MARKS | DO NOT WRITE IN THIS MARGIN

Total marks — 65

Attempt ALL questions

1. David took out a personal loan for £3000 on 1 July 2025.
He will start making repayments on 1 July 2026.
The effective rates of interest for the personal loan are as follows:

Dates	Interest rate
1 July 2025 to 30 September 2025	7.3% per **year**
1 October 2025 to 28 February 2026	7.9% per **year**
1 March 2026 to 30 June 2026	0.67% per **month**

Calculate the accumulated balance of David's loan on 30 June 2026. **3**

MARKS | DO NOT WRITE IN THIS MARGIN

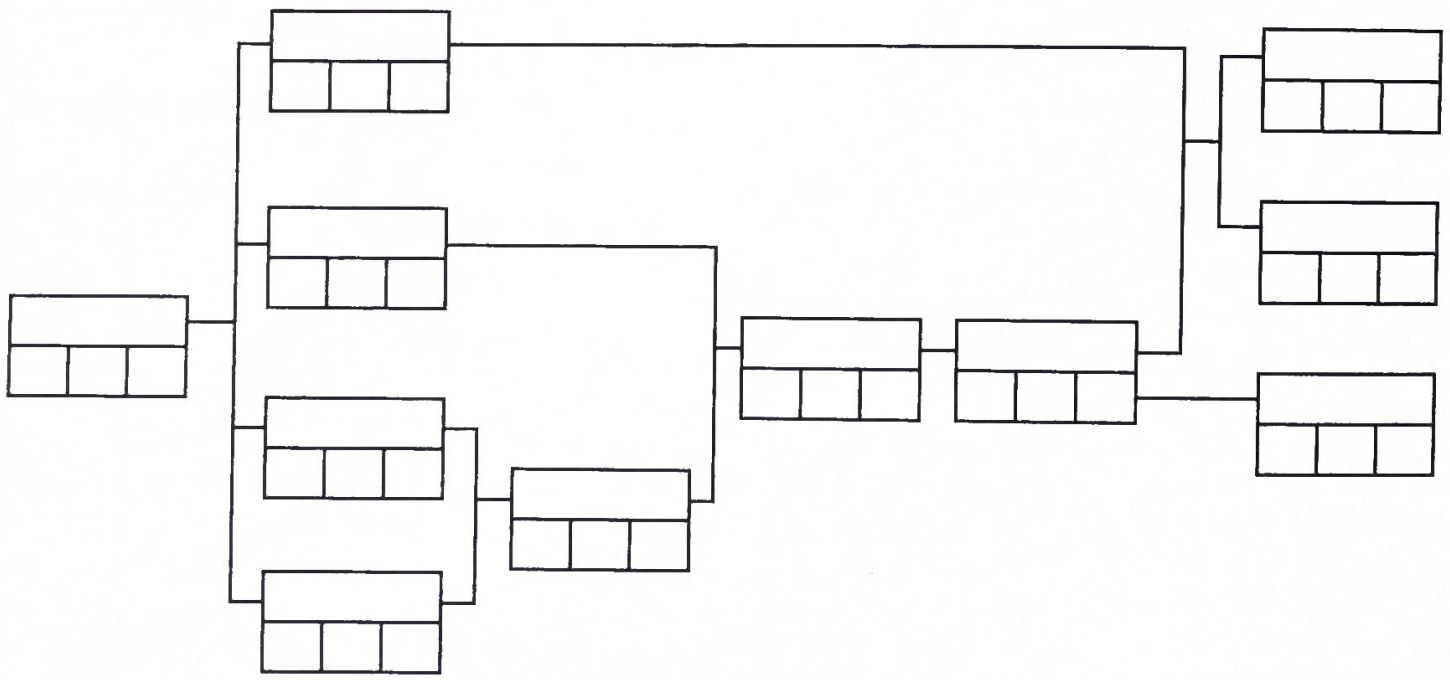
2. A company is repairing a house after a flood.

The table shows the list of tasks required to complete the house repairs, the time required for each task, and the order in which the tasks are to be completed.

Task	Description	Preceding task(s)	Duration (days)
A	Electrical safety tests	None	1
B	Remove damaged kitchen	A	3
C	Dry out house	A	21
D	Order and deliver new kitchen and bathroom	A	16
E	Remove damaged bathroom	A	1
F	Remove damaged floors	B, E	2
G	Replace the floors	C, F	3
H	Plaster the walls	G	4
I	Paint and decorate walls	H	3
J	Reinstate bathroom	D, H	2
K	Reinstate kitchen	D, H	3

(a) Complete the PERT chart showing the duration, the earliest start time and the latest completion time for each task. **5**

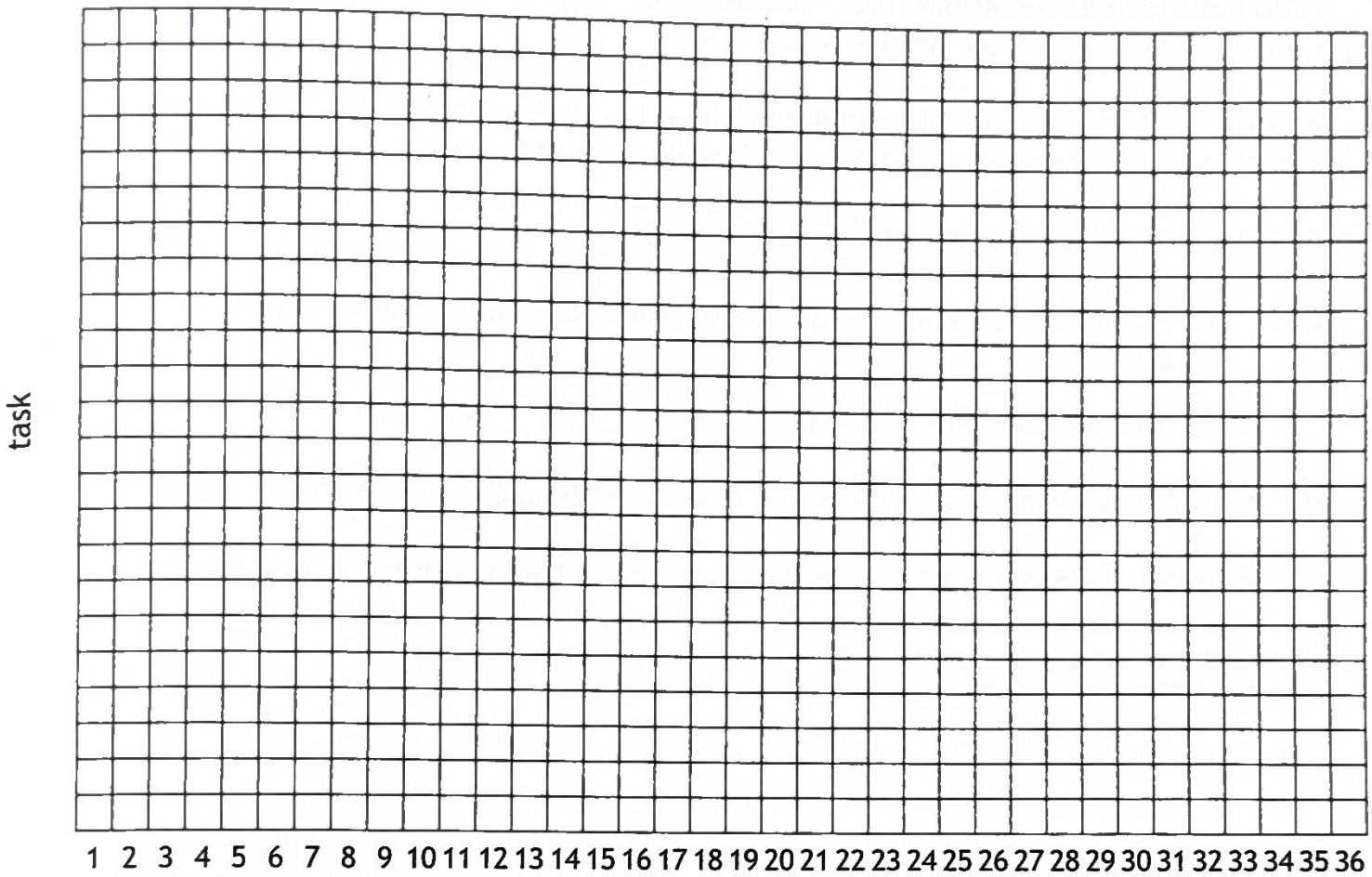
(An additional diagram, if required, can be found on *page 20*.)



MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(b) Construct a Gantt chart, without float times, for the house repairs. **3**
(An additional grid, if required, can be found on *page 20*.)



(c) State the float time to reinstate the bathroom (Task J). **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

3. You must refer to the spreadsheet file 'Q3 Tyres.csv' for the data, and the word processing file 'Q3 Tyres Answers.docx' when answering this question.

You must complete parts (a), (b) (i), (c) and (d) using appropriate statistical software.

You must include all output from statistical software, and your answers in the word processing file 'Q3 Tyres Answers.docx'.

A tyre manufacturer has collected data to investigate the relationship between the stopping distance (metres) and the tread depth (millimetres) of a new type of tyre.

(a) Construct a scatter plot of stopping distance on tread depth. **1**

(b) (i) Find the correlation coefficient between stopping distance and tread depth. **1**

(ii) Interpret the correlation coefficient. **1**

(c) Find the equation of the regression line of stopping distance on tread depth. **2**

(d) Estimate the stopping distance for a tyre with a tread depth of 6.2 millimetres. **2**

Print the word processing file 'Q3 Tyres Answers.docx'

MARKS | DO NOT WRITE IN THIS MARGIN

4. As part of a recruitment process to become a firefighter, candidates must complete a verbal reasoning test and a numerical reasoning test.

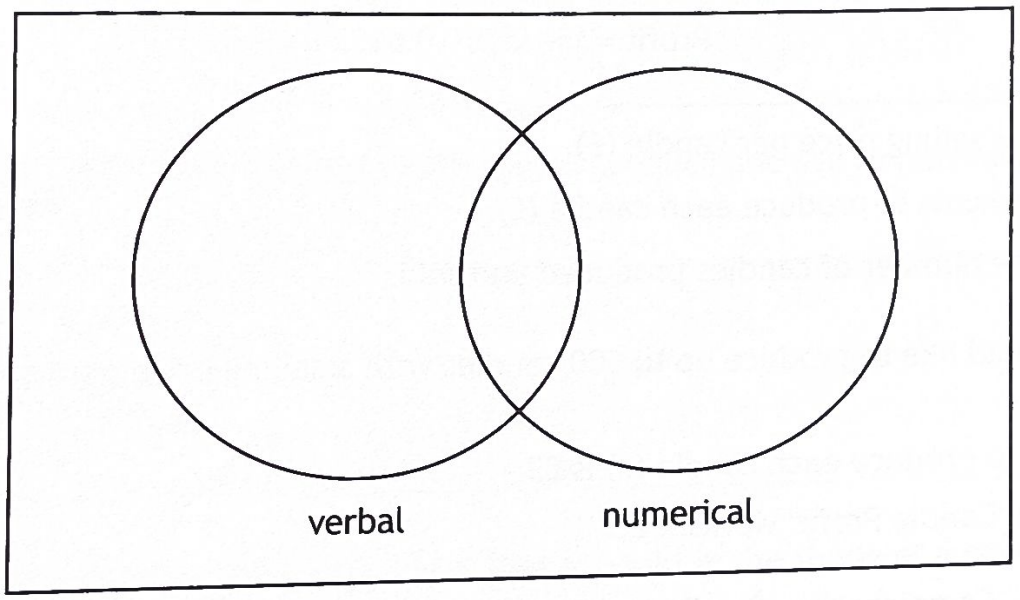
One day, a group of 140 candidates sat both tests.

The results were as follows:

- 87 passed the verbal reasoning test
- 75 passed the numerical reasoning test
- 42 passed both tests.

(a) Complete the Venn diagram to show this information. 2

(An additional diagram, if required, can be found on *page 21*.)



One candidate is chosen at random from this group.

(b) Calculate the probability that this candidate passed only one of the tests. 1

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

5. You must refer to the spreadsheet file 'Q5 Profit Function.xlsx' when answering this question.

You must complete parts (a) (i) and (a) (ii) using the spreadsheet file.

Parts (b) (i), (b) (ii) and (b) (iii) must be completed in the answer space provided.

Claire owns a small business producing and selling wax candles.

She wants to introduce a new scent for summer.

Claire's total profit is affected by more than just the selling price per candle and cost to produce each candle. As production increases, the cost of storage, distribution and promotions reduces the total profit.

She uses the following Profit Function model to calculate her profit:

$$\text{Profit} = (s - c)x - 0.015x^2$$

- s is the selling price per candle (£).
- c is the cost to produce each candle (£).
- x is the number of candles produced and sold.

Claire would like to produce up to 500 candles with a selling price per candle (s) of £9.

The cost to produce each candle (c) is £3.

Open the 'Candle Profit' worksheet.

(a) (i) Complete the 'Candle Profit' worksheet to model how Claire's profit will change as the number of candles (x) increases from 0 to 500. **3**

(ii) Construct an appropriate graph to model Claire's profit. **2**

5. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

(b) (i) State the type of model Claire is using. 1

(ii) Explain what the graph shows when Claire produces and sells more than 400 candles. 1

(iii) State how many candles Claire should produce and sell to maximise her profit. 1

To produce each candle, Claire pours wax into a mould in the shape of a cuboid.

Each mould has a length of exactly 3 centimetres and a breadth of exactly 4 centimetres.

Claire pours the wax to a height of 7 centimetres with a relative error of 2%.

(c) Calculate the absolute error of the volume of the candle. 2

Print the 'Candle Profit' worksheet in value view and formula view.

Ensure the graph is positioned beside the table and is contained on one page in the printout.

MARKS | DO NOT WRITE IN THIS MARGIN

6. Natasha opens a savings account.

The **annual** effective rate of interest for this savings account is 1.5%.

Interest is paid at the end of each month.

(a) Calculate the monthly effective rate of interest. 1

Natasha will make an initial deposit of £1000 into this savings account on the first day of July.

One month later, and every month after that, she will deposit £150 on the first day of each month.

(b) Complete the savings schedule to calculate Natasha's savings account balance immediately after making her second deposit. 2

Time (months)	Interest earned (£)	Deposit (£)	Balance (£)
0			1000
1			
2			

Space for working if required

MARKS | DO NOT WRITE IN THIS MARGIN

7. A university student wants to answer the following research question:

'Is there a significant difference in the mean time taken to run 100 metres between pupils aged 10 and pupils aged 12?'

The university student selects a random sample of pupils aged 10 and 12.

They then record how long each pupil takes to run 100 metres.

(a) (i) State an appropriate hypothesis test to investigate the research question. **1**

(ii) State the null and alternative hypotheses. **1**

The hypothesis test was performed and generated a p-value of 0.072.

(b) Interpret the p-value, and the result of the hypothesis test, in context. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

8. You must refer to the information on 'Deductions from salaries' and 'Mortgage products and affordability' given in the pre-release material when answering this question.

You must refer to the spreadsheet file 'Q8 Janet's Mortgage.xlsx' when answering this question.

You must complete part (b) using the spreadsheet file.

Parts (a) and (c) must be completed in the answer space provided.

Janet's gross annual salary is £32,100.

She contributes 3% of her salary before tax into her pension fund.

Janet pays £130.16 in National Insurance each month.

(a) Calculate Janet's net monthly income. **4**

8. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

Janet is applying for a mortgage of £98,000.

Level repayments would be made at the end of every month.

The fixed annual effective rate of interest would be 5.4% for the first two years.

Janet would like her mortgage balance to be **no more than £93,000** at the end of the fixed rate period so that she can reduce her loan-to-value ratio.

Open the 'Mortgage' worksheet.

(b) Complete the 'Mortgage repayment schedule' to determine the minimum level monthly repayment amount required. **4**

(c) Determine whether Janet's mortgage lender would consider this amount affordable. **1**

Give a reason for your answer.

Print the 'Mortgage' worksheet in value view and formula view.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

9. A company has won a contract to manufacture and deliver flooring to a new housing development.

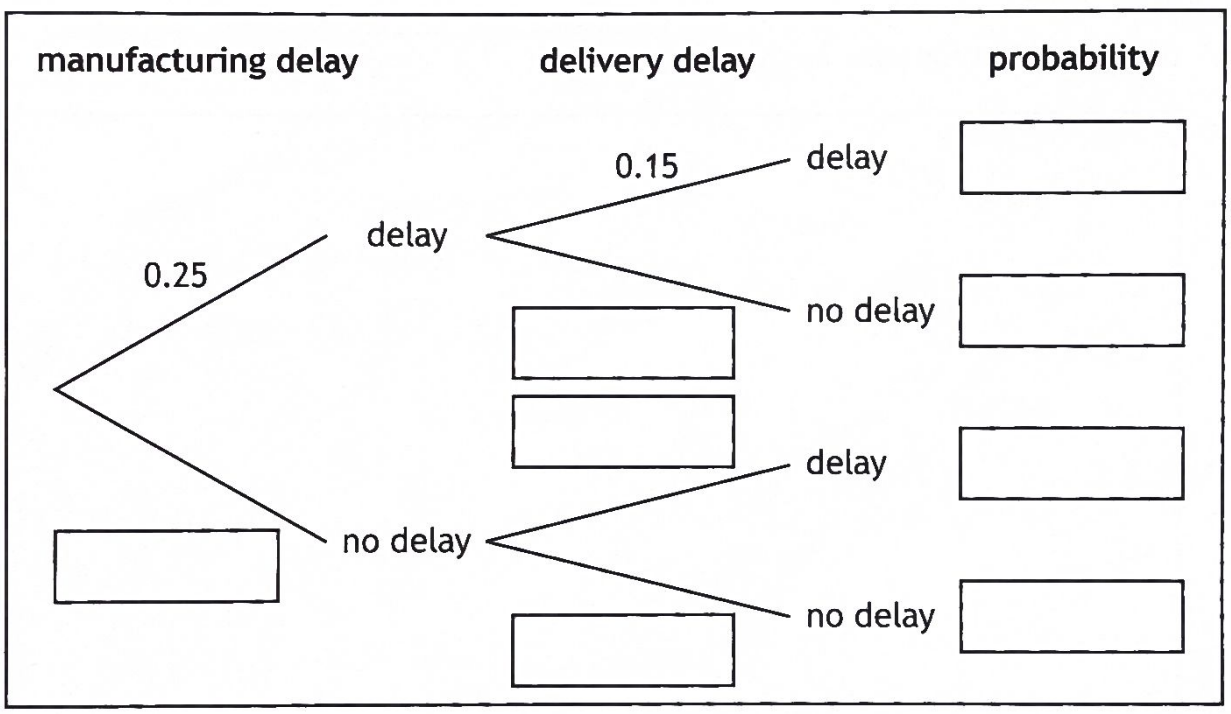
If they fail to supply the flooring on time, they will have to pay a penalty of £120,000.

Two reasons for a possible delay have been identified:

- Manufacturing delay — there is a 0.25 probability that there is a delay in the manufacture of the flooring.
- Delivery delay — there is a 0.15 probability that there is a delay while the company deliver the flooring.

(a) (i) Calculate the missing probabilities and complete the tree diagram. **2**

(An additional diagram, if required, can be found on *page 21*.)



(ii) Determine the probability that one or both of these delays will happen. **1**

(iii) Hence, calculate the expected cost of a delay. **1**

MARKS | DO NOT WRITE IN THIS MARGIN

9. **(continued)**

The company is considering using the following control measures:

- Control measure 1 — hire additional staff to help manufacture the flooring at an additional cost of £20,000.
- Control measure 2 — hire an external delivery company to help deliver the flooring at a cost of £12,500.

(b) Calculate the expected cost of delay using:

(i) only control measure 1 — **1**

(ii) only control measure 2. — **1**

The company decides to use both control measures.

(c) Based on your calculations, explain why the company decided to use both control measures. — **1**

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

10. Deirdre bought a van using a finance deal. As part of the deal, she must make a final lump sum payment.

The lump sum payment of £8175 is due in three years' time.

To budget for this payment, Deirdre will make a single deposit into a savings account with an annual effective rate of interest of 7.1%.

(a) Calculate the minimum amount Deirdre must deposit to ensure she has accumulated at least £8175 when the lump sum payment is due. **2**

In June 2021, when Deirdre bought the van, the Consumer Price Index (CPI) was 111.4.

After three years, the CPI was 133.0.

(b) Determine whether Deirdre's savings have increased at least in line with inflation. Give a reason for your answer. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

10. (continued)

Deirdre's insurance policy has a £195 excess for accidental damage.

Her van door is damaged in an accident.

A company has quoted £210 to repair the damage.

(c) Give one reason why Deirdre might not choose to make a claim on her insurance. 1

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

11. You must refer to the information on 'Honeybees' given in the pre-release material when answering this question.

Each year the National Hive Count takes place. During the count, all UK beekeepers are asked to submit the number of honeybee hives they own.

The following data was collected:

Year	Number of honeybee hives
2019	264 000
2020	260 000
2021	272 631
2022	288 311

(a) State one reason why the data might misrepresent the number of honeybee hives in the UK. **1**

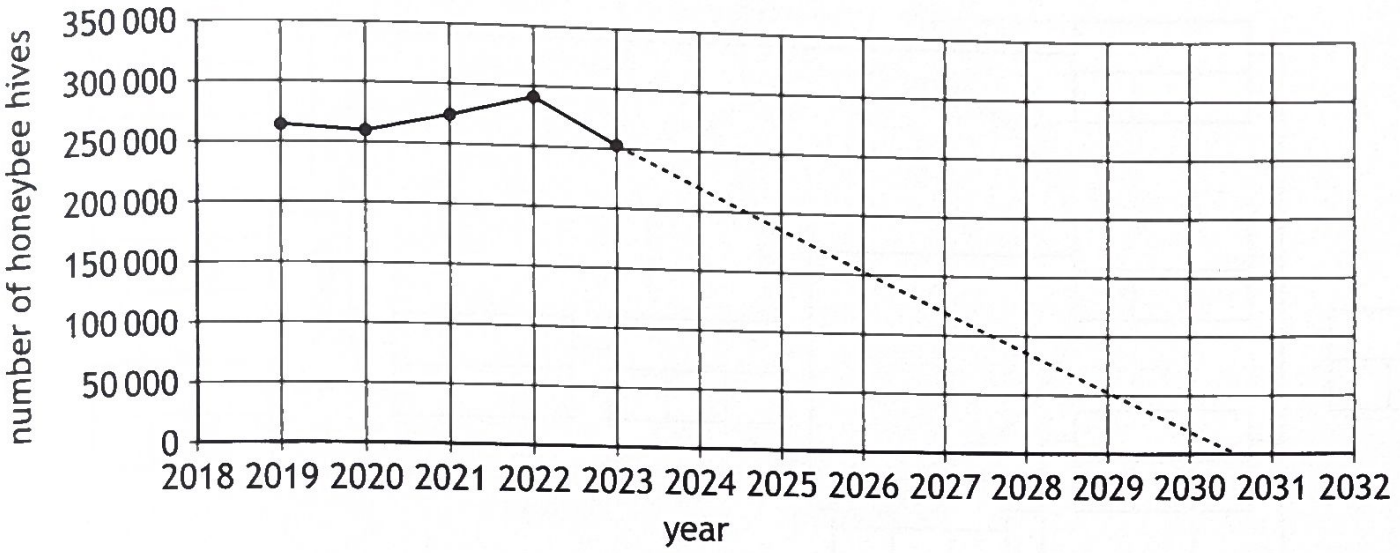
11. (continued)

MARKS | DO NOT WRITE IN THIS MARGIN

From 2022 to 2023 there was a decline of approximately 36 000 beehives.

A newspaper published this graph with the headline:

'NO honeybees in UK by 2031!'



(b) Explain why the headline may be unrealistic. **1**

It takes approximately 17 000 honeybees one month to produce one jar of honey.

(c) Estimate the **weight** of honey produced in the UK in 2022.

State any assumptions you have made. **3**

[END OF QUESTION PAPER]

X844760119