OCR
RECOGNISING ACHIEVEMENT

ADVANCED GCE

MATHEMATICS (MEI) 4754B

Applications of Advanced Mathematics (C4) Paper B: Comprehension

Candidates answer on the question paper.

OCR supplied materials:
- Insert (inserted)
- MEI Examination Formulae and Tables (MF2)

Other materials required:
- Scientific or graphical calculator
- Rough paper

Monday 13 June 2011
Morning

Duration: Up to 1 hour

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- The insert contains the text for use with the questions.
- You are permitted to use a scientific or 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.
- 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 your question paper.
- 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.
- The total number of marks for this paper is **18**.
- This document consists of **4** pages. Any blank pages are indicated.

1 In lines 59 and 60, the text says "In that case the proportion suffering such an attack would be 6.4%."

Explain how this figure was obtained. **[1]**

1	

2 **(i)** In lines 8 to 10, the article says "Some banks do not allow numbers that begin with zero, numbers in which the digits are all the same (such as 5555) or numbers in which the digits are consecutive (such as 2345 or 8765)."

How many different 4-digit PINs can be made when all these rules are applied? **[3]**

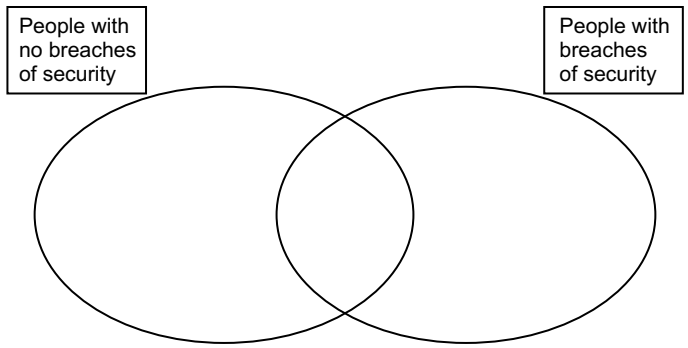
(ii) At the time of writing, the world population is 6.7×10^9 people. Assuming that, on average, each person has one card with a 4-digit PIN (subject to the rules in part **(i)** of this question), estimate the average number of people holding cards with any given PIN. Give your answer to an appropriate degree of accuracy. **[2]**

2 (i)	
2 (ii)	

3 In lines 46 and 47, the text says "Of the 11 people with unauthorised transactions, 3 could explain them as breaches of card security (typically losing the card) but 9 could not … ."

Place numbers in the three regions of the diagram consistent with the information in this sentence. **[2]**

3



4 In lines 101 and 102, the text says "The total number of transactions for those who responded has been estimated as 100 000 for the $3\frac{1}{2}$ years covered by the survey."

Estimate the number of transactions per person per day that would give this figure. **[2]**

4

5 The survey described in the article was based on a small sample.

State one conclusion which is unlikely to be influenced by the size of the sample. **[1]**

5

6 A bank has detection software that can be set at two different levels, 'Mild' and 'Severe'.

- When it is set at Mild, 0.1% of all transactions are queried.
- When it is set at Severe 0.5% of all transactions are queried.

(i) One day the bank has 500 000 transactions.

The software is set on 'Mild'. There are 480 false positives. Only $\frac{1}{3}$ of the unauthorised transactions are queried. Complete the table. **[3]**

(ii) What is the ratio of false positives to false negatives? **[1]**

(iii) If the software had been set on 'Severe' for the same set of 500 000 transactions, with the total numbers of authorised and unauthorised transactions the same as in part **(i)** of this question, the number of false negatives would have been 5. What would the ratio of false positives to false negatives have been with this setting? **[3]**

6 (i)

Transactions	Authorised	Unauthorised	Total
Queried			
Not queried			
Total			500 000

6 (ii)

6 (iii)

[A copy of the table is provided below for your working.]

Transactions	Authorised	Unauthorised	Total
Queried			
Not queried		5	
Total			500 000