AQA

Level 3 Certificate
MATHEMATICAL STUDIES
Paper 2C – Graphical techniques

Date	Morning	Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
* a clean copy of the Preliminary Material (enclosed)
* a scientific calculator or a graphics calculator
* a copy of the formulae sheet
* a ruler.

Instructions

* Use black ink or black ball-point pen. Pencil should only be used for drawing.
* Fill in the boxes at the bottom of this page.
* Answer **all** questions.
* You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question. You do not necessarily need to use all the space provided.
* Do not write outside the box around each page.
* Show all necessary working; otherwise marks for method may be lost.
* Do all rough work in this book. Cross through any work that you do not want to be marked.
* 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.

Information

* The marks for questions are shown in brackets. The maximum mark for this paper is 60.
* The paper reference for this paper is 1350/2C.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

1350/2C

Answer **all** questions in the spaces provided.

1   Ben has been asked to write a short report on the average number of text messages sent per day by students in his class.

Ben's complete report is given below.

To study the number of text messages sent and received by students, I asked my friends to count the number of messages they sent and received. To display this information clearly, I entered the 9 pieces of data into a spreadsheet, as shown below.

	A	B	C	D
1	**Person**	**Number of messages sent**	**Number of messages received**	**Total number of messages**
2	Olivia	16	28	44
3	Josh	18	5	33
4	Ava	7	18	25

Analyse Ben's report, identifying any errors.

Suggest any improvements he could make.

[4 marks]

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2 Pete wants to buy a house.

His annual salary is £66 000

The bank will lend him three times his annual salary for a mortgage.

This is 90% of the house price.

He makes these notes:

3 x 66 000 = 188 000

188 000 x 0.9 = 169 200

So I can buy a house up to £169 200

This does not look right. What have I done wrong?

Critically analyse Pete's notes making corrections where necessary.

[3 marks]

3   Use **Positive spin** on the Preliminary Material.

3 **(a)**   The editor of the local newspaper received a letter of complaint to say the data had been badly presented.

Was the complaint justified?

[2 marks]

3 **(b)**   The newspaper headline for the 2014 by-election result said:

> # Half of Newark voters did not vote and UKIP made the biggest gain

Does the data support these claims?

[3 marks]

3 (c) Comment on the validity of each of the statements made by the three candidates on page 3 of the Preliminary Material.

Show working to justify your comments.

[8 marks]

4 Tom is on holiday in France.

The table shows the distances, in kilometres, between four cities in Northern France.

	Calais	Amiens	Lille	Paris
Calais	-	159	110	288
Amiens	159	-	144	145
Lille	110	144	-	221
Paris	288	145	221	-

In this question use 8 kilometres = 5 miles.

Tom is going to drive from Calais to Lille, spend 6 hours in Lille, and then drive to Paris.

He will drive on the motorway for 90% of the distance and on rural roads for the other 10%.

He expects to have an average speed of 75 miles per hour on the motorway and an average speed of 40 miles per hour on the rural roads.

He says,

"If I set off at 9.00 am I should arrive in Paris at about 6.00 pm."

Is he correct?

You **must** show your working.

[7 marks]

Turn over for the next question

5   The sales of two chocolate bars (A and B) for the period 2000 to 2014 are shown.
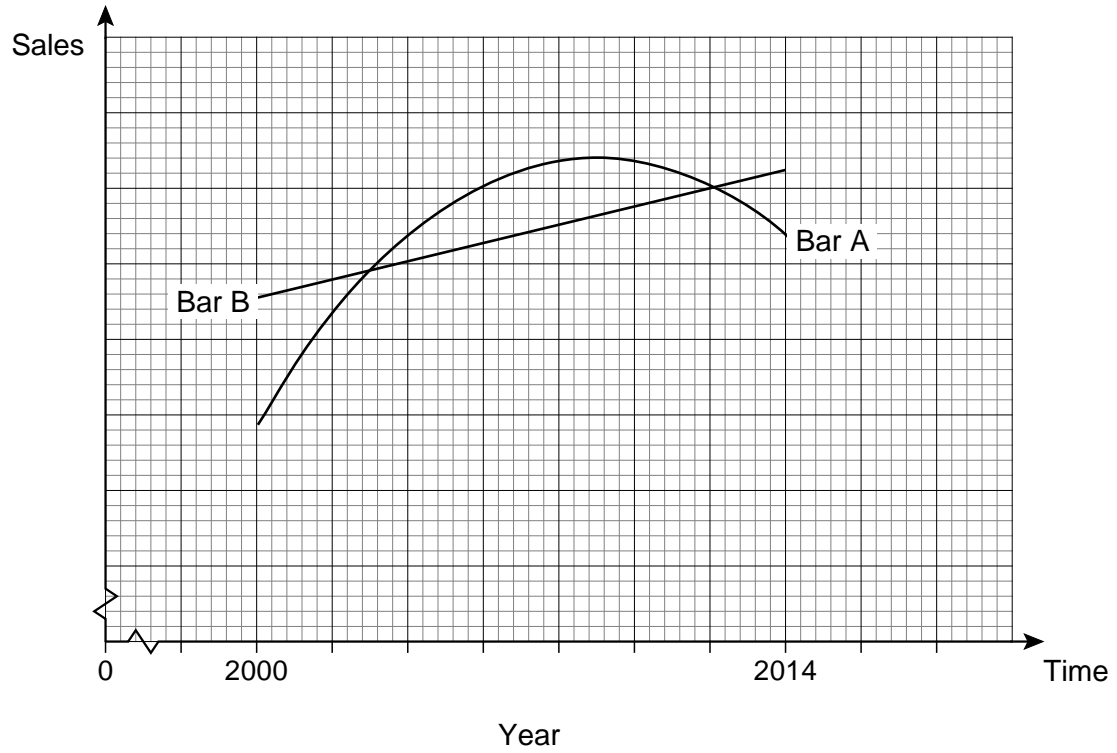
5   **(a)**   A marketing executive says that from 2000–2010 bar A sales more than doubled.

Is she correct?   Justify your answer.

[2 marks]

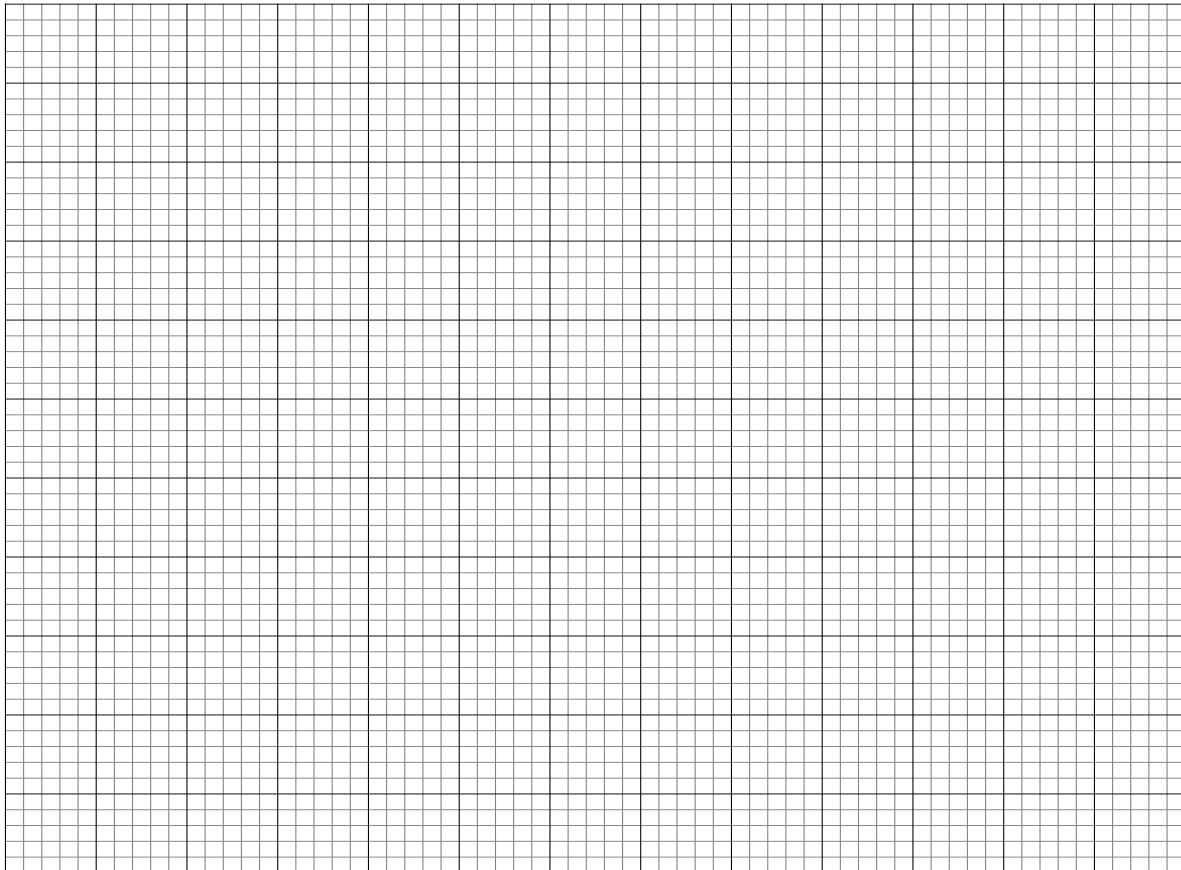**5** **(b)** Both chocolate bars are produced by the same company.

In 2014 the company decides to invest in a marketing campaign for **one** of the chocolate bars.

Use the evidence to advise the company which chocolate bar they should invest in for their marketing campaign.

Give reasons to justify your answer.

[3 marks]

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Turn over for the next question

Turn over ►

6   The market share of a web browser may be modelled by the equation

$$M = aT^2 + b$$

where:

- M is the percentage market share
- T is the number of months after October 2008
- and a and b are constants.

Table of values of Percentage Market Share at T Months after October 2008

T	4	8	12	16	20
M	1.5	2.7	4.4	6.8	9.5

6 (a)   Estimate the values a and b.

You may use the grid on the next page if you wish.

[6 marks]

6 (b) The owner of the web browser estimates that the income from advertising per month is £23 000 per percentage point of market share.

Estimate the income from advertising in October 2010

[3 marks]

6 (c) Why would this model not be valid for large values of T ?

[2 marks]

Turn over ▶

7   A colony of bacteria initially contains 4000 bacteria.

A scientist wants to know how long it will take for the size of the colony to double.

The number of bacteria, $N,$ after t hours is given by

$$N = 4000e^{0.034t}$$

7   **(a)**   On the axes below, sketch the graph of $N = 4000e^{0.034t}$ for $t \geqslant 0$

Show the coordinates of any points where the curve crosses an axis.

[2 marks]

7   **(b)**   Work out the number of bacteria after 6 hours.

[2 marks]

7   **(c)**   Work out how long it takes for the number of bacteria to double from its initial value of 4000

[3 marks]

7 **(d)** Alia says,

"It will always take the same amount of time for the size of the colony to double from one given value to a size that is twice that value."

Is Alia correct? Justify your answer.

[3 marks]

Turn over for the next question

8   Hannah is estimating the value of acceleration due to gravity.

She films a ball dropped from a window.

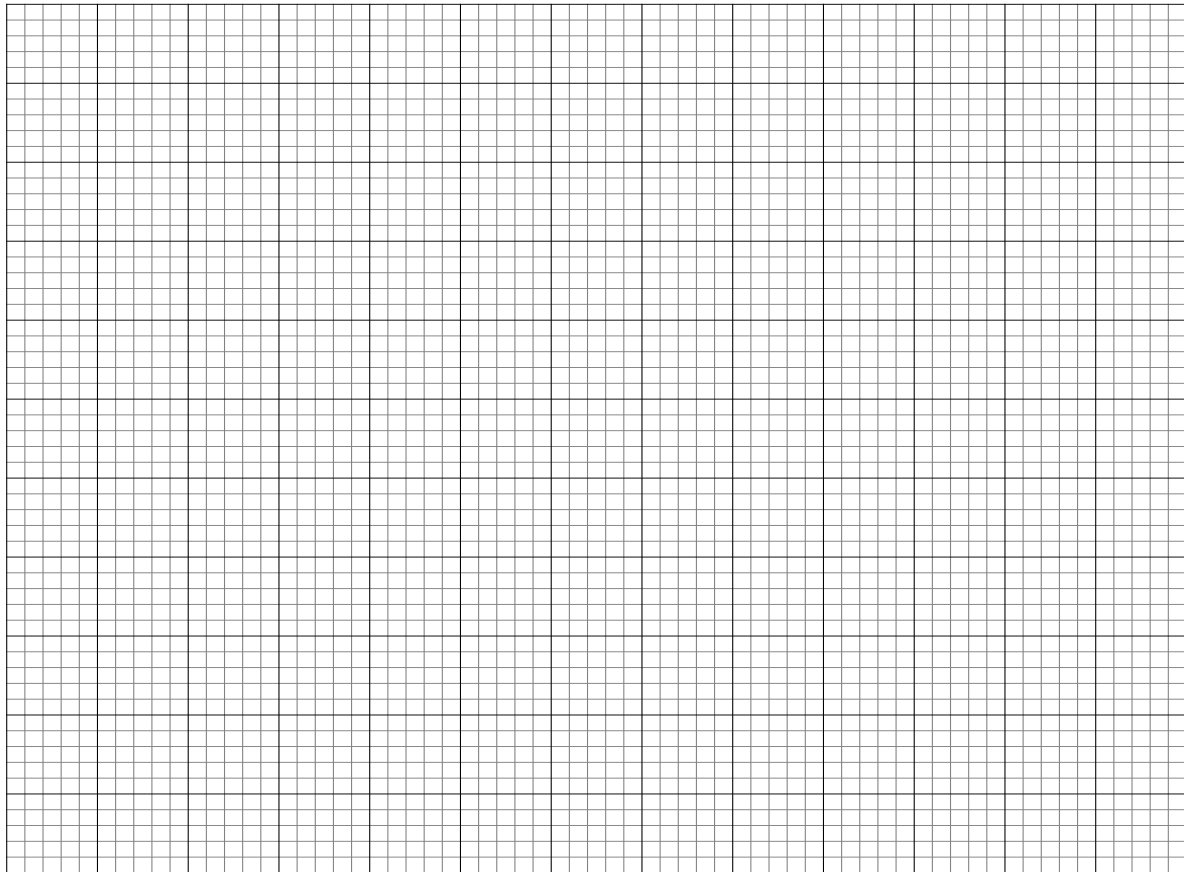The data from this experiment is summarised in the table.

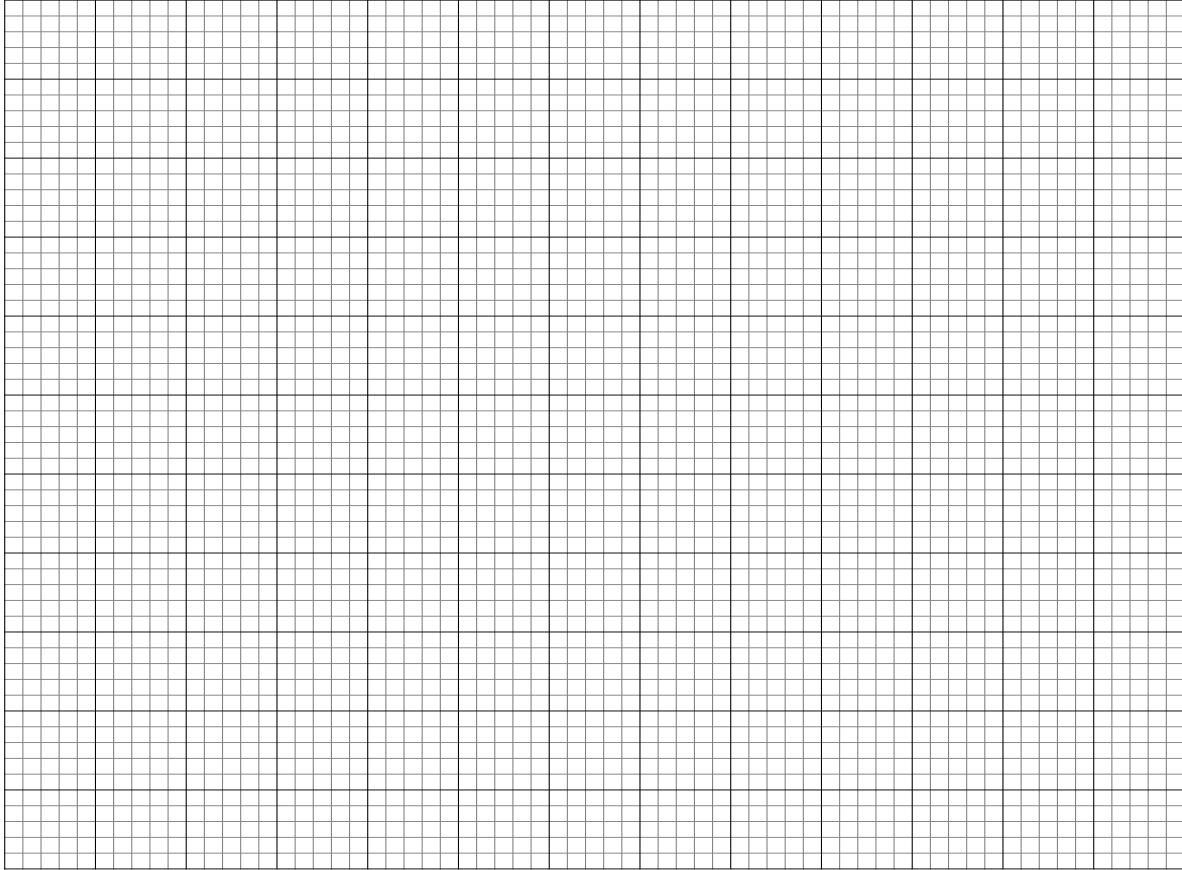| Time after ball is dropped (seconds)	Distance (metres)
0.0	0.00
0.2	0.20
0.4	0.78
0.6	1.76
0.8	3.12
1.0	4.86
1.2	7.00

Hannah expects there to be a constant value for the acceleration of the ball.

Write a short report about the acceleration of the ball as it falls, clearly showing the method and the working that you have used.

You may use the grids on the next pages if you wish.

[7 marks]

END OF QUESTIONS