

# Level 3 Certificate

## MATHEMATICAL STUDIES

### Paper 2C

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	
<b>Total</b>	

### 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.

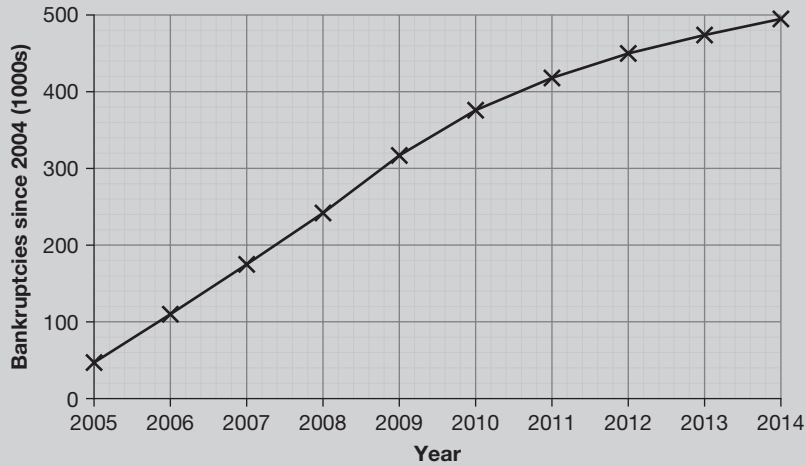
### Advice

- 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.

1

## UK bankruptcy rate continues to rise

This graph of cumulative bankruptcies since 2004 illustrates the total failure of this government's attempts to ease the hardships of thousands of working people.



a) In what way is this newspaper cutting misleading?

[2 marks]

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b) Suggest a sentence that a government spokesperson might write about this graph. Your sentence must involve numerical data from the graph.

[2 marks]

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**3** Use **Different perspectives!** on the Preliminary Material.

a) What emotive language is used in the newspaper extract?

[1 mark]

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b) In addition to the figures mentioned in the newspaper extract, the government will receive £6.2 billion in fees from RBS. Show how this leads to the figure given in the headline.

[2 marks]

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c) What reasons does George Osborne give for the decision he has taken?

[2 marks]

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d) Suppose that the price of RBS shares rises significantly after the government sells part of its stake. Write a brief, reasoned justification for which, if either, of George Osborne and the Daily Mirror were correct in their judgements.

[4 marks]

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e) What is the current **total** valuation of RBS's shares according to Rothschilds?

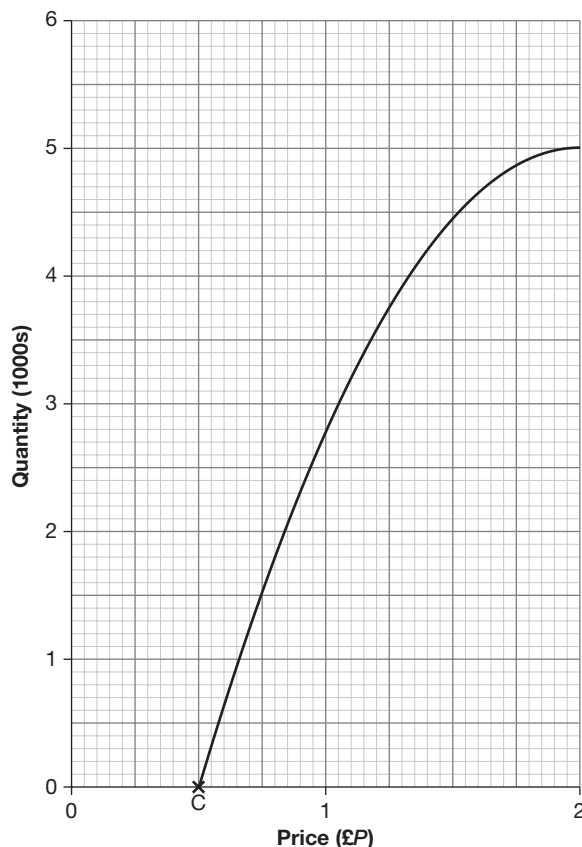
[2 marks]

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- 4 As shown on the graph, the price (£ $P$ ) of a punnet of strawberries affects the quantity (1000s) of punnets that local fruit farmers will supply each week to a group of market traders.



- a) Interpret point  $C$ , where the curve cuts the horizontal axis, in terms of the price of a punnet of strawberries and quantity supplied.

[2 marks]

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- b) By drawing a tangent to the curve, find the gradient of the curve at  $P = 1$ .

[3 marks]

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- c) Suppose that the price of a punnet is £1. What is the effect of increasing the price of a punnet by 1p?

[2 marks]

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- d) The quantity of punnets (in 1000s) that customers will buy from the traders is given by  $4 - 0.5P$ . At what price per punnet do supply and demand match exactly?

[3 marks]

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- 5 At time  $t$  seconds, the vertical velocity,  $v$  metres per second, of a paraglider may be modelled by the function

$$v = 2t - 13$$

for values of  $t$  from 0 to 11.

- a) Sketch a graph of  $v$  against  $t$ .

[2 marks]

- b) Describe the motion of the paraglider and sketch a graph of the height of the paraglider against  $t$  for this period of 11 seconds.

[5 marks]

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- c) Describe the acceleration of the paraglider during this period.

[2 marks]

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6 Some financial advisors use the 'rule of 70':

*If an investment grows at, say, 5% per annum then  
it will double in value in  $\frac{70}{5} = 14$  years.*

- a) Calculate the value of an investment of £1000 which earns 5% per annum for 14 years.  
Hence comment on the 'rule of 70' in this case.

[3 marks]

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b) A colony of bacteria is growing at 25% per day.

- i Applying the 'rule of 70' in this context, how many days will it take for the colony to double in size?

[2 marks]

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- ii Check the accuracy of the 'rule of 70' in this case.

[3 marks]

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7 Carbon-14 decays exponentially so that the proportion of the original amount remaining after  $t$  years is given by  $e^{-0.000121t}$ .

- a) Sketch the graph of  $y = e^{-0.000121t}$ . Show the coordinates of any points where the curve crosses an axis and comment on these points.

[4 marks]

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- b) What proportion remains after 5728 years?

[2 marks]

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- c) An Egyptian mummy is found to contain 70% of the original amount of carbon-14. What date would you estimate for this mummy?

[4 marks]

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- d) An alternative expression for the proportion of the original amount remaining after  $t$  years is given by  $2^{-kt}$ , where  $k$  is a constant. Find  $k$ .

**[3 marks]**

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