AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

Level 3 Certificate
MATHEMATICAL STUDIES

Paper 2C Graphical techniques

Wednesday 23 May 2018 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a clean copy of the Preliminary Material and the Formulae Sheet (enclosed)
- a scientific calculator or a graphics calculator
- a ruler.

Instructions
- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Show all necessary working; otherwise, marks for method may be lost.
- Do all rough work in this book. Cross through any work 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.

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You may ask for more answer or graph paper, which must be tagged securely to this answer booklet.
- The paper reference for this paper is 1350/2C.

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

1 Use **Brexit** from the Preliminary Material.

1 (a) The UK population was 65 million in June 2016

What percentage of the population, correct to one decimal place, were eligible voters for the EU membership referendum?

Circle your answer.

[1 mark]

51.7 71.5 71.6 72.3

1 (b) One improvement that could be made to each graph in the Preliminary Material would be to label the axes.

Suggest **two** other improvements that could be made to each graph.

[4 marks]

Graph 1: EU immigration in the UK

Improvement 1

Improvement 2

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Graph 2: Brexit's impact on the pound

Improvement 1

Improvement 2

1 (c) For 2015, the UK paid the EU £14.6 billion.

During the campaign, Vote Leave claimed that the EU costs the UK over £350 million every week.

Is Vote Leave's claim justified?

You **must** show your working.

[2 marks]

Question 1 continues on the next page

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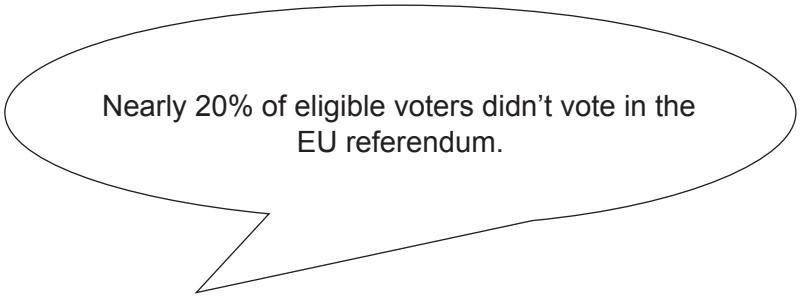
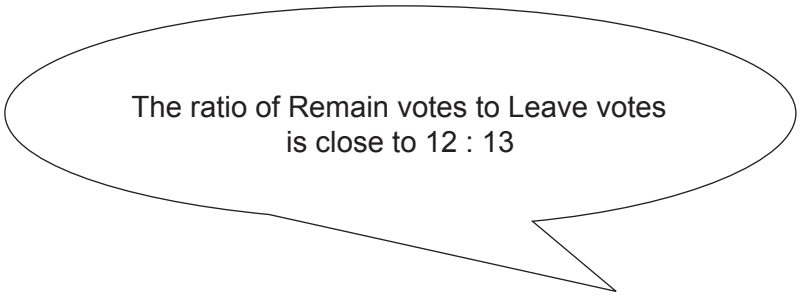
1 (d) Many people made comments on social media about the referendum.

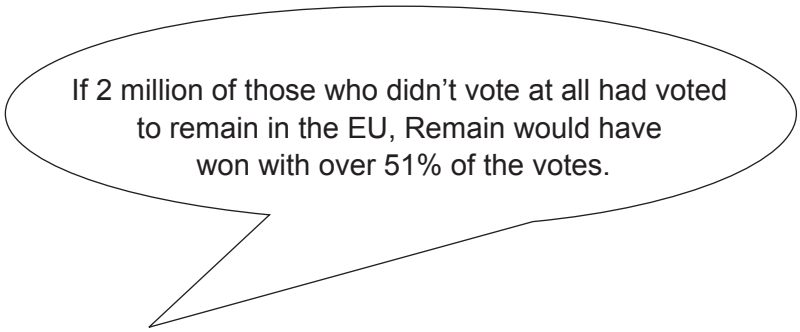
Here are three of the comments.



Tim



Kelly



Larissa

Using the table on page 2 of the Preliminary Material, check the validity of these comments.

You **must** show your calculations.

[7 marks]

Tim's comment

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Kelly's comment

Larissa's comment

14

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2 Maria is planning to move to Spain. She wants to buy a house which, including all associated fees, will cost €327 500

In May 2014 she opened a Spanish bank account with a deposit of £17 000
The account pays no interest.

The current exchange rate is £1 = €1.08

This is a decrease of 10% from the May 2014 rate.

Maria owns a house in England which she bought for £253 000. She has no mortgage. The house is now worth 12.5% more than she paid for it.

Advise Maria on whether the money she gets from selling her house in England, together with the money in her Spanish bank account, will be enough to buy the house in Spain.

You **must** show your working.

[6 marks]

6

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3 A boat is travelling at a constant speed on a straight canal.

The boat travels 150 metres in 60 seconds.

3 (a) Calculate the speed of the boat.

[2 marks]

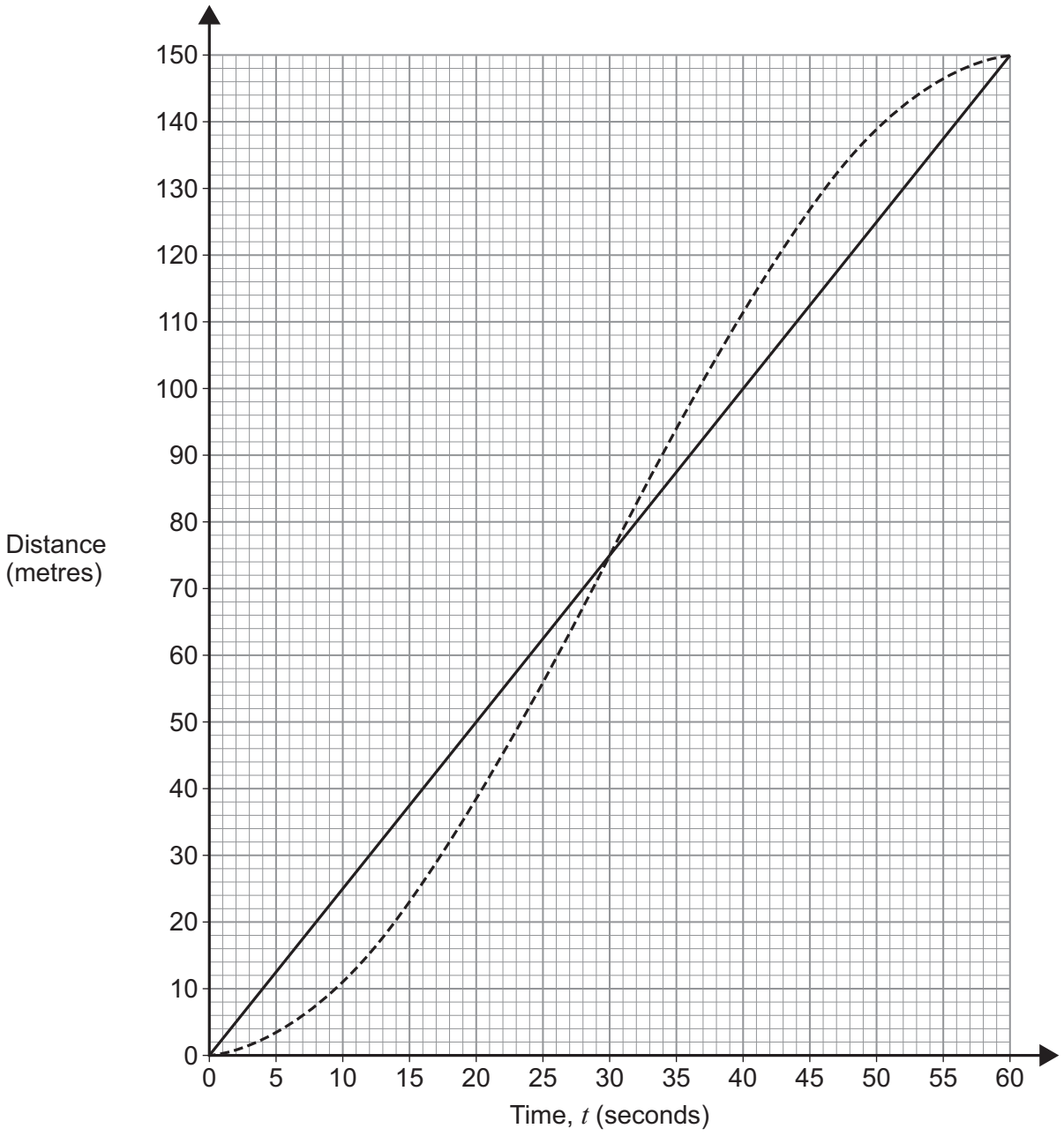
Answer _____ m s^{-1}

Question 3 continues on the next page

3 (b) A child is cycling on a path next to the canal.

The child sets off when she is level with the front of the boat.

The graph shows how the distance travelled by the child and the distance travelled by the boat vary with time, t seconds.



State all the values of t when the child is level with the front of the boat.

[2 marks]

Answer _____

Do not write outside the box

3 (c) Use the graph to estimate the speed of the child when $t = 30$

[3 marks]

Answer _____ m s^{-1}

3 (d) The distance, s metres, travelled by the child at time t seconds is modelled by

$$s = \frac{1}{8}t^2 - kt^3$$

Work out the value of k.

[3 marks]

Answer _____

10

Turn over for the next question

4 Extreme sports, including wingsuit flying, are rapidly increasing in popularity.

Wingsuit flying involves skydiving from a high altitude whilst wearing a special wingsuit which allows flyers to glide, thereby travelling horizontally as well as vertically.

In one competition, flyers are awarded points for their average horizontal speed during the competition window. The competition window is a time interval which starts when the flyer is at an altitude of 2960 metres and ends when the flyer is at an altitude of 1980 metres.

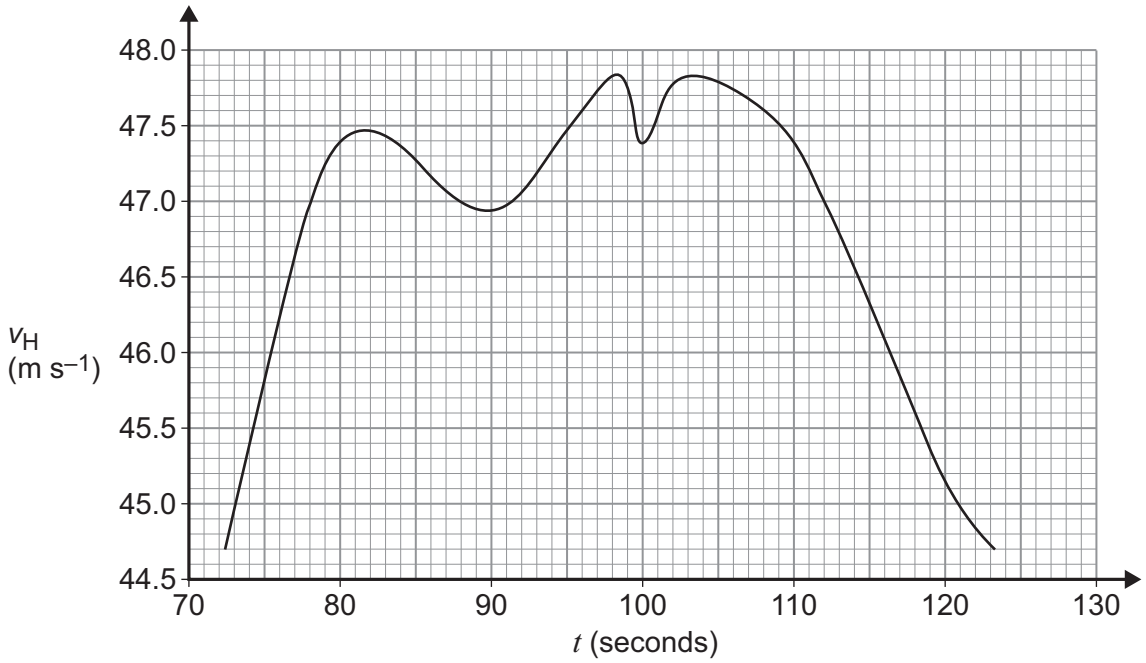
The table below shows information about one flyer during this competition.

	Altitude d_V (metres)	**Time t (seconds)**	**Horizontal distance travelled d_H (metres)**
Start of jump	4420	0	0
Competition window starts	2960	72.4	2495
Competition window ends	1980	123.2	4910
Opens parachute	1220	165	6440

4 (a) For this flyer, show that the average horizontal speed, v_H, during the competition window is 47.54 m s^{-1}, correct to 2 decimal places.

[2 marks]

4 (b) The graph below shows the horizontal speed of the flyer during the competition window.



Bonus points are awarded if the flyer exceeds their average horizontal speed for at least 25% of their competition window.

Was this flyer awarded bonus points?

Show working to justify your answer.

[3 marks]

4 (c) How many times during the competition window was the flyer moving with zero horizontal acceleration?

Give a reason for your answer.

[2 marks]

7

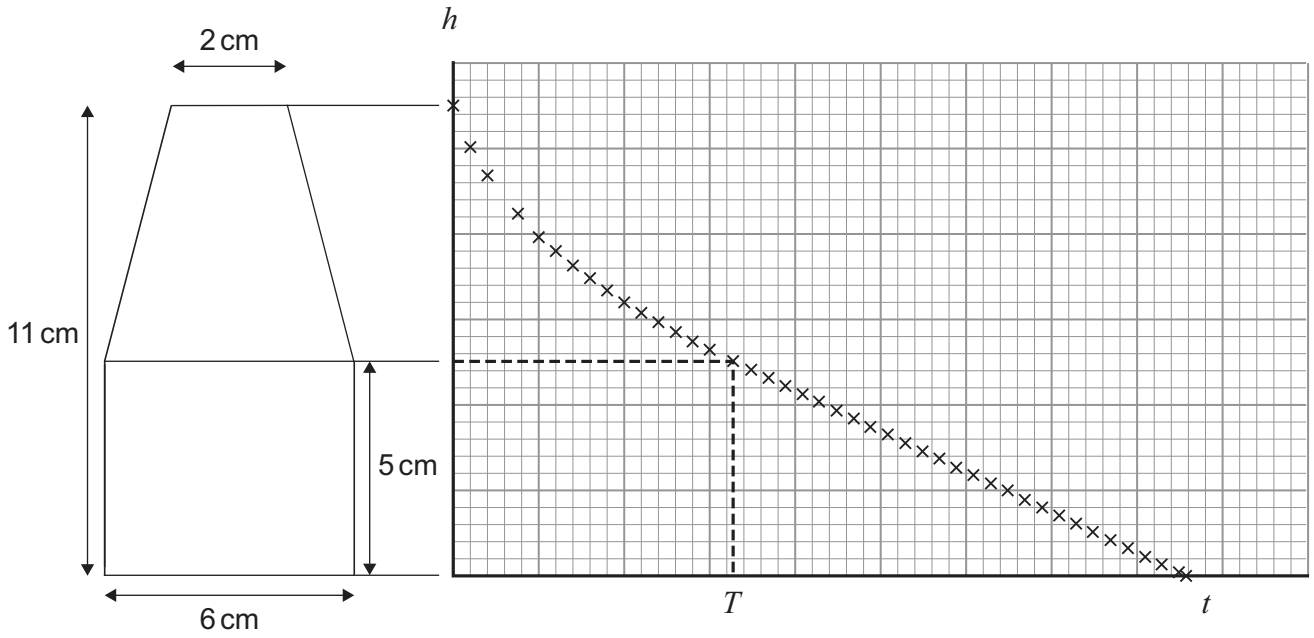
5 A company that makes candles has just launched a new product.

The new candles have:

- a lower part which is a cylinder of diameter 6 cm and height 5 cm
- an upper part which is a truncated cone that narrows to a diameter of 2 cm
- a total height of 11 cm

The diagram shows a cross section of the candle.

The graph shows how, when the candle is burning, its height, h cm, varies with time, t hours.



5 (a) Describe the rate of change of the height both before T hours and after T hours.

[2 marks]

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5 (b) After the upper part of the candle has burned, the height, h cm, follows the model

$$h = mt + c \qquad \text{for } T < t \leqslant 19.2$$

where t is the time, in hours, for which the candle has been burning.

Work out the values of m, c and T, given that:

- every hour, the height of the candle decreases by 0.39 cm
- the candle burns out when t = 19.2 hours.

[5 marks]

m = _____

c = _____

T = _____

Question 5 continues on the next page

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5 (c) The company wants to change their design so that the candle will burn for exactly 24 hours.

The new candle has a taller lower part with the same diameter as before. The upper part does not change.

Both parts of the candle burn at the same rate as before.

Calculate the height of the new candle.

[3 marks]

Answer _____ cm

10

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6 Veronica posts an interesting video on Facebook.

The total number of views, N, at time t hours after the video was first viewed is modelled by

$$N = e^{0.6t}$$

6 (a) Work out the total number of views 15 hours after the video was first viewed.

[1 mark]

Answer _____

6 (b) Work out the value of t when the total number of views is 3000

[3 marks]

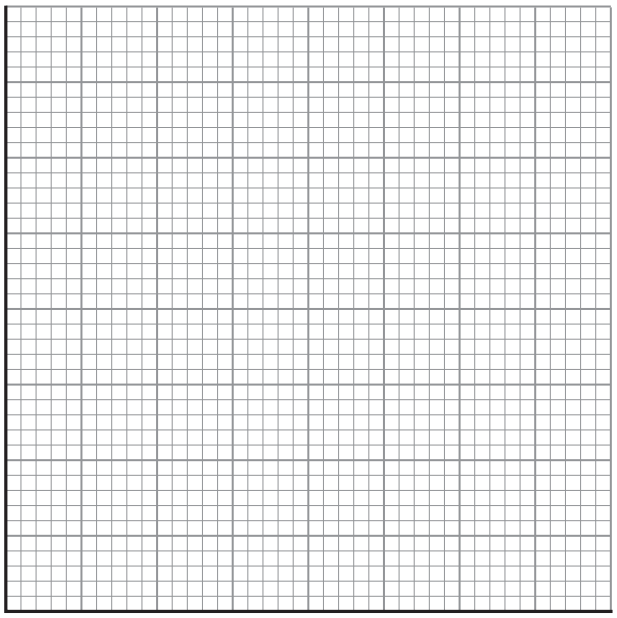
Answer _____

Question 6 continues on the next page

6 (c) Work out the rate at which the number of views was increasing 3 hours after the video was first viewed.
You may use the table and the grid below.

[4 marks]

t	0	1	2	3	4	5
N						



Answer _____

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6 (d) Work out the time taken for the number of views to double.

[5 marks]

Answer _____ hours

13

END OF QUESTIONS

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