

6683/01

# Edexcel GCE

## Statistics

Unit S1

Advanced Subsidiary / Advanced

Time: 1 hour 30 minutes

**Materials required for the examination**

Answer Book (AB04)  
Graph Paper (GP02)  
Mathematical Formulae

**Items included with these question papers**

Nil

**Candidates may use any calculator EXCEPT those with a facility for symbolic algebra, differentiation and/or integration. Thus candidates may NOT use calculators such as Texas TI 89, TI 92, Casio CFX 9970G, Hewlett Packard HP 48G.**

**Instructions to Candidates**

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Full marks may be obtained for answers to ALL questions.

In the boxes on the Answer Book provided, write the name of the Examining Body (Edexcel), your Centre Number, Candidate Number, the Unit Title (Statistics S1), the Paper Reference (6683), your surname, other names and signature.

**Information for Candidates**

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A booklet 'Mathematical Formulae including Statistical Formulae and Tables' is provided.

Values from the Statistical Tables should be quoted in full. The answer to each part of a question which requires the use of tables or a calculator should be given to three significant figures, unless otherwise specified.

This paper has 6 questions. Page 4 is blank.

**Advice to Candidates**

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You must ensure that your answers to parts of questions are clearly numbered.

You must show sufficient working to make your methods clear to the Examiner.  
Answers without working will gain no credit

1. (a) Explain what you understand by a statistical model. **(2 marks)**
- (b) Write down a random variable which could be modelled by
- (i) a discrete uniform distribution,
  - (ii) a normal distribution. **(2 marks)**
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2. A group of students believes that the time taken to travel to college,  $T$  minutes, can be assumed to be normally distributed. Within the college 5% of students take at least 55 minutes to travel to college and 0.1% take less than 10 minutes.
- Find the mean and standard deviation of  $T$ . **(9 marks)**
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3. The discrete random variable  $X$  has probability function
- $$P(X = x) = \begin{cases} kx, & x = 1, 2, 3, 4, 5, \\ 0, & \text{otherwise.} \end{cases}$$
- (a) Show that  $k = \frac{1}{15}$ . **(3 marks)**
- Find the value of
- (b)  $E(2X + 3)$ , **(5 marks)**
  - (c)  $\text{Var}(2X - 4)$ . **(6 marks)**
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4. A drilling machine can run at various speeds, but in general the higher the speed the sooner the drill needs to be replaced. Over several months, 15 pairs of observations relating to speed,  $s$  revolutions per minute, and life of drill,  $h$  hours, are collected.
- For convenience the data are coded so that  $x = s - 20$  and  $y = h - 100$  and the following summations obtained.
- $$\Sigma x = 143; \Sigma y = 391; \Sigma x^2 = 2413; \Sigma y^2 = 22441; \Sigma xy = 484.$$
- (a) Find the equation of the regression line of  $h$  on  $s$ . **(10 marks)**
  - (b) Interpret the slope of your regression line. **(2 marks)**
  - (c) Estimate the life of a drill revolving at 30 revolutions per minute. **(2 marks)**
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5. The distances, in km, travelled to school by the teachers in two schools in the same town are summarised in the back-to-back stem and leaf diagram below.

	School A		School B	
(3)	4 4 4	0	3 4 4	(3)
(2)	6 5	0	5 7	(2)
(6)	4 3 2 2 1 1	1	0 0 1 2 2 3	(6)
(1)	7	1	7 7 7 8 8 9 9	(7)
(6)	4 3 2 2 1 0	2	0 0 1 2 2 3 4	(7)
(2)	9 7	2	5 5 6 6 7 7 8 8 9 9	(10)
(5)	4 2 2 1 0	3	0 1 1 1 3 3 4 4	(8)
(3)	9 8 8	3	5 6 8 9	(4)
(3)	3 1 0	4	0 1	(2)
(0)		4		(0)
(0)		5		(0)
(0)		5	5	(1)

Key: 7 | 2 | 5 means 27 in School A and 25 in School B

The three quartiles for School A are 12, 22 and 32 respectively.

- (a) Find the three quartiles for School B. **(4 marks)**
- (b) On graph paper, draw a box plot to represent the data for School A. **(4 marks)**

Outliers are defined to be outside the limits  $Q_1 - 1.5(Q_3 - Q_1)$  and  $Q_3 + 1.5(Q_3 - Q_1)$ .

- (c) Using the same scale draw a box plot for School B. **(6 marks)**
- (d) Compare and contrast the two box plots. **(2 marks)**
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6. For any married couple who are members of a tennis club, the probability that the husband has a degree is  $\frac{3}{5}$  and the probability that the wife has a degree is  $\omega = \frac{3u}{8a}$ . The probability that the husband has a degree, given that the wife has a degree, is  $\frac{11}{12}$ .

A married couple is chosen at random.

- (a) Show that the probability that both of them have degrees is  $\frac{11}{24}$ . **(2 marks)**  
(b) Draw a Venn diagram to represent these data. **(5 marks)**

Find the probability that

- (c) only one of them has a degree, **(2 marks)**  
(d) neither of them has a degree. **(3 marks)**

Two married couples are chosen at random.

- (e) Find the probability that only one of the two husbands and only one of the two wives have degrees. **(6 marks)**

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**END**



## Key to Marking Principles

The total number of marks for each paper is 75.

Method marks (M) are awarded for ‘knowing a method and attempting to apply it’, unless otherwise indicated.

Accuracy marks (A) can only be awarded if the relevant method marks (M) have been earned.

(B) marks are independent of method marks.

Method marks cannot be subdivided.

For misreading which does not alter the character of a question or materially simplify it, deduct two from any A or B marks gained, in that part of the question affected.

All marks are ‘correct answer only’ unless shown, for example, as  $A\overset{\wedge}{M}$  to indicate that previous wrong working is to be followed through. After a misread the subsequent A marks affected are treated as  $A\overset{\wedge}{M}$  but manifestly absurd answers should never be awarded A marks.

The abbreviation awrt stands for ‘anything which rounds to’.

The abbreviation –1eeoo stands for ‘deduct one mark for every error or omission’.

The abbreviation cso stands for ‘correct solution only’.

# EDEXCEL FOUNDATION

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## Specimen Paper

### Advanced Subsidiary/Advanced Level General Certificate of Education

Subject **STATISTICS**  
**S1**

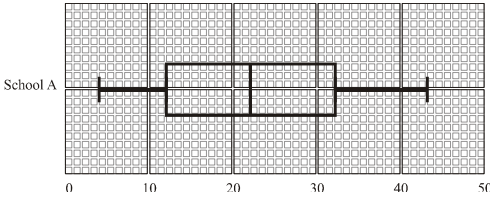
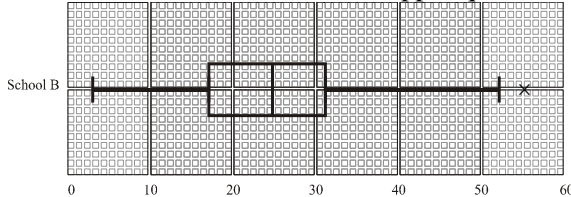
Paper No.

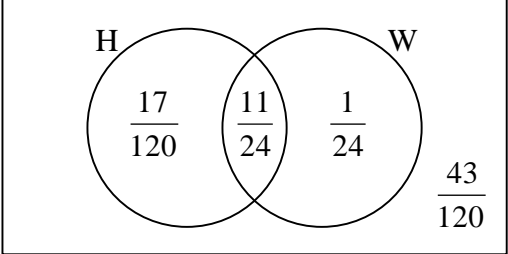
Question number	Scheme	Marks
<b>1.</b> <b>(a)</b> <b>(b) (i)</b> <b>(ii)</b>	A statistical process devised to describe or make predictions about the expected behaviour of a real-world problem.  The number showing on the uppermost side of a die after it has been rolled.  The height of adult males.	B1 B1 (2)  B1  B1 (2)
<b>2.</b>	<div style="text-align: center;"> </div> <p> <math>P(T &gt; 55) = 0.05</math>  <math>\therefore P\left(Z &gt; \frac{55 - \mu}{\sigma}\right) = 0.05</math>  <math>\Rightarrow \frac{55 - \mu}{\sigma} = 1.6449</math> </p> <p> <math>P(T &lt; 10) = 0.001</math>  <math>\therefore P\left(Z &lt; \frac{10 - \mu}{\sigma}\right) = 0.001</math>  <math>\Rightarrow \frac{10 - \mu}{\sigma} = -3.0902</math> </p> <p> <math>\therefore 55 - \mu = 1.6449\sigma</math>  <math>10 - \mu = -3.0902\sigma</math>  <math>\therefore \mu = 39.368</math>  <math>\sigma = 9.5035</math> </p>	<p style="text-align: right;">                     1.6449 B1                      Standardising M1                      Completely correct A1                 </p> <p style="text-align: right;">                     -3.0902 B1                      Standardising M1                      Completely correct A1                 </p> <p style="text-align: right;">                     Attempt to solve M1  <math>\mu = 39.4</math> A1  <math>\sigma = 9.50</math> A1                 </p> <p style="text-align: right;">(9)</p>





Question number	Scheme	Marks
<p>3. (a)</p> <p>(b)</p> <p>(c)</p>	<p><math>k(1+2+3+4+5)=1</math>  <math>\Rightarrow k = \frac{1}{15} *</math></p> <p><math>E(X) = \frac{1}{15} \{1+2 \times 2 + \dots + 5 \times 5\}</math>  <math>= \frac{11}{3}</math></p> <p><math>\therefore E(2X+3) = 2E(X)+3</math>  <math>= \frac{31}{3}</math></p> <p><math>E(X^2) = \frac{1}{15} \{1+2^2 \times 2 + \dots + 5^2 \times 5\}</math>  <math>= 15</math></p> <p><math>\text{Var}(X) = 15 - \left(\frac{11}{3}\right)^2</math>  <math>= \frac{14}{9}</math></p> <p><math>\text{Var}(2X-4) = 4\text{Var}(X)</math>  <math>= \frac{56}{9}</math></p>	<p>Use of <math>\sum P(X=x)=1</math> M1A1</p> <p>A1 (3)</p> <p>Use of <math>E(X) = \sum xP(X=x)</math> M1A1</p> <p>A1</p> <p>M1</p> <p>A1 ✓ (5)</p> <p>Use of <math>E(X^2) = \sum x^2P(X=x)</math> M1</p> <p>A1</p> <p>Use of <math>\text{Var}(X) = E(X^2) - [E(X)]^2</math> M1</p> <p>A1</p> <p>Use of <math>\text{Var}(aX) = a^2\text{Var}(X)</math> M1</p> <p>A1 ✓ (6)</p>
<p>4. (a)</p>	<p><math>b = \frac{15 \times 484 - 143 \times 391}{15 \times 2413 - (143)^2}</math>  <math>= -3.0899</math></p> <p><math>a = \frac{391}{15} - (-3.0899) \left(\frac{143}{15}\right)</math>  <math>= 55.5237</math></p> <p><math>\therefore y = 55.52 - 3.09x</math></p> <p><math>\therefore h - 100 = 55.52 - 3.09(s - 20)</math></p> <p><math>\therefore h = 217.32 - 3.09s</math></p>	<p>M1A1</p> <p>AWRT -3.09 A1</p> <p>M1A1</p> <p>AWRT 55.5 A1</p> <p>B1 ✓</p> <p>M1A1 ✓</p> <p>AWRT 217; 3.09 A1 (10)</p>

Question number	Scheme	Marks
(b)	For every extra revolution/minute the life of the drill is reduced by 3 hours.	B1B1 (2)
(c)	$s = 30 \Rightarrow h = 124.6$	M1 A1 ✓ (2)
5.	<p>(a) <math>Q_1 = \underline{17}</math></p> $Q_2 = \frac{24 + 25}{2} = \underline{24.5}$ <p><math>Q_3 = \underline{31}</math></p> <p>(b) </p> <p>(c) <math>Q_1 - 1.5(Q_3 - Q_1) = 17 - 1.5(31 - 17) = \underline{-4}</math>  <math>\Rightarrow</math> no outlier below lower quartile</p> $Q_3 + 1.5(Q_3 - Q_1) = 31 + 1.5(31 - 17) = \underline{52}$ $\Rightarrow$ an outlier (55) above upper quartile <p></p> <p>(d) Comments on location and spread. Accept any TWO sensible comments.</p>	<p>B1</p> <p>M1A1</p> <p>B1 (4)</p> <p>Box plot M1 Scales &amp; label B1</p> <p><math>Q_1, Q_2, Q_3; 4, 43</math> A1 ✓; A1 (4)</p> <p>M1A1</p> <p>A1</p> <p><math>Q_1, Q_2, Q_3</math> A1 ✓ 3, 52 A1</p> <p>55 A1 (6)</p> <p>B1 ✓ B1 ✓ (2)</p>

Question number	Scheme	Marks
6. (a)	$P(H \cap W) = P(H W)P(W)$ $= \frac{11}{12} \times \frac{1}{2} = \frac{11}{24} *$	M1 A1 (2)
(b)		Diagram M1 M1A1 A1 B1 (5)
(c)	$P(\text{only one has a degree}) = \frac{17}{120} + \frac{1}{24} = \frac{11}{60}$	M1A1 (2)
(d)	$P(\text{neither has a degree}) = 1 - \left\{ \frac{17}{120} + \frac{11}{24} + \frac{1}{24} \right\}$ $= \frac{43}{120}$	M1A1 A1 (3)
(e)	<p>Possibilities  <math>-(HW')(H'W); (H'W)(HW'); (HW)(H'W'); (H'W')(HW)</math></p> $\therefore P(\text{only 1 H or 1 W}) = \left( 2 \times \frac{17}{120} \times \frac{1}{24} \right) + \left( 2 \times \frac{11}{24} \times \frac{43}{120} \right)$ $= \frac{49}{144}$	Any one B1 All correct B1 $2 \times \frac{17}{120} \times \frac{1}{24}$ B1 ✓ $2 \times \frac{11}{24} \times \frac{43}{120}$ B1 ✓ Adding their probabilities M1 $\frac{49}{144}$ A1 (6)

