Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U40-1

A23-3310U40-1

THURSDAY, 9 NOVEMBER 2023 – MORNING

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

1 hour 45 minutes

ADDITIONAL MATERIALS

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 at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

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

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

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

In question **3**, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**5**	
3.	**6**	
4.	**8**	
5.	**13**	
6.	**8**	
7.	**14**	
8.	**15**	
9.	**4**	
Total	**80**	

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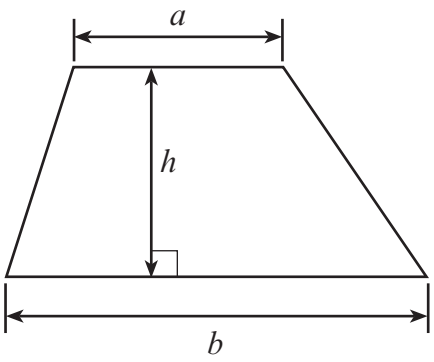
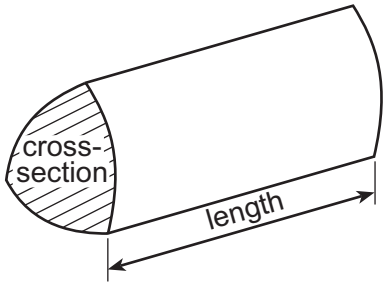
Formula List – Intermediate Tier

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



Volume of prism = area of cross-section × length



Examiner only

1. Miss Jardon's electricity bill is shown below.
Complete the bill to find the total amount that Miss Jardon owes. [7]

Miss Jardon
34 Heol Ysbyty

Period	Previous meter reading	Present meter reading	Number of units of electricity used
July, August and September 2023	68 928	69 658	.....

Charge for electricity: ..... units at **£0.19 per unit**	£ .....
Standing charge: 3 months at **£6.50 per month**	£ .....
Total charges:	£ .....

VAT at 5%:	£ .....

Amount due to pay £ .....

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Examiner only

2. A report from a Saturday newspaper is shown below.

> **Mean rainfall for the last 5 days is 42 mm**
>
> Mid Wales had significant rainfall over the last 5 days.
> 40 mm of rain fell on Monday, 37 mm on Tuesday and 39 mm on Wednesday.
> Thursday was the wettest day, when 48 mm of rain fell.
> Rain fell again on Friday.
> The mean rainfall per day for these 5 days was 42 mm.

(a) Calculate the rainfall for Friday.
You must show all your working. [3]

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Rainfall on Friday was ..... mm

(b) It did not rain on Saturday or Sunday in this week.
Calculate the mean rainfall per day for the week. [2]

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Mean rainfall per day for the week is ..... mm

Examiner only

3. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Elwyn ordered a solid garden ornament.

The ornament arrives in a box in the shape of a cuboid.
The box has length 15 cm, width 15 cm and height 30 cm.

The box only contains the ornament and packing.
The packing fits around the ornament and fills **all** the other space in the box.
When Elwyn opens the box, he is surprised at the volume of the packing in the box.
He says,

"$\frac{2}{3}$ of this box is filled with packing."

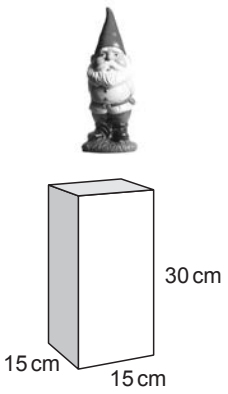

Diagram not drawn to scale

Use this information to calculate the volume of the garden ornament.
You must show all your working. [4 + 2 OCW]

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Examiner only

4. (a) Maggie sees a Bluetooth speaker in a sale.

The price of the speaker is reduced by 18% in the sale.
The original price of the speaker was £45.

Maggie's mum says she will share the cost of buying this speaker.
The ratio of the amount Maggie's mum pays to the amount Maggie pays is 8 : 1.

Calculate the amount Maggie's mum will pay towards buying this speaker in the sale.
You must show all your working. [4]

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Examiner only

(b) The diagram below shows a flowerbed at Maggie's house.
Maggie's mum will pay her £2.50 per m^2 to weed the flowerbed.

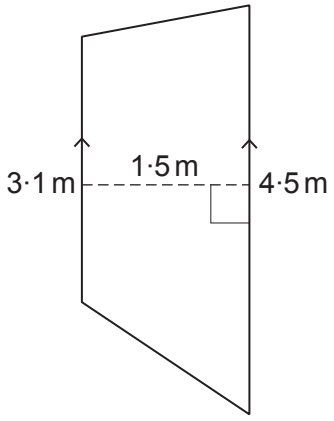

Diagram not drawn to scale

Calculate how much Maggie will get paid for the weeding. [4]

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5. Treviso is a company that designs and builds bicycles.

(a) Treviso has designed this new bike frame.
The missing angles need to be calculated.

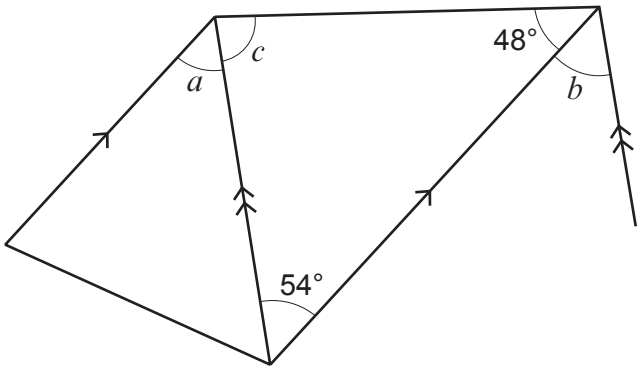

Diagram not drawn to scale

Find the size of each of the angles a, b and c. [3]

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a = ... ° b = ... ° c = ... °

Examiner only

(b) Each wheel on Treviso's new bike has a diameter of 29 inches.

(i)

Remember:	1 foot = 12 inches

Ollie tests Treviso's new bike over a distance of 1000 feet.
How many times will a wheel rotate during the test? [4]

(ii)

Remember:	12 inches ≈ 30 cm

What is the diameter of each wheel in **millimetres**? [3]

Diameter is ..... mm

(c) Ollie uses the new bike in a 48 km race.
He completes the race in a time of 1 hour 30 minutes.
Calculate his average speed for the race.
Give your answer in km / h. [3]

Average speed is ..... km / h

Examiner only

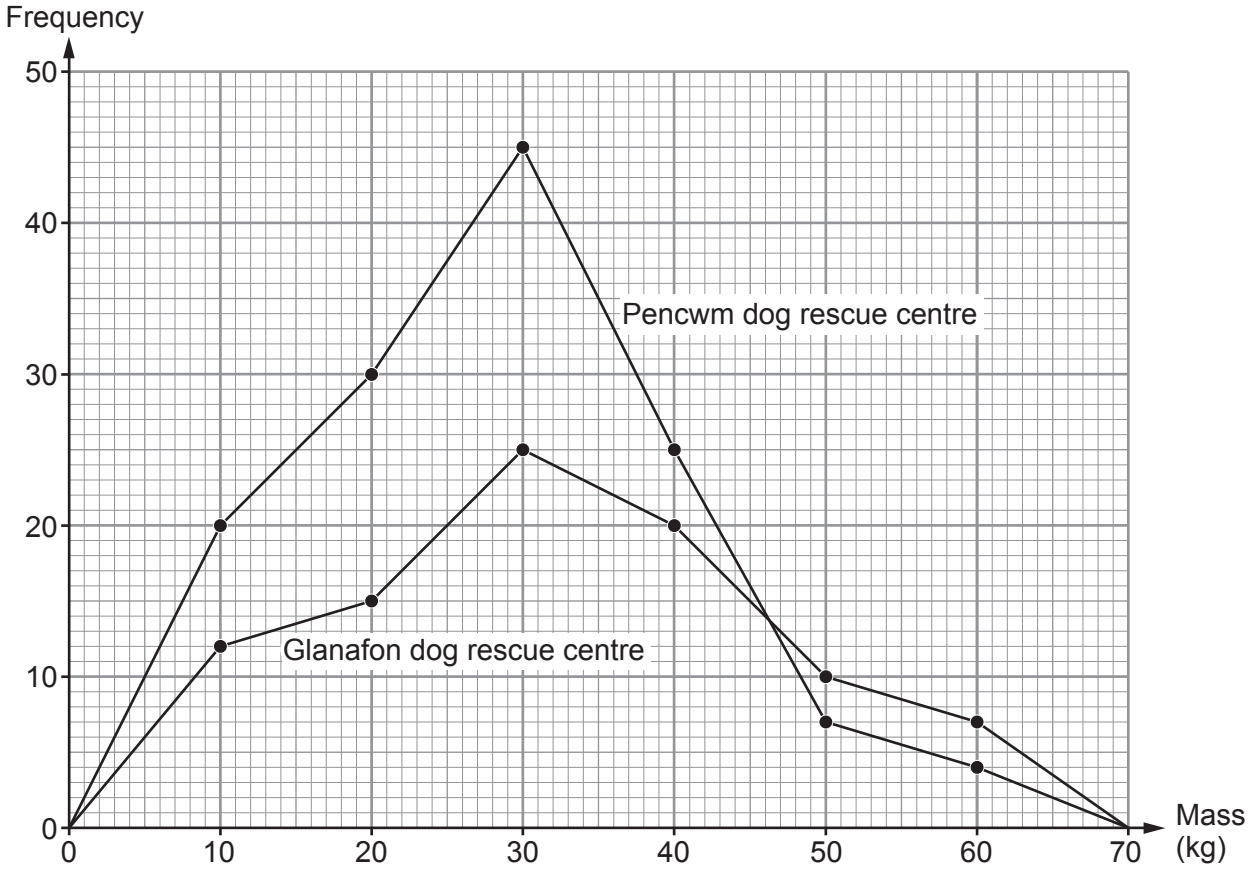
6. Glanafon and Pencwm dog rescue centres take in unwanted dogs.

The mass of each dog in the two dog rescue centres was recorded.

Groups of width 10 kg were used:

$5\,\text{kg} \leqslant \text{mass} < 15\,\text{kg}, \quad 15\,\text{kg} \leqslant \text{mass} < 25\,\text{kg}, \quad \ldots, \quad 55\,\text{kg} \leqslant \text{mass} < 65\,\text{kg}$

The results are shown in the frequency polygons below.



(a) Doreen, Rory and Muzhir look at these frequency polygons.

(i) Doreen says,

"The modal group of the masses of dogs in each dog rescue centre is the same."

Is Doreen correct?

Yes ☐ No ☐ Can't tell ☐

You must give a reason for your answer. [1]

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Examiner only

(ii) Rory says,

"28 of the dogs in Pencwm each have a mass of 18 kg."

Is Rory correct?

Yes ☐ No ☐ Can't tell ☐

You must give a reason for your answer. [1]

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(iii) Muzhir says,

"There is a higher proportion of dogs that are heavier than 35 kg in Glanafon than in Pencwm."

Without doing any calculations, decide if Muzhir is correct.

Correct ☐ Incorrect ☐ Can't tell ☐

You must give a reason for your answer. [1]

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(b) The estimate of the mean mass of the dogs in Glanafon was 32·5 kg.
How much less was the estimate of the mean mass of the dogs in Pencwm?
You must show all your working. [5]

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Estimate of the mean mass of the dogs in Pencwm is ..... kg less than in Glanafon.

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7. Jac is planning to visit the Empire State Building in New York.

(a) According to the internet, the Empire State Building has a total of 1172 miles of elevator cable.

Complete the following statement. [2]

There is a total of ..... **km** of elevator cable in the Empire State Building.

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(b) The elevators in the Empire State Building were designed to move at a rate of 0·366 kilometres per minute.

Complete the following statement. [2]

The elevators in the Empire State Building were designed to move

at ..... **metres per second**.

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(c) Planners had an original budget of $60 million to construct the Empire State Building. It actually cost $41 000 000 to construct.

Complete the following statement.
Give your answer correct to 2 decimal places. [3]

Constructing the Empire State Building cost ..... % less than the original budget.

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Examiner only

(d) More than 4 million people visit the Empire State Building each year.
What is 4 million written in standard form?
Circle your answer. [1]

4×10^{-5} $0\cdot4\times10^{5}$ 4×10^{5} 4×10^{6} 4×10^{7}

(e) The conversion rate at the exchange shop is £1 = $1.25.
The exchange shop only has $10 notes and $50 notes.

Jac has exactly £350.
He wants to exchange as close to £350 as possible for US dollars ($).
He asks for as **few** notes as possible.

Calculate:
- how many $10 notes and how many $50 notes Jac gets
- how much he pays for his currency.

You must show all your working. [6]

Examiner only

8. (a) (i) A single tree can absorb 48 **pounds** of carbon dioxide per year.
Calculate the carbon dioxide absorbed per year by a forest of 440 of these trees.
Give your answer in **kilograms**. [2]

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Carbon dioxide absorbed per year is ..... kg

(ii) A forest of trees absorbs $2{\cdot}3 \times 10^{11}$ grams of carbon dioxide per year.
Which of the following is $2{\cdot}3 \times 10^{11}$?
Circle your answer. [1]

230 000 000 000 23 000 000 000 2 300 000 000 000

0·000 000 000 002 3 0·000 000 000 023

(b)

Remember:	$10\,000\,m^2 \approx 2{\cdot}47$ acres

A report states that a fire in a forest has a high risk of spreading when there are more than 60 trees per acre.

There are 615 trees in Grancwm Forest.
The forest covers an area of $40\,000\,m^2$.

Would a fire in Grancwm Forest have a high risk of spreading?

Yes ☐ No ☐

You must show all your working to support your answer. [4]

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Examiner only

(c) A vertical pine tree stands on horizontal ground.
From a point on the ground 21 metres from its base, the angle of elevation of the top of the pine tree is 39°.

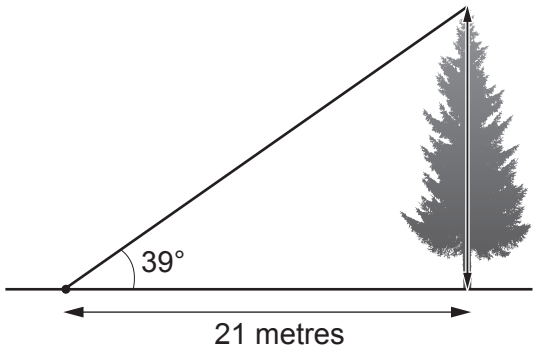

Diagram not drawn to scale

(i) Show that the pine tree has a vertical height of 17 metres. [3]

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(ii) A cylindrical log is cut from this pine tree.
The **circumference** of the cross-section of the log is 1·75 m.
The length of the log is half the height of the tree.

Calculate the volume of the log.
Give your answer in m^3.
You must show all your working. [5]

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Volume of the log is ..... m^3

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9. A car was bought in 1973 for £2500.

In the first year, this car depreciated by 23% of its value.
In each of the following 39 years, it depreciated by 4% of its value the previous year.

The car then started to increase in value.
In each of the next 10 years, it increased by 14% of its value the previous year.

Calculate the value of the car after these 50 years.
You must show all your working. [4]

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The value of the car after 50 years is £ .....

END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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