete the puzzle.

**(3)**



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**Question 6 continued**

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**Question 6 continued**

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**Question 6 continued**

**(Total 13 marks)**

**Q6**

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**7.** In a large company,

78% of employees are car owners,
30% of these car owners are also bike owners,
85% of those who are not car owners are bike owners.

(a) Draw a tree diagram to represent this information.

**(3)**

An employee is selected at random.

(b) Find the probability that the employee is a car owner or a bike owner but not both.

**(2)**

Another employee is selected at random.

Given that this employee is a bike owner,

(c) find the probability that the employee is a car owner.

**(3)**

Two employees are selected at random.

(d) Find the probability that only one of them is a bike owner.

**(3)**

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**Question 7 continued**

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**Question 7 continued**

Q7

**(Total 11 marks)**

**TOTAL FOR PAPER: 75 MARKS**

**END**