AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

Level 3 Certificate
MATHEMATICAL STUDIES

Paper 1

Wednesday 15 May 2019 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a clean copy of the Preliminary Material and 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 each question in the space 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.

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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

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There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

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

1 Jenny is carrying out a survey about cars passing her school.

1 (a) She records the colour of each car.

Circle the **two** words that describe the type of data she is collecting.

[2 marks]

quantitative secondary primary qualitative

1 (b) She records the year of registration of every 20th car that passes, starting with the first car that passes.

Explain why this is **not** a random sample.

[1 mark]

_____

_____

_____

3

Turn over for the next question

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Use **Student loans** from the Preliminary Material.

2 Andrew started university in September 2015 and took out a student loan.

He graduated from university in July 2018 and started work with an annual salary of £18 000

He receives a pay rise of 5% every January and an inflationary increase of 2% every April.

The spreadsheet shows some information about his salary.

	A	B	C
1	2018	July	18 000.00
2	2019	Jan	18 900.00
3	2019	April	19 278.00
4	2020	Jan	20 241.90
5	2020	April	
6	2021	Jan	
7	2021	April	

2 (a) Circle the formula that gives the correct value for cell C4

[1 mark]

=C3*1.02 =C3*1.05 =C3*1.2 =C3*1.5

2 (b) Complete the spreadsheet.

Give each value correct to the nearest penny.

[2 marks]

Do not write outside the box

2 (c) In which month and year will Andrew have to start paying back his student loan?

[1 mark]

Answer _____

2 (d) Work out Andrew's first **month's** student loan repayment.

[4 marks]

Answer £ _____

8

Turn over for the next question

3 A report has claimed that, due to streaming, modern technology is responsible for reducing the length of song introductions (intros).

Steven collected data from two different time periods, 1970 to 2000 and 2010 to 2018, to test this claim.

Length of intro in seconds	
1970 to 2000	**2010 to 2018**
120	20
78	10
65	14
65	18
52	9
32	22
50	23
20	12
68	6
41	14
39	19
56	15
72	10
59	15
61	16
87	23
48	15
62	21
27	28

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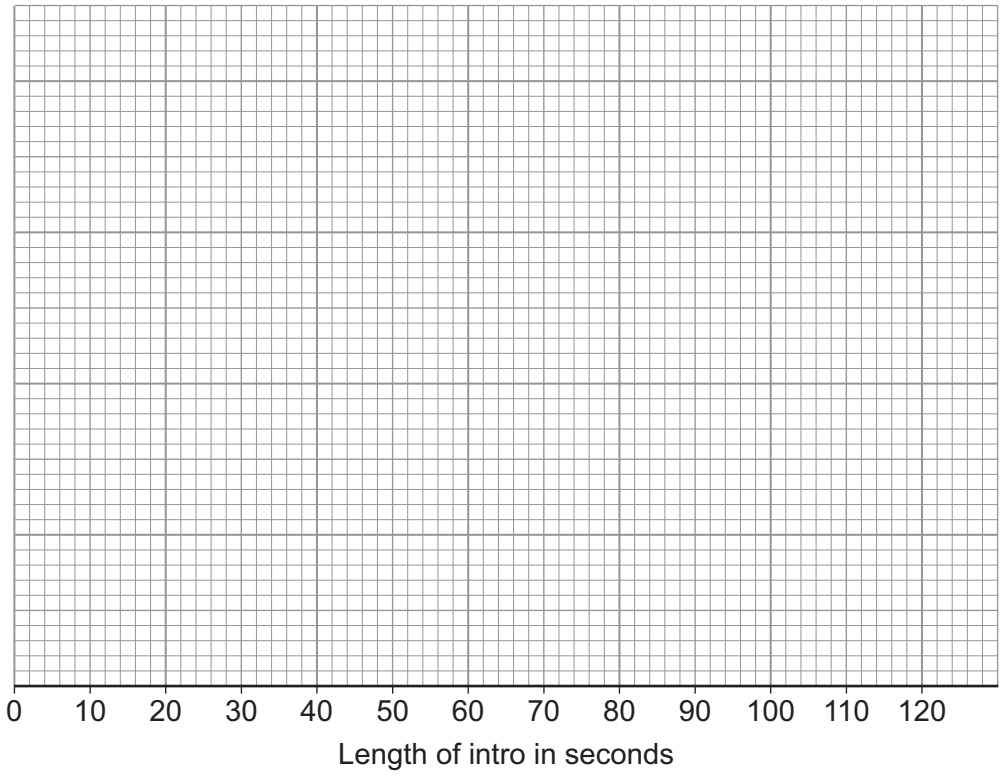
3 (a) Complete the table below to show the summary statistics for 1970 to 2000

[4 marks]

	Lowest value	Lower quartile	Median	Upper quartile	Highest value
1970 to 2000					
2010 to 2018	6	12	15	21	28

3 (b) Draw box and whisker plots on the grid below to represent the two sets of data.

[3 marks]



Question 3 continues on the next page

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3 (c) Make **two** comparisons of the lengths of song intros from the two sets of data.

[2 marks]

Comparison 1 _____

_____

_____

_____

Comparison 2 _____

_____

_____

_____

9

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4 Yasmin wants to save money for her newborn son to go to university when he is 18

She wants to invest some money in a savings account so he will have at least £20 000 in 18 years' time.

She opens a savings account at 5.5% compound interest per year for 18 years.

Work out the minimum amount she needs to invest.

[3 marks]

Answer £ _____

3

Turn over for the next question

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5 Estimate the total amount of time **per year** taken by **all** the students in an average year 10 class to get ready to go to school in the morning.

State any assumptions that you make.

You **must** show your working.

[4 marks]

Answer _____

4

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6 Mia has just bought a house for £230 000

Mia's house is expected to increase in price by 2.5% per year, correct to 2 significant figures.

Work out the minimum expected increase in the price of her house in 2 years' time.

[4 marks]

Answer £ _____

4

Turn over for the next question

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7 Use **Income Tax and National Insurance 2018–2019** from the Preliminary Material.

Mike is an engineer.

His salary is £42 500 per year.

He pays income tax and National Insurance but has no other deductions.

His net pay is £2690.07 per **month**.

Mike wants to buy a new house but can't afford the mortgage payments.

He says,

"If my net pay increased by £270 per month I could afford the mortgage payments."

Mike is promoted to supervisor.

His salary increases by £5250 per **year**.

Can he now afford the mortgage payments?

You **must** show your working.

[10 marks]

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10

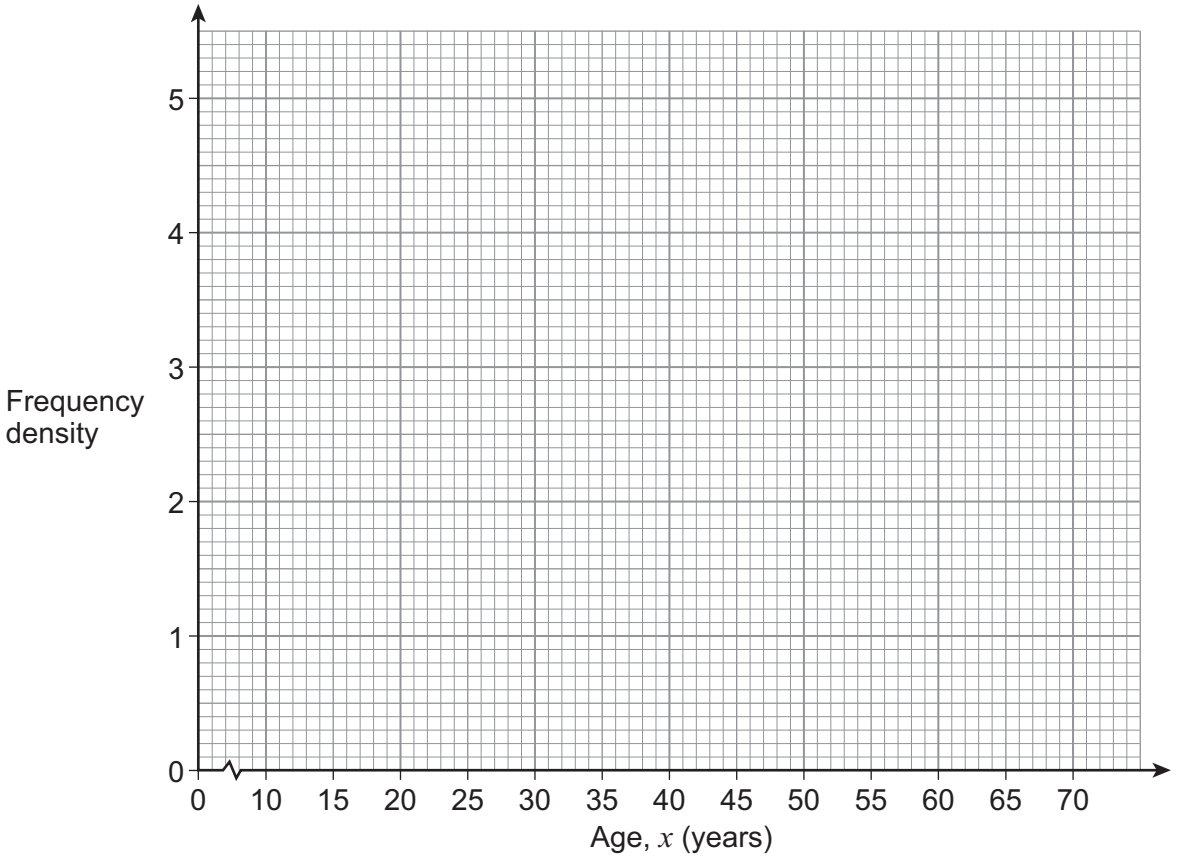
8 There are 120 applicants for a new television show.

The table shows information about their ages.

Age, x (years)	Frequency
$18 \leqslant x < 25$	14
$25 \leqslant x < 40$	36
$40 \leqslant x < 50$	48
$50 \leqslant x < 70$	22

8 (a) Draw a histogram to represent this information.

[2 marks]



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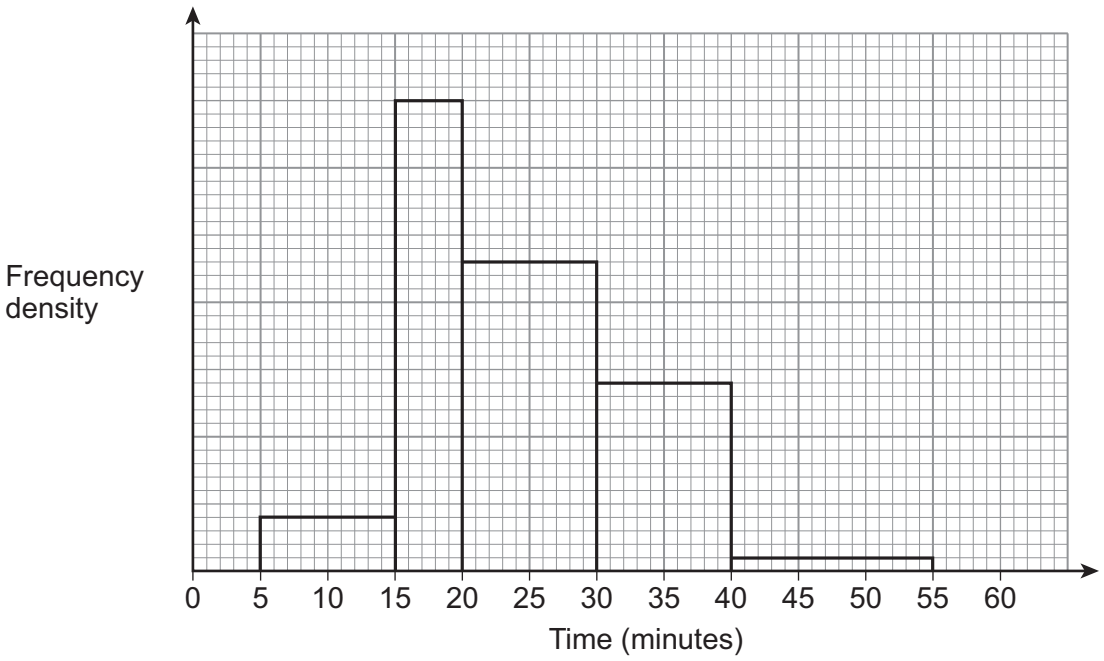
8 (b) The 120 applicants were all given a task to complete.

The histogram represents the times they took to complete the task.



Those applicants who completed the task in 18 minutes or less were selected for the show.

Estimate the number of applicants who were selected for the show.

[4 marks]

Answer _____

Question 8 continues on the next page

8 (c) The television manager wants to interview some of the applicants about their experience of doing the task.

Here is some more information about the applicants.

	Age, x (years)			
	$18 \leqslant x < 25$	**$25 \leqslant x < 40$**	**$40 \leqslant x < 50$**	**$50 \leqslant x < 70$**
Male	5	19	12	8
Female	9	17	36	14

The manager wants a sample of 50 applicants, stratified by age group and gender.

How many females from the age group $40 \leqslant x < 50$ should he select?

[2 marks]

Answer _____

8

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ANSWER IN THE SPACES PROVIDED

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9 (a) Use **Great Britain's motorways** from the Preliminary Material.

Here is a map of the M1 motorway.

The motorway has three lanes each way for just over half its length.

Nearly all of the remainder of the motorway is four lanes each way.

The distance from Northampton to Luton along the motorway is 36 miles.

The cost of resurfacing a motorway is £15 per square metre.

1 mile ≈ 1600 metres.

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Estimate the cost of resurfacing the whole of the M1 motorway.

Your estimate should include the hard shoulder.

State any assumptions you make.

You **must** show your working.

[10 marks]

Question 9 continues on the next page

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Answer £ _____

9 (b) Explain **how** your answer may have been affected by an assumption you made.

[1 mark]

11

END OF QUESTIONS