



Rewarding Learning

ADVANCED
General Certificate of Education
2012

Mathematics

Assessment Unit S4

assessing

Module S2: Statistics 2

[AMS41]



FRIDAY 22 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number on the Answer Booklet provided.

Answer **all seven** questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

You are permitted to use a graphic or scientific calculator in this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$



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Answer all seven questions.

Show clearly the full development of your answers.

Answers should be given to three significant figures unless otherwise stated.

- 1** Thomas is investigating the correlation between the height, x cm, and weight, y kg, of Sixth Year students. His results are given in **Table 1** below.

Table 1

Student	A	B	C	D	E	F	G	H	I	J
Height (x , cm)	162	174	186	158	165	175	175	166	182	174
Weight (y , kg)	62	85	95	72	58	94	78	58	73	80

Summary values of these data are:

n	Σx	Σy	Σx^2	Σy^2	Σxy
10	1717	755	295511	58655	130384

- (i)** Calculate the product-moment correlation coefficient for these data. [5]

- (ii)** Comment on the value obtained in part **(i)**. [1]

- 2** Evelyn is an office manager. She investigates the length of telephone calls at the office. Evelyn records the length, x minutes, of a sample of 40 calls.

Her summary values are:

$$\Sigma x = 288 \quad \Sigma x^2 = 2818$$

- Find a 95% confidence interval for the mean length of calls. [8]

- 3 Carol is investigating the link between air temperature, y °C, and height above ground level, x m. Her data are given in **Table 2** below.

Table 2

Height (x , m)	50	100	150	200	250	300
Temperature (y , °C)	24.6	21.7	18.5	15.4	12.5	9.2

Summary values of these data are:

n	Σx	Σy	Σx^2	Σy^2	Σxy
6	1050	101.9	227500	1896.35	15140

- (i) Find the regression equation of temperature on height above ground level. [6]

- (ii) Estimate the temperature at 220 m above ground level. [2]

Based on her equation, Carol estimates the temperature at 400 m above ground level to be 3 °C.

- (iii) Why might this value be unreliable? [1]

- 4 (i) Carefully explain the meaning of the term 'Null Hypothesis'. [2]

A Statistics class is testing the claim that the average amount of weekly pocket money given to teenagers is £12.50

They asked a sample of 50 teenage pupils in their school how much weekly pocket money, £ x , they each received.

A summary of the results is as follows:

$$\Sigma x = 596 \qquad \Sigma x^2 = 7576$$

- (ii) Test the claim at 5% level. [13]

- 5 A bakery produces buns whose mass is Normally distributed with mean 50 g and standard deviation 2.1 g. The buns are sold in packs of 4.
Find the percentage of packs in which the buns have an average mass between 49 g and 51 g. [8]

- 6 Jack suspects that the amount of instant coffee in jars of his favourite brand is less than the 100 g stated on the label. He weighs the contents of nine jars.
His results are given below:

102.4 97.9 99.5 100.2 98.7 99.1 97.8 100.5 99.6

Assuming Normality, test Jack's suspicion at 5% level. [13]

- 7 The Normally distributed random variable X is such that $X \sim N(75, 6)$.
Also $S = X_1 + X_2 + X_3$ and $T = 3X$, where X_1, X_2 and X_3 are three independent random variables each with the same distribution as X .

Find:

(i) $P(S \geq 235)$; [6]

(ii) $P(T \geq 235)$. [4]

A second Normally distributed variable Y , independent of X , is such that $Y \sim N(60, 8)$

(iii) Find $P(4Y - 3X \leq 10)$. [6]

THIS IS THE END OF THE QUESTION PAPER

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