

| Please write clearly i | in block capitals. | |
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| Candidate signature | I declare this is my own work. | / |

Level 3 Certificate MATHEMATICAL STUDIES

Paper 1

Wednesday 17 May 2023 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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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 paper or graph paper, which must be tagged securely to this answer booklet.

| For Exam | iner's Use |
|----------|------------|
| Question | Mark |
| 1 | |
| 2 | |
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| 9 | |
| TOTAL | |



| Answer | all | questions | ın | the | spaces | provided |
|--------|-----|-----------|----|-----|--------|----------|

1 Rafiq and Ellen are doing surveys about favourite school lessons.

They each want to take a sample of 75 students from their school.

The table shows the number of students in each year group.

| Year 7 | Year 8 | Year 9 | Year 10 | Year 11 |
|--------|--------|--------|---------|---------|
| 216 | 203 | 163 | 174 | 144 |

| 1 | (a) | To get his sample | e of 75. Rafid | asks 15 stu | udents from eacl | h of the five v | ear groups. |
|---|-----|-------------------|------------------|----------------|---------------------|------------------|-------------|
| | (ω) | 10 got mo oampic | , or , o, i tain | a acino io cin | aaciilo iroiii oaci | i oi tilo livo y | our groups |

What is the name of this sampling method?

[1 mark]

| Answer | |
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| 1 (| b) | Give one advantage a | and one disadvantag | e of Rafic | a's samplind | method |
|-----|----|-----------------------------|----------------------------|------------|--------------|--------|
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Advantage_____

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| 1 (c) | Ellen decides that the number in her sample from each year group should be in proportion to the total number of students in that group. | ١ |
|-------|---|----------|
| | What is the name of this sampling method? | [1 mark] |
| | Answer | |
| (d) | There are 900 students in the school. | |
| | How many more Year 7 students than Year 11 students should Ellen have in her sample? | |
| | [| 2 marks] |
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| | Answer | |
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Turn over for the next question



- 2 Sally is planning a holiday in Canada.
- 2 (a) On 1 May 2020, Sally invested £2000 in this savings account.

High interest saver Invest at least £1000

1.5% compound interest per year

| 0 414 0000 1 1 | | |
|----------------------------------|--|------------|
| | the account and used all the money to buy Canadian | ı dollars. |
| The exchange rate was | £1 = 1.68 Canadian dollars | |
| Did Sally get more than 350 | 00 Canadian dollars? | |
| You must show your workin | ng. | |
| | [4 | l marks] |
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| 2 (b) | During the holiday, Sally bought a handbag for 190 Canadian dollars. | |
|-------|--|-----------|
| | She paid with her bank debit card. | |
| | The bank | |
| | added a fee of 2.5% of the cost of the handbag | |
| | used an exchange rate of £1 = 1.75 Canadian dollars. | |
| | Work out the total amount, in pounds, that Sally had to pay. | |
| | | [3 marks] |
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| | Answer £ | |

Turn over for the next question



3 Mr Berry wants his class to study some data on swimming times.

He collects data from the Internet about two swimming strokes, backstroke and breaststroke.

The table shows the fastest 19 times, in seconds, for the men's 100 m Backstroke at a major championship.

| Swimmer | Α | В | С | D | E | F | G | Н | I | J |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Time (s) | 51.85 | 51.94 | 52.38 | 52.54 | 52.91 | 52.98 | 53.17 | 53.45 | 53.60 | 53.86 |
| Swimmer | K | L | М | N | 0 | Р | Q | R | S | |
| Time (s) | 53.93 | 54.51 | 54.91 | 54.95 | 55.00 | 55.16 | 55.17 | 55.19 | 55.38 | |

3 (a) Which two words describe the type of data he has collected?Circle your answers.

[1 mark]

qualitative primary quantitative secondary

3 (b) The table below shows information about the fastest 19 times for the men's 100 m Breaststroke in the same championship.

| | Lowest value | Lower quartile | Median | Upper quartile | Highest value |
|--------------|--------------|----------------|--------|-------------------|---------------|
| Breaststroke | 49.45 | 50.12 | 51.76 | 52.32 | 53.44 |
| Backstroke | 51.85 | | | | 55.38 |

Complete this table to show the information for the backstroke.

The lowest and highest values have been completed for you.

[3 marks]



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| 49 | 49.5 5 | 50.5 | 51 5 | 51.5 52 | 52.5 53 | 53.5 | 54 54 | .5 55 | 5 |
| Averages | 8 | | | | | | | | [2 |
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| Use Student Loans in the Preliminary Material. |
|--|
| Anya left university in 2010 In January 2023, she decides to repay the rest of her student loan in one year. The SLC will continue to take the usual repayments each month from her salary. Anya wants to make 12 equal additional monthly payments to pay off the loan. Anya's salary is £45000 per year. The SLC tells Anya she needs to repay £2705 in total in 2023 to pay off the loan. |
| Work out the additional monthly payment she must make to pay off the loan in 12 months. |
| [4 marks] |
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| 6 (a) | Use Christmas Trees in the Preliminary Material. | | | | | | | | |
|-------|--|--|--|--|--|--|--|--|--|
| | During 2023, tree growers will plant seedlings to replace trees sold at Christmas 2022 and allow for growth in demand. | | | | | | | | |
| | They will plan for the trees to have time to grow to a height of 6 feet before cutting them. | | | | | | | | |
| | Estimate the total number of acres of land needed to be newly planted with Nordn firs in 2023 in the UK | | | | | | | | |
| | Use 1 acre = 43 560 square feet | | | | | | | | |
| | State any assumptions you make. | | | | | | | | |
| | You must show your working. [8 marks] | | | | | | | | |
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| 6 (b) | Explain how your answer may have been affected by one assumption you made. | mark] |
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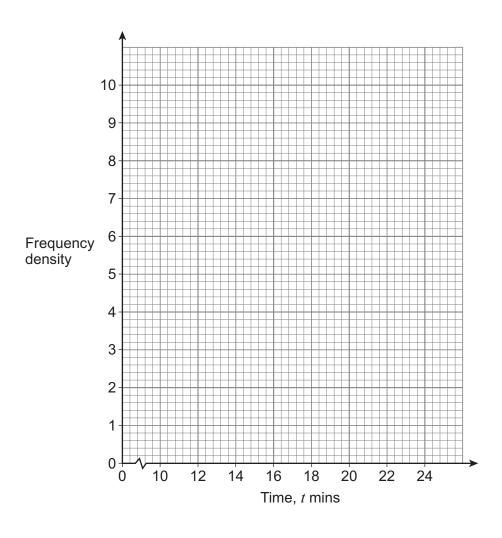
7 The members of a running club are divided into two teams for a race.

The table shows information about the times taken to complete the race by the 40 members of Team A.

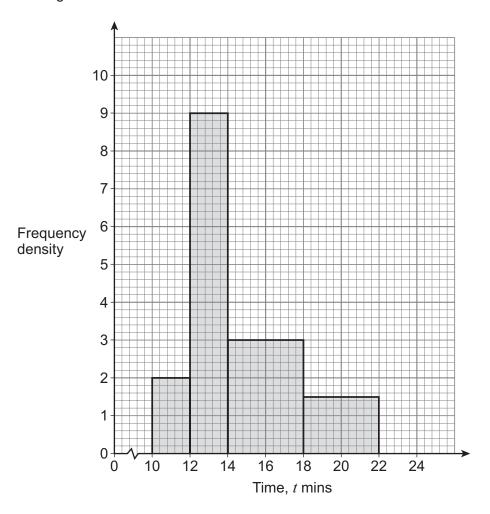
| Time, t mins | Frequency |
|--------------------|-----------|
| 10 ≤ <i>t</i> < 12 | 8 |
| 12 ≤ <i>t</i> < 14 | 17 |
| 14 ≤ <i>t</i> < 20 | 12 |
| 20 ≤ <i>t</i> < 24 | 3 |

7 (a) Draw a histogram to represent the data for Team A.

[3 marks]



7 (b) This histogram shows information about the times for the 40 members of Team B.



The runners from each team who completed the race in 15 minutes or less qualified for a competition.

Use the graph and data to estimate which team had more members who qualified. You **must** show your working.

[5 marks]

Answer

Turn over ▶

8



| Use Income Tax and National Insurance 2022–2023 from the Preliminary Material. | |
|--|--|
| Julian has an annual salary of £58 000 | |
| He pays income tax and National Insurance but has no other deductions. | |
| Budget advice is to spend a maximum of 30% of your net income on rent. | |
| Julian spends £1000 per month of his net income on rent. | |
| He says, | |
| "This fits within the budget advice." | |
| Is he correct? | |
| You must show your working. [9 marks] | |
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| Arzoo wants to | b borrow money to buy a new car. | outs |
|----------------------|--|------|
| Two companie | es offer loans. | |
| | nominal interest rate of 9% with the interest calculated annually. nominal interest rate of 8.75% with the interest calculated monthly. | |
| Which compan | ny offers the best Annual Equivalent Rate (AER)? | |
| You must show | w your working. [4 marks] | |
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END OF QUESTIONS



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