Surname	Centre number	Candidate number
First name(s)		0

GCSE

3320U30-1

Mathematics and Numeracy (Double Award)
Unit 3: Calculator-allowed
Higher Tier

2 hours

SAMPLE ASSESSMENT MATERIALS

Additional materials

The use of a calculator will be required for this examination.

A ruler, a protractor and a pair of compasses may be required.

Instructions to candidates

Use black ink or black ball-point pen. Do **not** use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided at the top of this page.

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

If you need more space, use the additional page(s) at the back of this booklet. Number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

Information for candidates

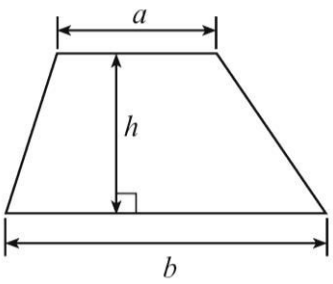
The number of marks is given in brackets at the end of each question or part-question.

In question 2(b) and 4(e), the assessment will take into account the quality of your mathematical organisation, communication and accuracy in writing.

For examiner's use only		
Question	**Maximum mark**	**Mark awarded**
1.	5	
2.	7	
3.	4	
4.	10	
5.	5	
6.	3	
7.	4	
8.	5	
9.	5	
10.	3	
11.	7	
12.	3	
13.	3	
14.	7	
15.	3	
16.	3	
17.	7	
18.	6	
Total	**90**	

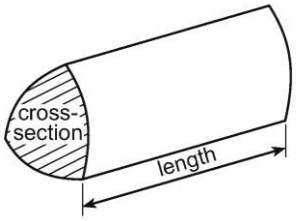
Formula List – Unit 3 Higher Tier

Area of a trapezium = $\frac{1}{2}(a+b)h$



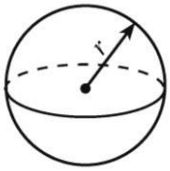
Volume of an Object with a Uniform Cross-section (e.g. Prism, Cylinder)

Volume = area of cross section × length



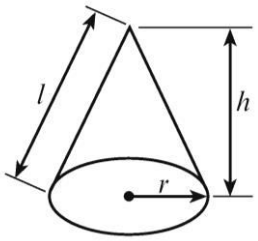
Volume of a sphere $= \frac{4}{3}\pi r^3$

Surface area of a sphere $= 4\pi r^2$



Volume of a cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of a cone $= \pi rl$

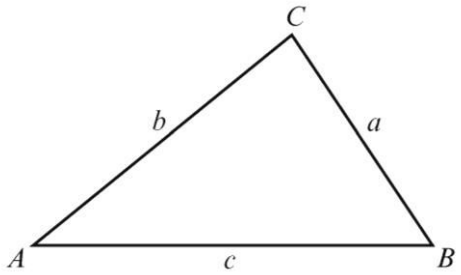


In any triangle ABC,

Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Answer **all** questions.

Examiner only

1. The diagram below shows a rectangle with length $(3x - 1)$ cm and width $(2x - 5)$ cm.

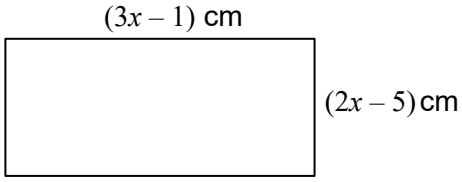


Diagram not drawn to scale

(a) Form an expression, in terms of x, for the perimeter of this rectangle. [2]
You must simplify your expression.

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(b) The perimeter of the rectangle is 48 cm.

Form an equation, in terms of x.
Solve your equation to find the value of x.
You must show all your working. [3]

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2. (a) A map of Wales and part of the Republic of Ireland is shown below. [3]

Examiner only

The village of Courtown in the Republic of Ireland is on a bearing of:

- 260° from Pwllheli and
- 310° from Fishguard.

Mark the position of Courtown on the map with a cross, X.

Examiner only

(b) *In this part of the question, you will be assessed on the quality of your organisation and communication.*

The map has a scale of 1 : 2 000 000.
Issa measures the distance between Fishguard to Courtown to be 5.6 cm on this map.

What distance does this represent in **kilometres**? [3 + 1 OC]
You must show all your working.

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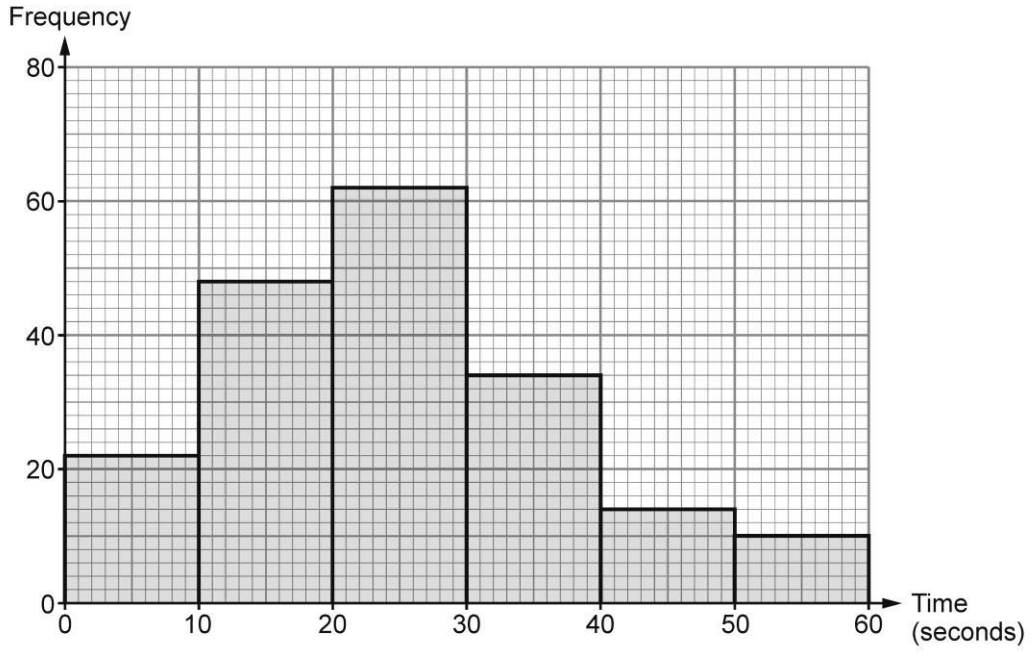
3. Mali works in a call centre. [4]

Examiner only

The frequency diagram below shows the time it took Mali to answer each call she received on Tuesday.

On Tuesday, she answered all the calls within 60 seconds.



Mali said,

'I answered 80% of the calls received on Tuesday within 30 seconds or less.'

Is Mali correct?

Yes ☐ No ☐

You must show working to support your answer.

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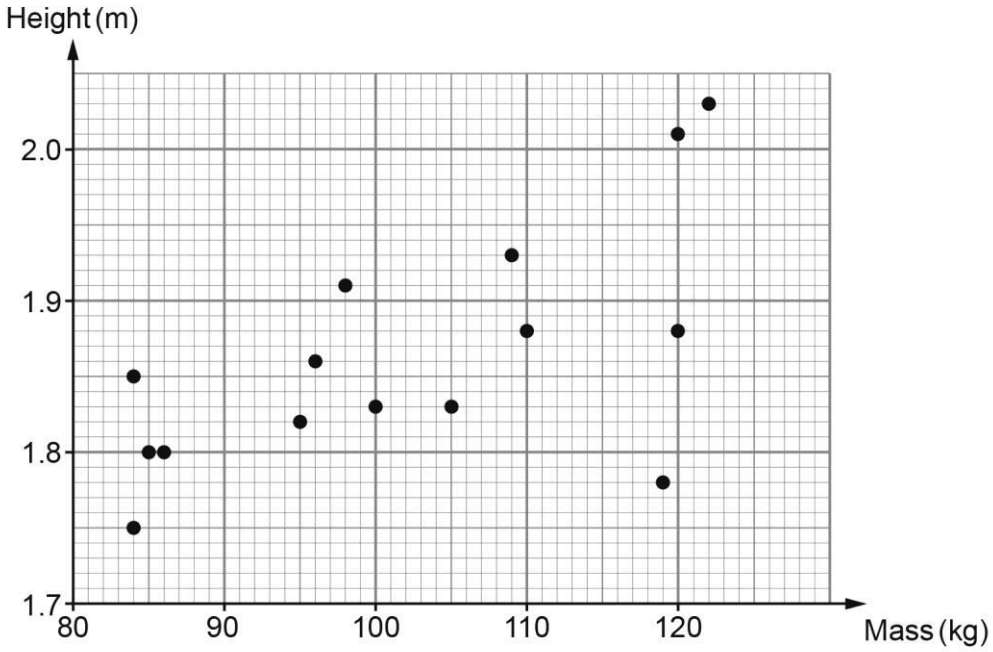
Examiner only

4. A rugby team consists of 15 players.
The Welsh rugby team played the Irish rugby team in February 2024.

The scatter diagram below shows the height and mass of each of the 15 Welsh players who started the game against Ireland.



(a) Two of the players, each with a mass greater than 90 kg, have the same mass. [2]

Find the difference between the heights of these two players.
Give your answer in centimetres.

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(b) Siôn believes the scatter diagram shows that there is a positive correlation between the height and mass of the 15 Welsh players.

(i) Explain what this means in the context of the scatter diagram. [1]

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(ii) Siôn's friend, Harri, looks at the scatter diagram and says; [1]

Examiner only

'One player's height and mass don't follow the same pattern as for the rest of the players'.

Write the height and mass of this player.

Height = ……m Mass = ……kg

(c) Draw a line of best fit on the scatter diagram. [1]

(d) Explain why it may not be appropriate to use your line of best fit to estimate the height of a rugby player with a mass of 125 kg. [1]

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(e) *In this part of the question, you will be assessed on the quality of your accuracy in writing.*

In a rugby team:

- 8 players are called forwards
- 7 players are called backs.

The mean mass of the 8 Irish forwards players who started the game against Wales was 113.25 kg.

The mean mass of the 7 Irish backs who started this game was 94.86 kg.

Find the mean mass of all 15 Irish players.
You must show all your working. [3 + 1W]

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5. The area of triangle *PQR*, shown in the diagram below, is 36 cm^2. [5]

Examiner only

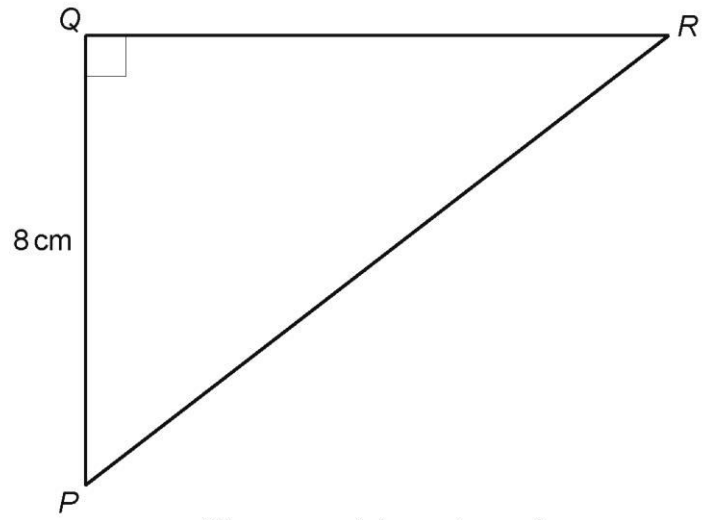

Diagram not drawn to scale

Calculate the length of *PR*.

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Examiner only

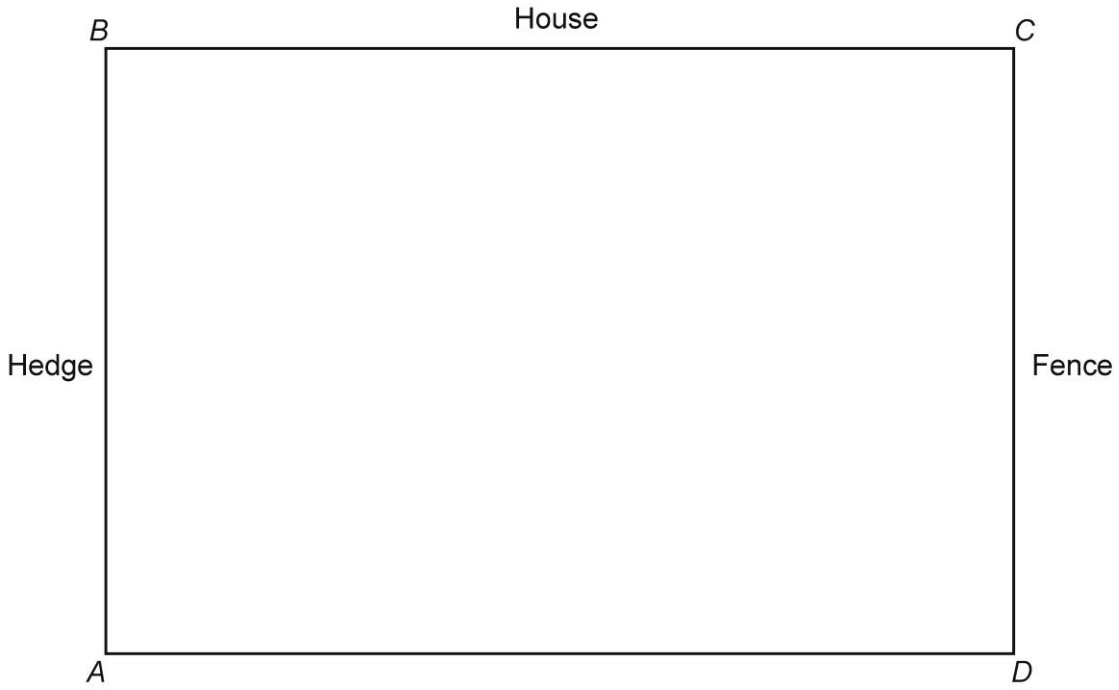
6. The scale diagram below shows a plan view of Gruff's garden.
The scale used is **1 cm represents 1 metre.**

Gruff's house is along the side *BC*.
There is a hedge along *AB*.
There is a fence along *CD*.

Gruff wants to plant a tree in the garden.

The tree must be
- nearer to the fence than the house
- less than 7 metres from the corner *A*.

Draw suitable lines on the diagram and shade the region where the tree could be planted. [3]



7. A solid metal cylinder has a radius of 2.3 cm and a height of 5 cm. [4]

Examiner only

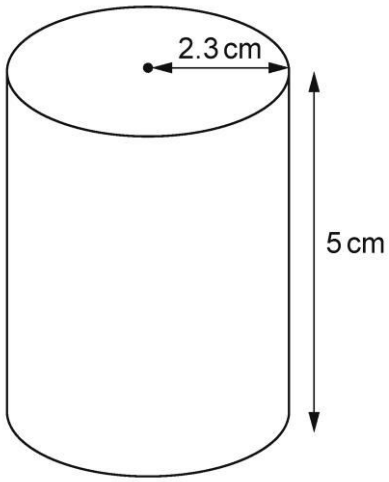


Diagram not drawn to scale

The mass of the cylinder is 423.1 g.
Find the density of the metal.
Give your answer in g/cm^3.

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Examiner only

8. Olivia sells electric cars.

She researched the distance that different makes of electric car can travel on a single charge.

The results are shown in the grouped frequency table below.

Distance, x (miles)	Frequency
$50 \leq x \leq 150$	23
$150 < x \leq 250$	84
$250 < x \leq 350$	116
$350 < x \leq 450$	28

(a) Which is the modal group? [1]

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(b) Hassan sees an electric car that he wants to buy. [4]

The distance this car can travel on a single charge is estimated to be 290 miles.

Olivia says,

'This car is a good choice, as 290 miles is greater than the estimated mean distance for the cars that I researched'.

Show that Olivia is correct.
You must show all your working.

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9. The diagram below shows a semicircle, with radius r, drawn inside a trapezium. [5]

Examiner only

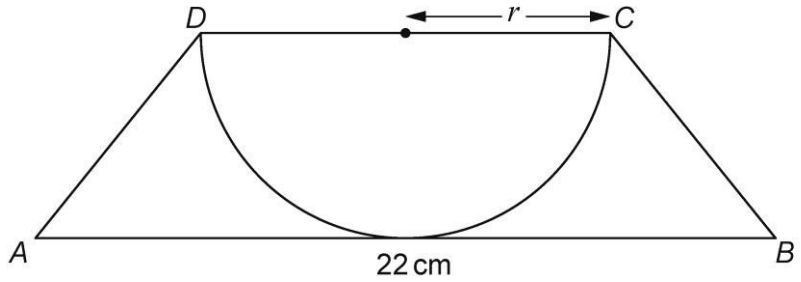

Diagram not drawn to scale

The area of the semicircle is 113.5 cm^2.
The semicircle touches the line *AB*.
AB = 22 cm.
Calculate the area of the trapezium *ABCD*.

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10. [3]

Examiner only

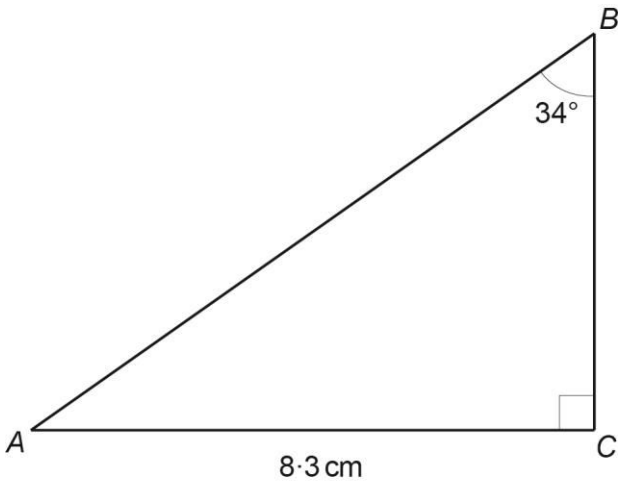

Diagram not drawn to scale

Calculate the length of the side *AB.*

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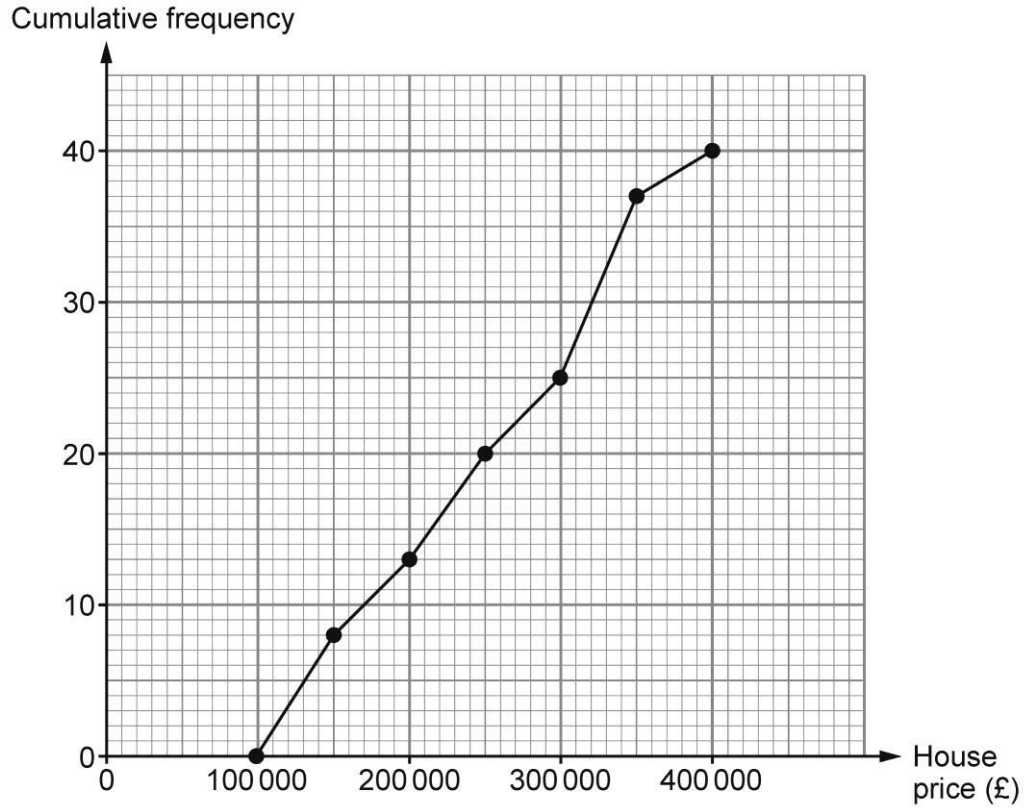
Examiner only

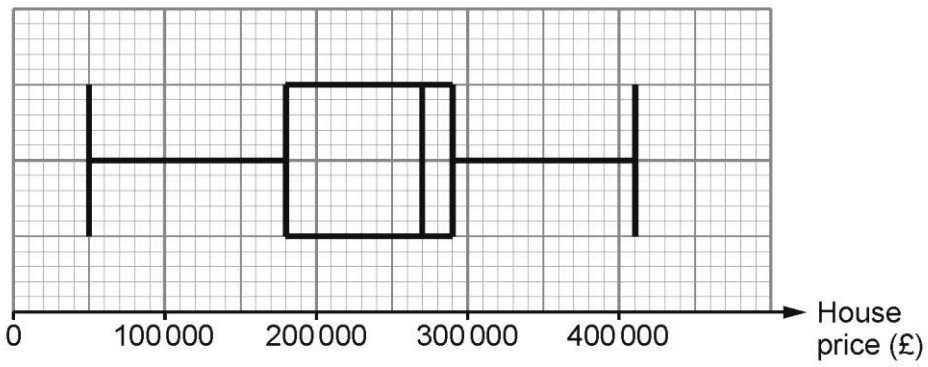
11. The cumulative frequency diagram shows the house prices of all 40 houses in the village of Abergwyn in February 2024.

The lowest house price in the village was £110 000.

The highest house price in the village was £390 000.



The box-and-whisker diagram shows the house prices of all 50 houses in the village of Caermaes in February 2024.



(a) Complete the table below, giving the best estimate for each entry. [4]

Examiner only

	Median	Interquartile range
Abergwyn	……	……
Caermaes	……	£110 000

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(b) Compare the house prices in both villages **using the data you completed in the table in part (a).** [1]

Which village do you think has the highest **average** house prices?

Abergwyn ☐ Caermaes ☐ Can't tell ☐

You must give a reason for your answer.

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(c) A local Estate Agent predicts that there will be a 1.2% increase in the median house prices in **Caermaes** in February 2025. [2]
What will be the median house price in Caermaes in February 2025?

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12. Calculate the volume of a pyramid with a base area of 13 200 cm^2 and a perpendicular height of 460 cm. [3]

Examiner only

Give your answer in m^3.

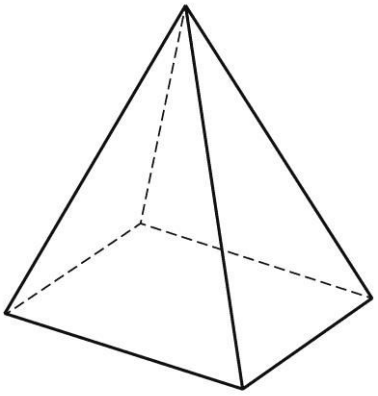

Diagram not drawn to scale

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13. The diagram below shows a sector of a circle with centre *O* and radius 7 cm. Calculate the perimeter of the sector *OAB*. [3]

Examiner only

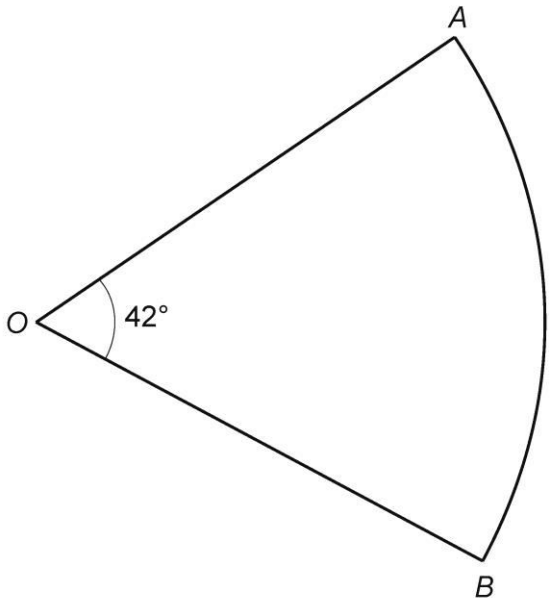

Diagram not drawn to scale

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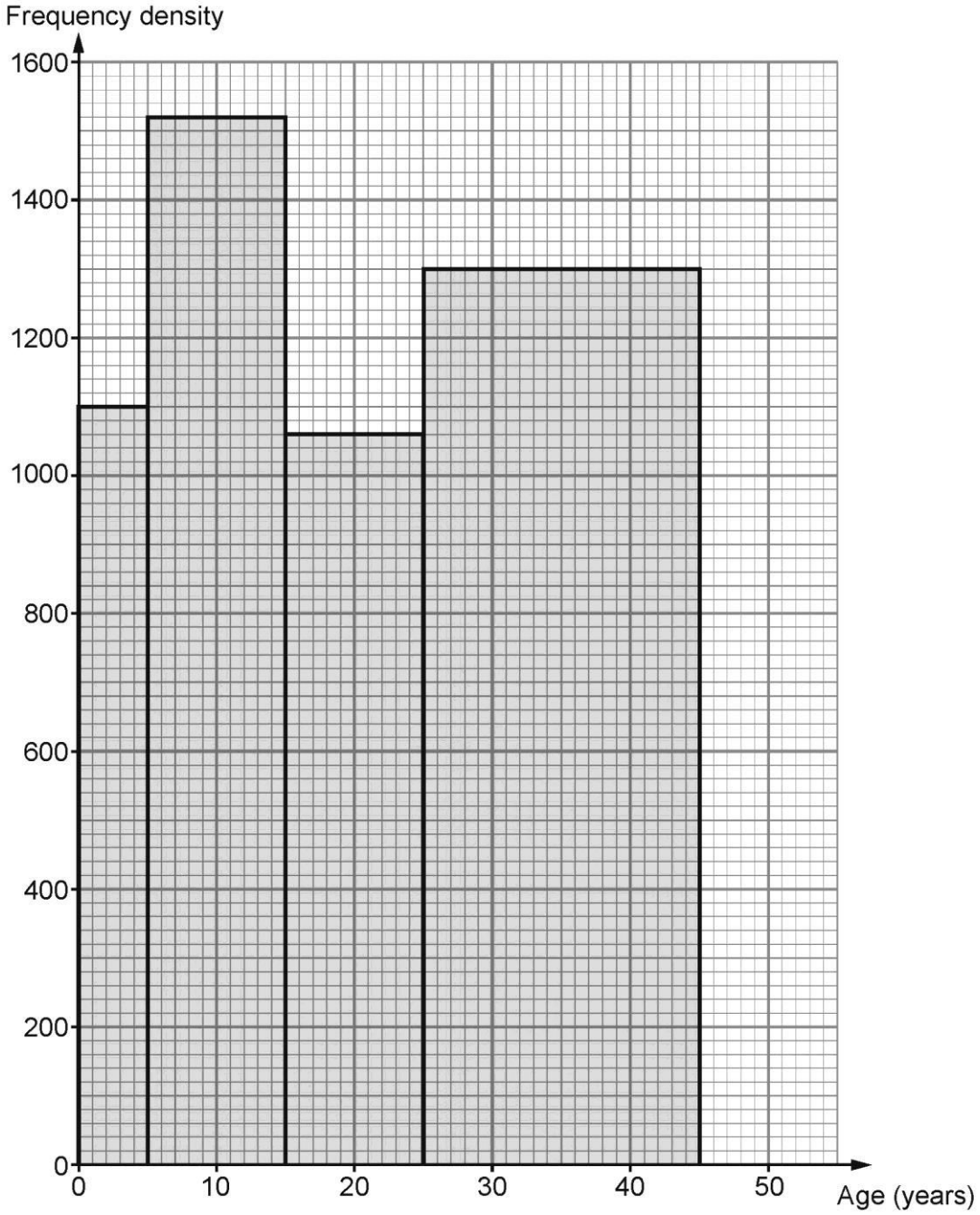
Examiner only

14. In June 2022, Gareth studied the population of people under the age of 45 in Pembrokeshire.

He used the data found on a website to draw the histogram below.
Gareth rounded the data correctly to the nearest 100 people.



Use the histogram to answer the following questions:

(a) Gareth knows that 1280 of the people were aged 40 years old. [3]

Express the number of people aged 40 years old as a percentage of the number of people aged 25 to 45 years old.
Give your answer correct to 1 decimal place.
You must show all your working.

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(b) The land area of Pembrokeshire is 1618 km^2. [4]

The population density for all of Pembrokeshire in June 2022 was 76 people per km^2.

How many people **over the age of 45** lived in Pembrokeshire in June 2022.
You must show all your working.

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Examiner only

15. Use the quadratic formula to solve the equation $3x^2 + 5x - 1 = 0$.
Give your solutions correct to 2 decimal places. [3]

Examiner only

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16. The two glasses below are mathematically similar. [3]

Examiner only

Diagram not drawn to scale

The volume of the smaller glass is 72 cm^3.
The volume of the larger glass is 243 cm^3.

The height of the larger glass is 18 cm.

Calculate the height of the smaller glass.

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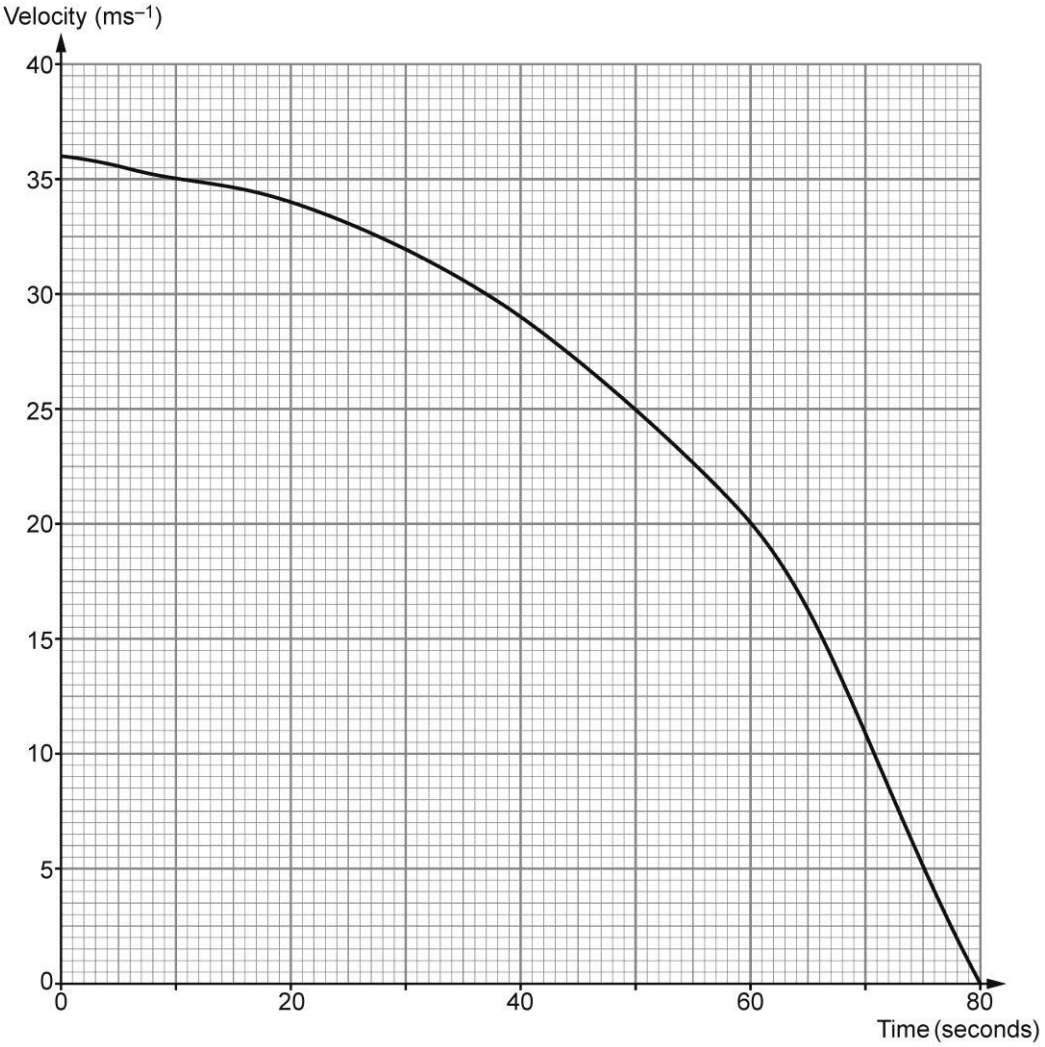
Examiner only

17. A train manufacturer has developed a new braking system.
The velocity-time graph shows the velocity of a train from the instant the new brakes are applied until it comes to rest.



(a) Estimate the train's deceleration at time 60 seconds. [3]

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(b) (i) Calculate an estimate of the distance travelled by the train from the instant the brakes are applied until it comes to rest. [3]

Examiner only

You must use exactly 4 strips of equal width.

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(ii) Explain how you could use the graph to gain a more accurate estimate of the distance travelled. [1]

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18. The Davies Family wants to go on holiday to Lisbon. [6]
Mrs Davies finds it's cheaper to fly from Manchester to Paris and on from Paris to Lisbon, rather than flying directly from Manchester to Lisbon.
The sketch below shows the journey based on the information from an airline.

Examiner only

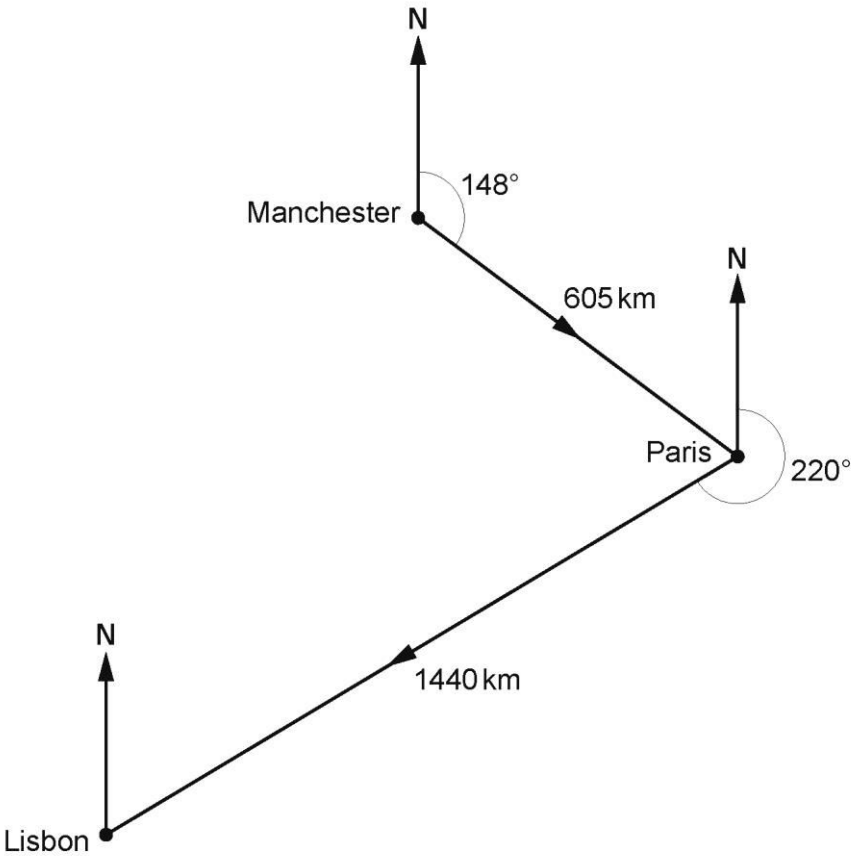

Diagram not drawn to scale

The bearing of Paris from Manchester is 148°.
The bearing of Lisbon from Paris is 220º.

The daughter, Ceri, is concerned of the increased carbon emissions by travelling the longer route.

She is told that an aeroplane will use 12 litres of fuel for every kilometre travelled.

How much less fuel would an aeroplane use by flying directly to Lisbon, rather than flying via Paris?

You must show all your working.

Examiner only

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END OF QUESTIONS

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Examiner only