

Level 3 Certificate

MATHEMATICAL STUDIES

Paper 1

Name: _____

Class: _____

Date: _____

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a clean copy of the Preliminary material
- a scientific calculator or a graphics calculator
- a copy of the formulae sheet
- a ruler.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in your name, class and the date at the top of this page.
- Answer all the questions.
- Do all rough work on this paper. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.
- The final answer to questions should be given to an appropriate degree of accuracy.
- You may not refer to the copy of the Preliminary material that was available prior to this examination. A clean copy is enclosed for your use.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
Total	

Information

- The maximum mark for this paper is 60.
- The marks for each question are shown in brackets [].
- Use this as a guide as to how much time to spend on each question.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Paper 1

1 A national chain of shoe shops wants to do a survey to find out what people think about the range of shoes they sell and their prices.

Describe how they could use

a) cluster sampling

[2 marks]

b) quota sampling.

[2 marks]

For each method give an advantage and a disadvantage.

2 Nicole uses an internet savings bank account. This pays 0.5% interest per month.

She saves £100 on the first day of each month.

The amount of money in her account after n months, $£A_n$, is given by the recurrence relation

$$A_n = 1.005(A_{n-1} + 100), \text{ where } A_0 = 0.$$

a) Explain the significance of the number 1.005 in the recurrence relation.

[1 mark]

b) Complete the table to give the balance in the account after the first four months.

Assume that the amount at the end of each month is rounded to the nearest penny.

[3 marks]

n	A_n
0	0
1	100.50
2	
3	
4	

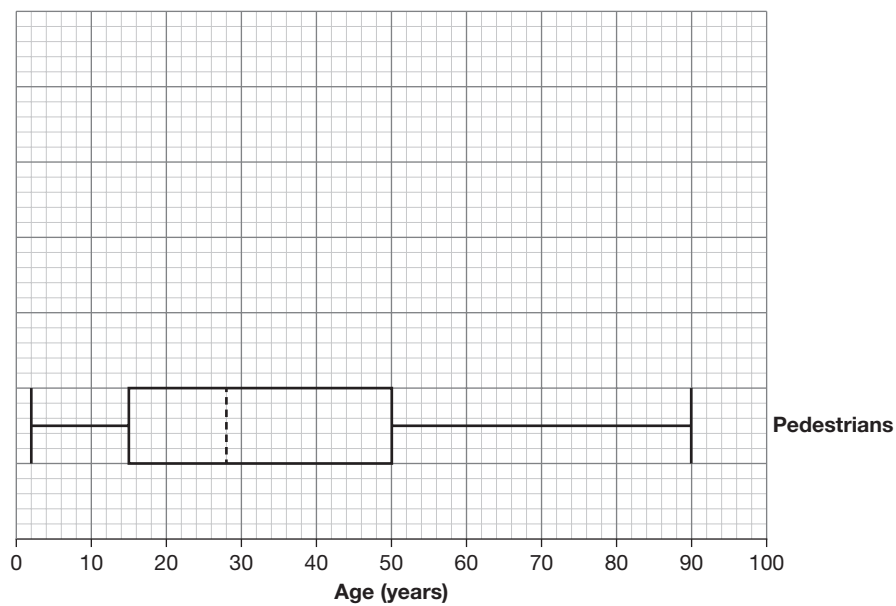
c) Find the AER of this account.

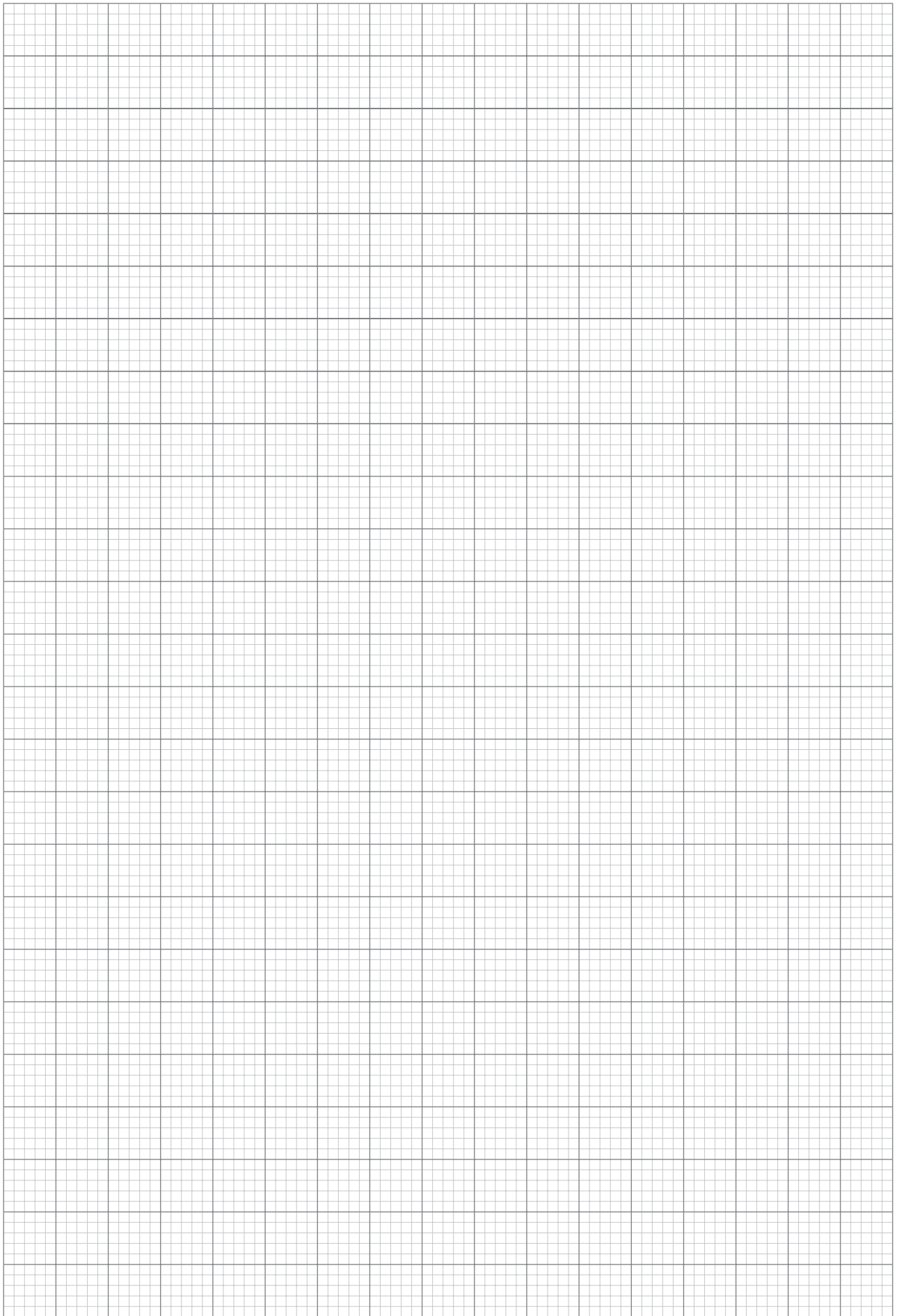
[3 marks]

4 The table shows the ages of cyclists injured in road accidents in Great Britain in 2013.

Age (years)	Number of casualties
0-4	40
5-7	190
8-11	602
12-15	1126
16-19	1299
20-29	4452
30-39	4269
40-49	3814
50-59	2119
60-69	767
70-79	281
80 and over	88

The ages of pedestrians injured in road accidents in Great Britain in 2013 were also recorded. The data are shown as a box and whisker diagram below.





- 5 On 12th June 2015, an applicant for a loan from an online lending company would have seen the following on-screen message.

Your loan application . . .
Representative example: £400 loan repayable over 26 weeks.
26 weekly payments of £26.15. Rate of interest 140% pa fixed.
Representative 845% APR. Total amount payable £679.90.

- a) Which figure in this message is the most important when comparing different loans? Briefly explain your answer.

[2 marks]

- b) Show the calculation which gives the total amount payable from other information in this message.

[2 marks]

- c) For the formula

$$C = \sum_{k=1}^m \left(\frac{A_k}{(1+i)^{t_k}} \right)$$

to be applied to this loan, write down the values of C , m , i and each A_k .

[4 marks]

6 a) The table below shows the weights of Braeburn apples grown in an orchard in one season.

Weight (g)	Number of apples
$70 \leq x < 100$	79
$100 \leq x < 120$	156
$120 \leq x < 140$	397
$140 \leq x < 160$	643
$160 \leq x < 180$	421
$180 \leq x < 200$	184
$200 \leq x < 240$	97
$240 \leq x$	0

The orchard supplies a supermarket with Braeburn apples.

The supermarket requires apples to have weights in the range $148 \leq x < 218$ grams.

Estimate the percentage of the Braeburn apples from the orchard that are in this range.

[5 marks]

b) To promote healthy eating, each school pupil in the UK is to be given an apple on each day of a school week.

Estimate how many tonnes of apples will be needed.

Show details of your assumptions and calculations.

[4 marks]

c) The Consumer Price Index for fruit changed from 137.6 in September 2014 to 147.4 in December 2014. Find the percentage change in the price of fruit.

[2 marks]
