OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE UNIT **4754(B)/01**

MATHEMATICS (MEI)

Applications of Advanced Mathematics (C4)

Paper B: Comprehension

TUESDAY 23 JANUARY 2007 Afternoon

Time: Up to 1 hour

Additional materials:
Rough paper
MEI Examination Formulae and Tables (MF2)

Candidate Name										
Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the spaces provided.
- Answer **all** the questions.
- Write your answers in the spaces provided on the question paper.
- You are permitted to use a graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 18.
- The insert contains the text for use with the questions.
- You may find it helpful to make notes and do some calculations as you read the passage.
- You are **not** required to hand in these notes with the question paper.

ADVICE TO CANDIDATES

- Read each question carefully and make sure you know what you have to do before starting your answer.
- You are advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.

For Examiner's Use	
Qu.	Mark
1	
2	
3	
4	
5	
6	
Total	

This document consists of **4** printed pages and an insert.

[Turn over

1 In a certain country, twenty cars are on display in a car showroom. The costs of the cars in the local currency, the zen, are shown below.

10 255	23 250	48 500	25 950	12 340
34 750	5 690	13 580	7 450	9 475
18 890	14 675	6 295	21 225	37 850
51 200	43 340	16 575	8 380	28 880

(i) Complete the table giving the frequencies of the leading digits. [1]

Leading digit	1	2	3	4	5	6	7	8	9
Frequency	6	4	2						

The country joins the European Union and so the costs of the cars are converted to euros. The exchange rate is 1 zen = 3 euros.

(ii) Give the costs of the cars in euros in the space below and then complete the table giving the frequencies of the leading digits in euros. [2]

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Leading digit	1	2	3	4	5	6	7	8	9
Frequency	7								0

(iii) In the table below, give the frequencies predicted by Benford's Law, in each case correct to **one decimal place**. [2]

Leading digit	1	2	3	4	5	6	7	8	9
Frequency	6.0								

(iv) Compare the results in the three tables. [1]

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For Examiner's Use

2 On lines 28 and 29 it says 'Similarly, the numbers in Table 3 with leading digit 5, 6, 7, 8 or 9 give numbers in Table 5 with leading digit 1'. Explain how this is reflected in the frequencies in Table 4 and Table 6. [1]

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3 Line 104 refers to the relationship $p_1 = p_3 + p_4 + p_5$. Explain how this relationship is obtained.

[2]

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4 Benford's Law is quoted on lines 126 to 127. Show that this is equivalent to

$$p_n = \log_{10}\left(1 + \frac{1}{n}\right).$$

[2]

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5 Using the results $\mathrm{L}(4) = 2 \times \mathrm{L}(2)$ and $\mathrm{L}(6) = \mathrm{L}(3) + \mathrm{L}(2)$, and the relationship $p_6 + p_7 = p_3$, derive the result $\mathrm{L}(8) = 3 \times \mathrm{L}(2)$ stated on line 123. [3]

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[Turn over

For Examiner's Use

6 The distribution of leading digits in the **daily** wages, in pounds sterling, of the employees of a firm is given in the table below.

Leading digit	1	2	3	4	5	6	7	8	9
Frequency (**daily** wages)	29	16	12	10	8	7	6	5	4

The employees all work a 5-day week. Using the values for the **daily** wages above, find the entries marked *a* and *b* for the **weekly** wages in the table below. Explain your reasoning.[4]

Leading digit	1	2	3	4	5	6	7	8	9
Frequency (**weekly** wages)	*a*			*b*					

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