Surname	Centre Number	Candidate Number
Other Names		0

GCSE

3310U50-1

A17-3310U50-1

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
HIGHER TIER

MONDAY, 6 NOVEMBER 2017 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

The use of a calculator is not permitted in 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** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet. Question numbers must be given for all work written on the continuation page.

Take π as 3·14.

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 **4***(b)*, 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.	**6**	
3.	**9**	
4.	**12**	
5.	**5**	
6.	**4**	
7.	**8**	
8.	**8**	
9.	**7**	
10.	**6**	
11.	**8**	
Total	**80**	

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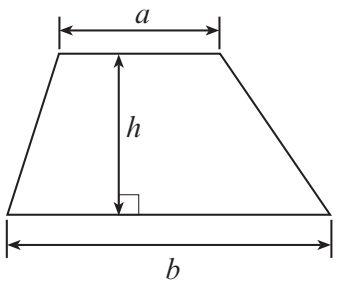
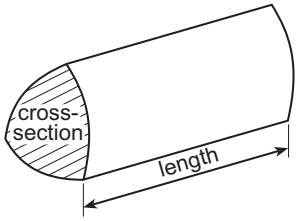
Formula List - Higher Tier

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

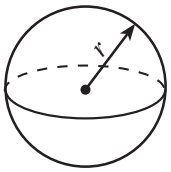


Volume of prism = area of cross-section × length



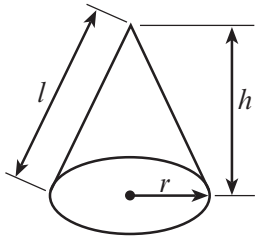
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

Curved surface area of cone = $\pi r l$

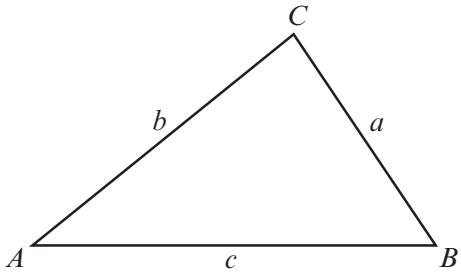


In any triangle ABC

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 $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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Examiner only

1. *(a)* Ysgol Fron Isa and Ysgol Caewen are two very different high schools.
One school is large, and in a rural area. The other is a small school in a town.
The town in which the small school is situated has many traffic-free cycle routes.

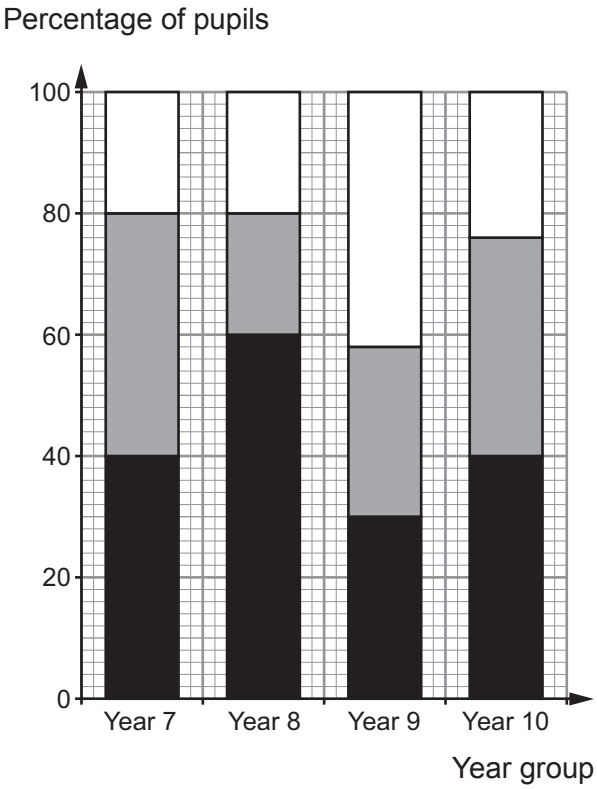
All of the pupils in Years 7 to 10 were surveyed in both of these schools.
They were asked the following questions.

Do you cycle to school?	Yes ☐	No ☐
If you answered 'no', would you like to cycle to school?	Yes ☐	No ☐

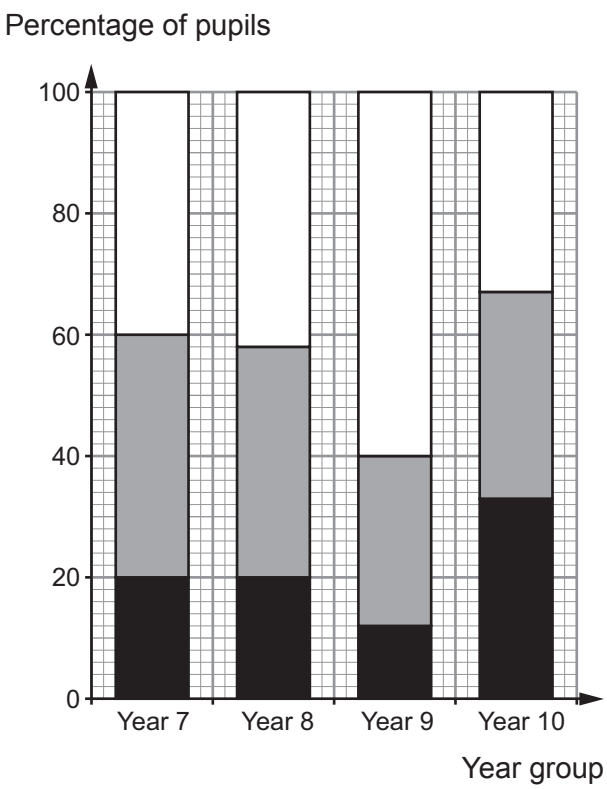
The results were displayed in graphs, as shown below.

Key: ■ Cycle ▒ Would like to cycle ☐ Others

Ysgol Fron Isa



Ysgol Caewen



Examiner only

(i) Which school and year group has an approximately equal split between the 3 categories:
- pupils who cycle to school,
- pupils who would like to cycle to school, and
- other pupils? [1]

School: ..... Year Group: .....

(ii) Circle either TRUE or FALSE for each of the following statements. [3]

There are definitely more pupils in Ysgol Fron Isa who cycle to school than in Ysgol Caewen.	TRUE	FALSE
Both schools have pupils in each year group with no interest in cycling to school.	TRUE	FALSE
The questions asked were biased.	TRUE	FALSE
Approximately 20% of the pupils surveyed in Ysgol Caewen cycle to school.	TRUE	FALSE
It is more likely that it is Ysgol Fron Isa that is the small school situated in a town.	TRUE	FALSE

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(b) In January 2011, there were 1200 miles of National Cycle Network (NCN) routes in Wales. In January 2016, there were 1400 miles of NCN routes in Wales.

(i) If the number of miles of NCN routes in Wales were to continue to increase by the same number of miles per year, how many miles of cycle routes would there be in January 2018? [2]

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(ii) Why is your answer in (i) unlikely to be an accurate estimate of the number of miles of NCN routes in Wales in January 2018? [1]

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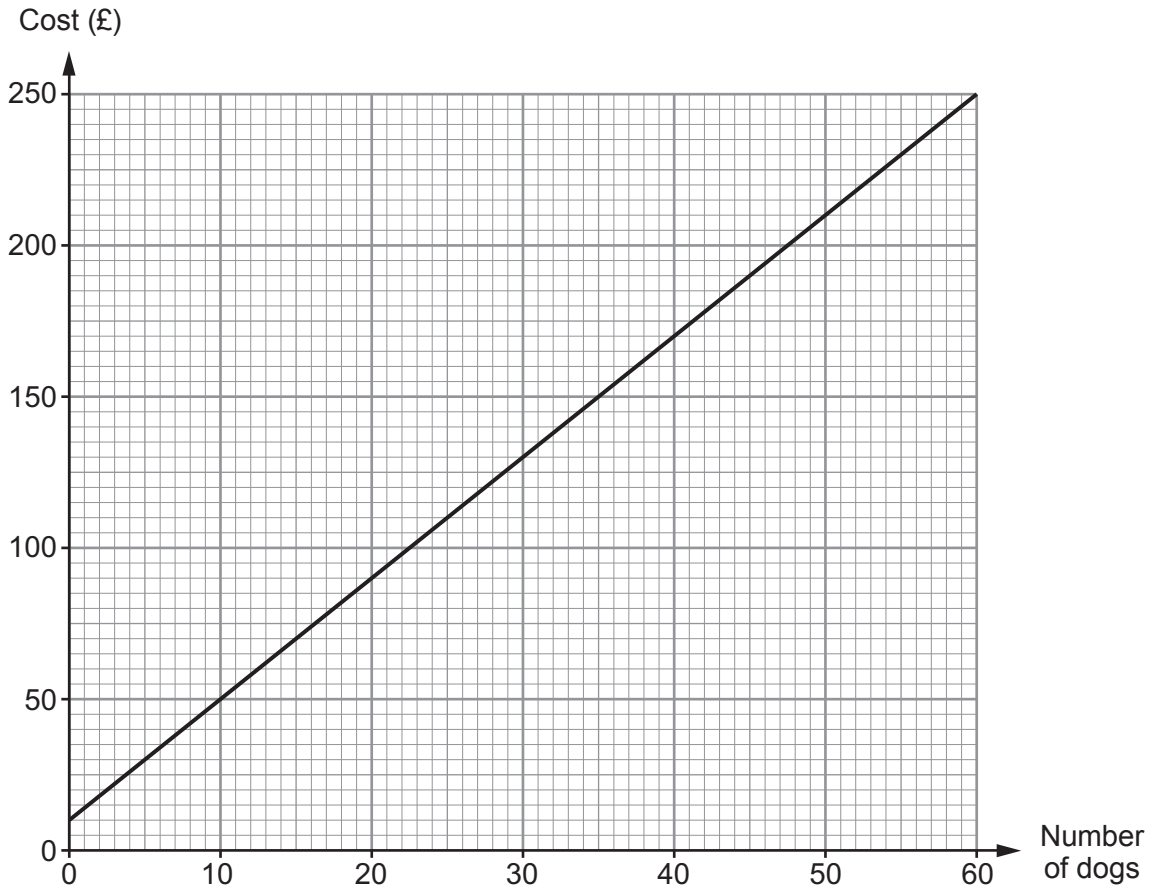
Examiner only

2. William owns and runs dog kennels.
His costs depend on the number of dogs in the kennels.
The running costs for one day are shown on the graph below.



(a) Why does the graph not pass through (0, 0)? [1]

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Examiner only

(b) What is the increase in the daily running costs for each additional dog that is kept in the kennels? [2]

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(c) (i) Freda also runs a dog kennels.
The cost of keeping 20 dogs in her kennels for one day is £130.
She knows that as the number of dogs increases, the overall cost increases at the same rate as in William's kennels.

Display this information on the graph paper opposite. [2]

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(ii) Find the cost of keeping 30 dogs for one day in Freda's kennels. [1]

£ .....

Turn over.

Examiner only

3.

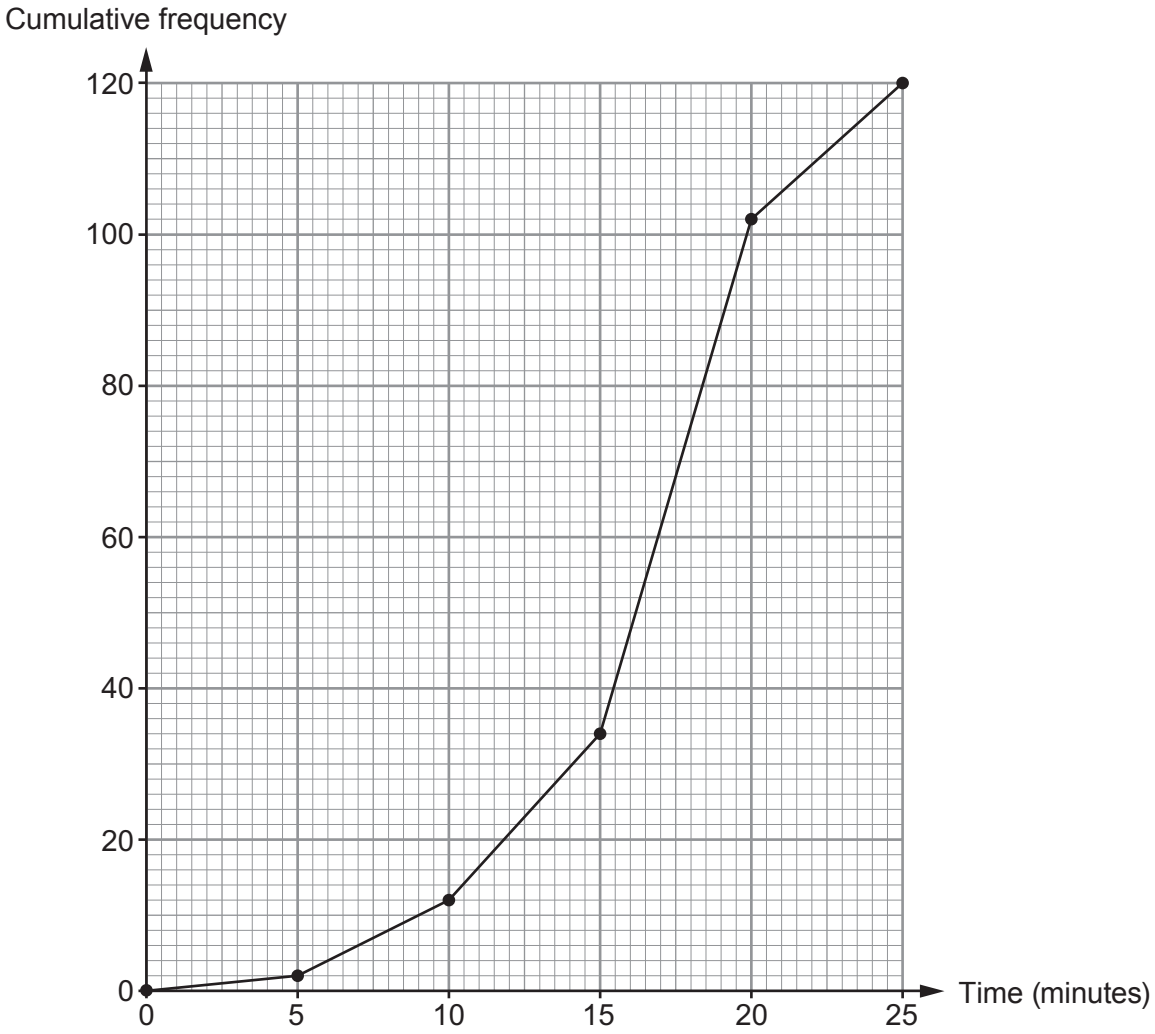
Meirion's Window Cleaning Business

No job too small!

Email: meirion@mwcb.cymru

Meirion is a window cleaner.
From Monday to Friday, he records how long he spends cleaning windows for each of his customers.

He draws a cumulative frequency diagram to display the findings.



Examiner only

(a) (i) Use Meirion's cumulative frequency diagram to find the median and interquartile range of the times he spends cleaning windows for each of his customers. [3]

Median ..... minutes

.....

Interquartile range ..... minutes

(ii) Meirion looks back at his raw data.
He finds that the median is actually 17 minutes 30 seconds.
Why is there a difference between the median from his cumulative frequency diagram and the actual median from his raw data? [1]

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(b) Meirion is looking at the time it took to clean individual customers' windows.
Find the number of customers whose windows took between 10 and 15 minutes to clean. [2]

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(c) Meirion thinks that for approximately 80% of his customers, he cleaned their windows in less than 20 minutes.
Is Meirion correct?
You must show all your working. [3]

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Examiner only

4. Megan Pugh's electricity bill is shown below.
It covers the period May, June and July 2017.

Megan Pugh
203 Stryd Bryntor
Maesgwyn

Period	Previous meter reading	Present meter reading	Number of units of electricity used
May, June and July 2017	13450	13900	450

Charge for electricity: 450 units at **20p per unit**	£90.00
Standing charge: 3 months at **£7.60 per month**	£22.80
Total charges:	£112.80

VAT at 5%: 5% of £112.80	£5.64

Amount to pay: £112.80 + £5.64 = **£118.44**

(a) On 1 August 2017, the charge per unit for electricity was increased by 5%.
What is the increased cost per unit of electricity?
Circle your answer. [1]

20.5p 21p 21.5p 22p 22.5p

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

Megan wants to calculate her next 3-monthly electricity bill.
She knows the following:

- Her meter reading on 31 October 2017 was 14400.
- The charge per unit for electricity has increased by 5% since her last bill.
- The standing charge has increased by 20p **per month** since her last bill.
- VAT remains at 5%.

On 31 October 2017, Megan had £470 in her bank account.

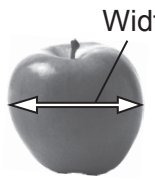
After paying her next 3-monthly electricity bill, will Megan be able to buy a new washing machine costing £330?
You must show all your working. [9 + 2 OCW]

Examiner only

Turn over.

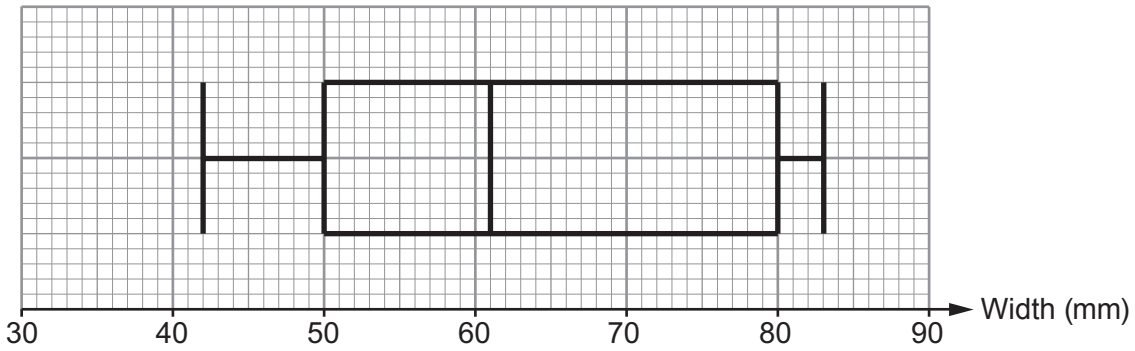
Examiner only

5. Lena has three apple trees in her garden.
She has one Gala apple tree, one Orange Pippin tree and one Pink Lady tree.
She picks 50 apples from each of the 3 trees.
She records the width of each apple, as shown.

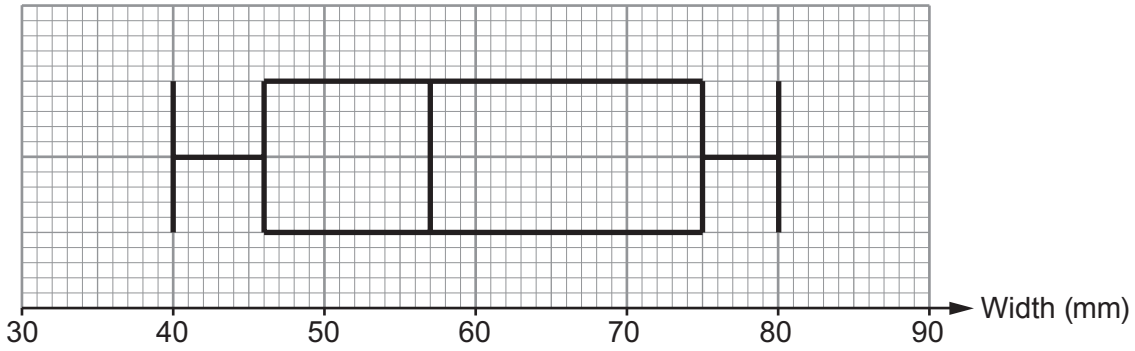


Lena constructs box and whisker diagrams for the widths of the apples collected from each of the three trees.

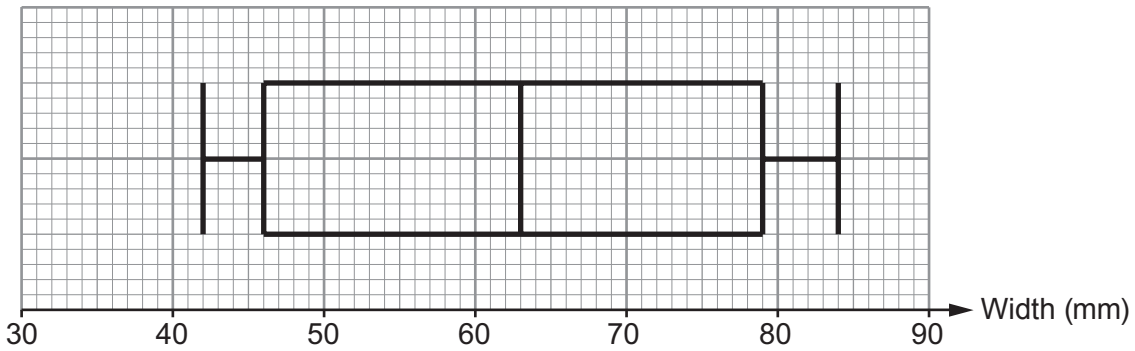
Gala apple tree



Orange Pippin apple tree



Pink Lady apple tree



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(a) Complete each of the following statements.

(i) 'Apples from the ..... apple tree have the least median width.

The median width of apples recorded for this tree is ..... mm.' [1]

(ii) 'The range of the widths of apples recorded for the Gala apple tree

is ..... mm.' [1]

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(iii) 'The ..... apple tree has apples with the greatest interquartile range of widths.

The interquartile range of the widths of apples recorded for this tree

is ..... mm.' [2]

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(b) Which tree has a higher proportion of larger apples?
You must give a reason for your answer. [1]

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Turn over.

Examiner only

6. Daniel has made a pizza to share with some friends.

After he has taken his share, he calculates that he has $0{\cdot}8\dot{3}$ of the pizza left.
Daniel shares what he has left equally between 3 of his friends.
Calculate the fraction of the whole pizza that each of these 3 friends will have.
Give your answer as a fraction in its lowest terms. [4]

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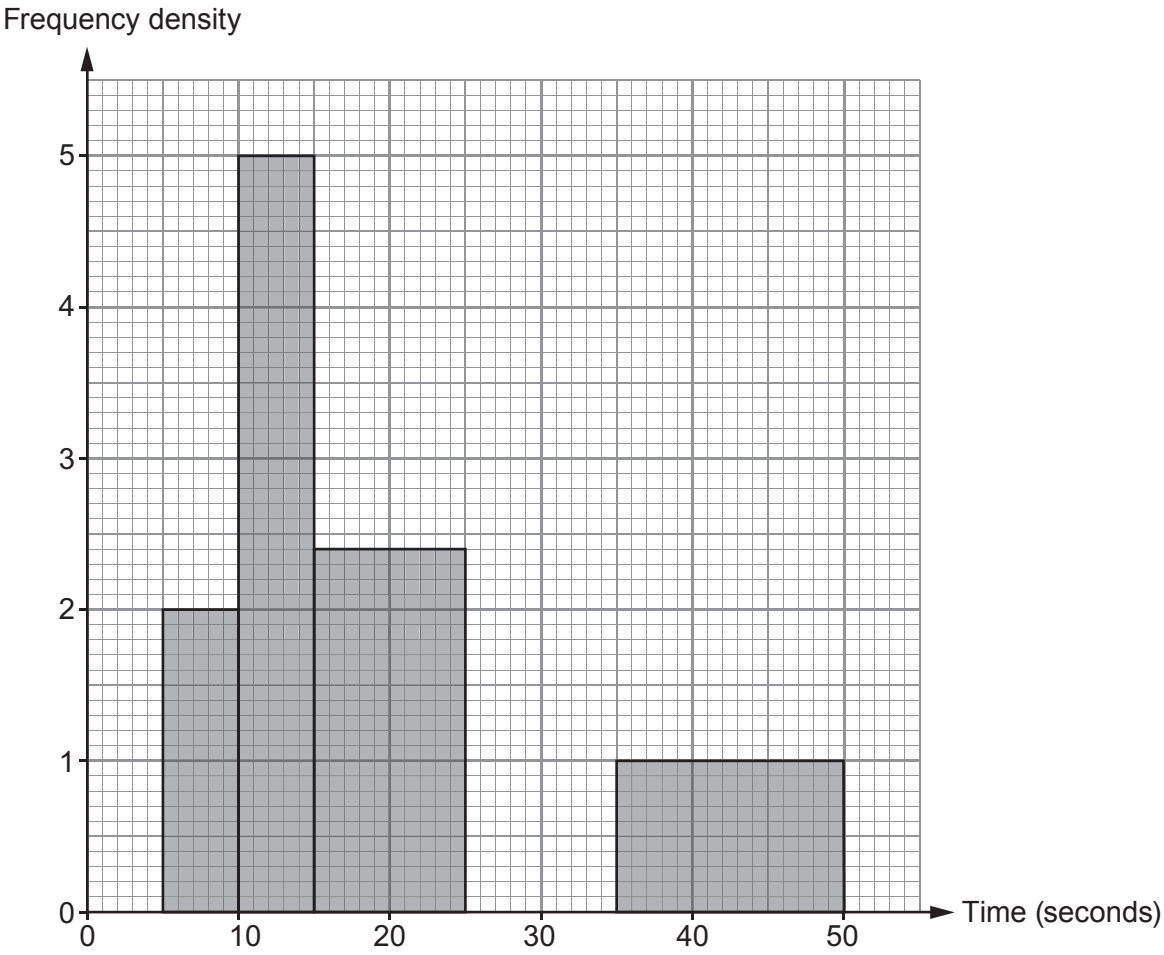
Examiner only

7. The times taken by a group of pupils to answer a numeracy question were recorded. The histogram below shows some of the results.



(a) The remaining 16 pupils took between 25 and 35 seconds to answer the question. Complete the histogram. [1]

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(b) What is the greatest possible range of times taken by the pupils to answer the question? Circle your answer. [1]

50 seconds 4 seconds 40 seconds 45 seconds 35 seconds

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Examiner only

(c) Calculate the total number of pupils that were in the group. [2]

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(d) Gareth was one of the pupils in the group.
He says,

"The time I took to answer the question was 18 seconds. This means I was in the fastest 50% of the pupils."

(i) Explain how Gareth's statement could be true.
You must use calculations to justify your answer. [3]

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(ii) Explain how Gareth's statement could be false. [1]

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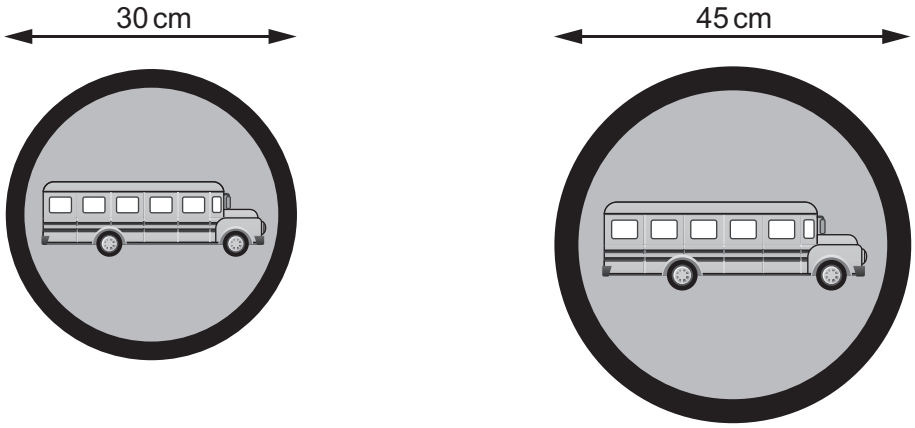
Examiner only

8. A company produces two **similar** road signs.



Diagrams not drawn to scale

(a) The cost of the paint needed for the smaller road sign is £1.60.
Calculate the cost of the paint needed for the larger sign. [4]

Examiner only

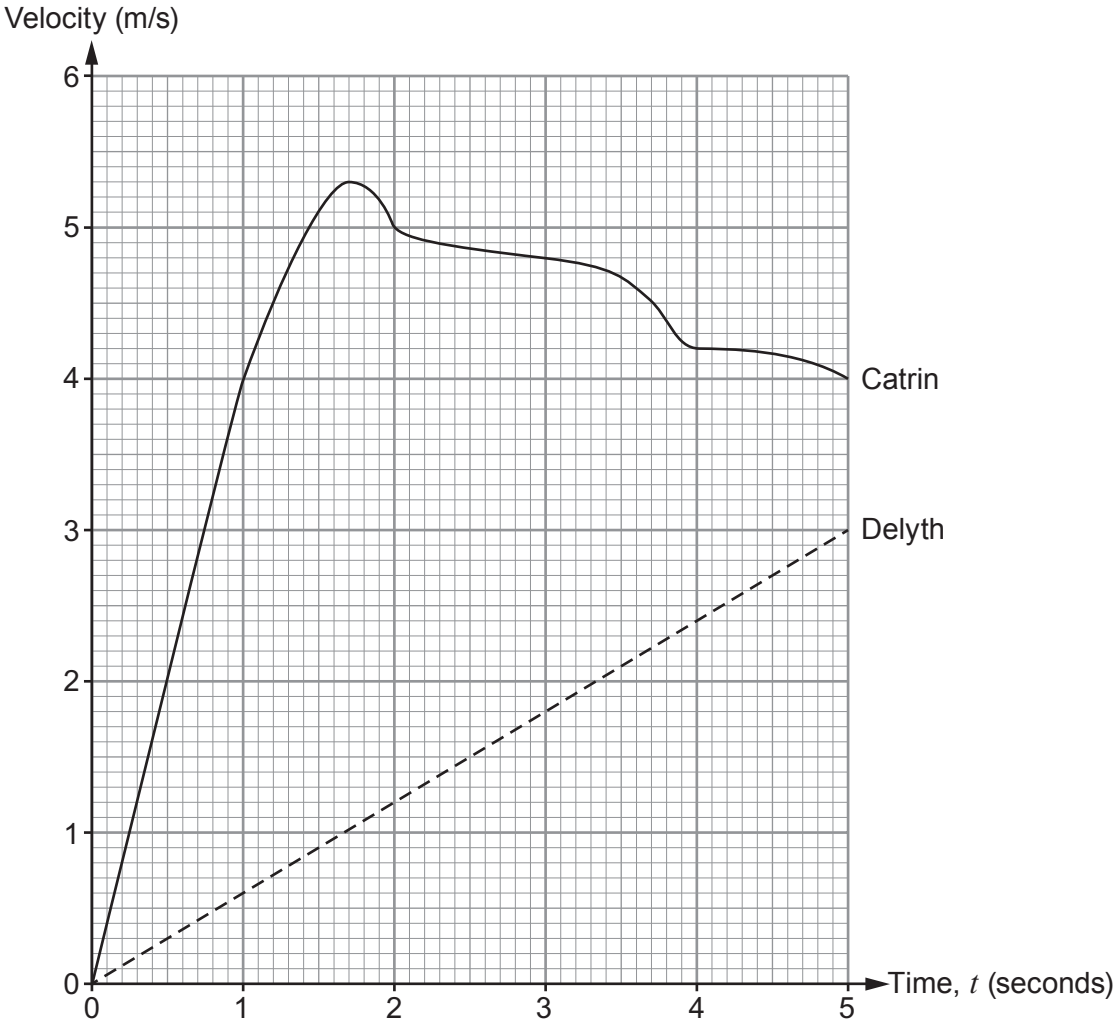
(b) The selling price of the smaller road sign is £12.00.
This selling price was calculated from the cost price by:

- adding a profit of 25%,
- then adding VAT at 20%.

Calculate the cost price of the smaller road sign.
You must show all your working. [4]

Examiner only

9. Two runners, Catrin and Delyth, start a race at the same time.
The velocity-time graph shows their velocities over the first 5 seconds of the race.



(a) After the start of the race, what was the earliest time that Catrin's acceleration was $0\,m/s^2$? [1]

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Examiner only

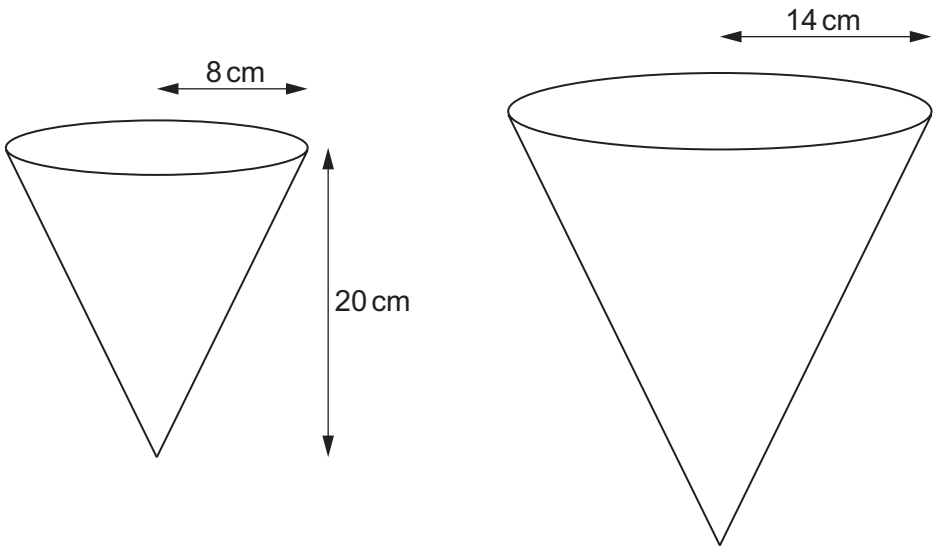
(b) Use the trapezium rule to calculate an estimate of the distance Catrin travelled in the first 5 seconds of the race.
Use Catrin's velocities at times $t = 0$, $t = 1$, $t = 2$, $t = 3$, $t = 4$ and $t = 5$.
You must show all your working. [3]

(c) (i) Calculate an estimate of how far Catrin was ahead of Delyth after 5 seconds. [2]

(ii) Explain why your answer to *(c)* (i) is an underestimate. [1]

Examiner only

10. The diagram below shows two **similar** flasks for measuring liquid.



Diagrams not drawn to scale

The flasks are in the shape of cones.
The smaller flask has a base radius of 8 cm and a vertical height of 20 cm.
The larger flask has a base radius of 14 cm.

(a) Calculate the vertical height of the larger flask. [2]

Examiner only

(b) The larger flask is now partly filled with liquid up to a vertical height of 15 cm.

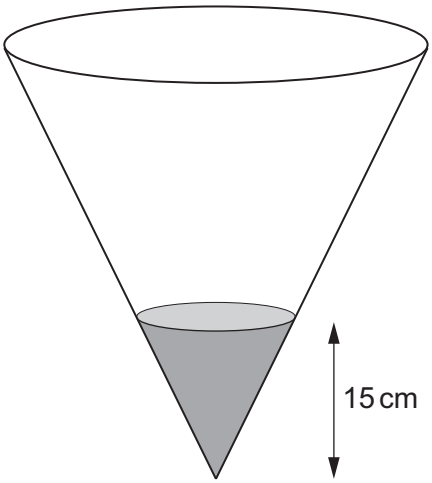


Diagram not drawn to scale

Calculate the volume of liquid in the flask.
Give your answer in terms of π. [4]

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11. A company is building a new headquarters.
The diagram below shows the ground plan of the new headquarters.

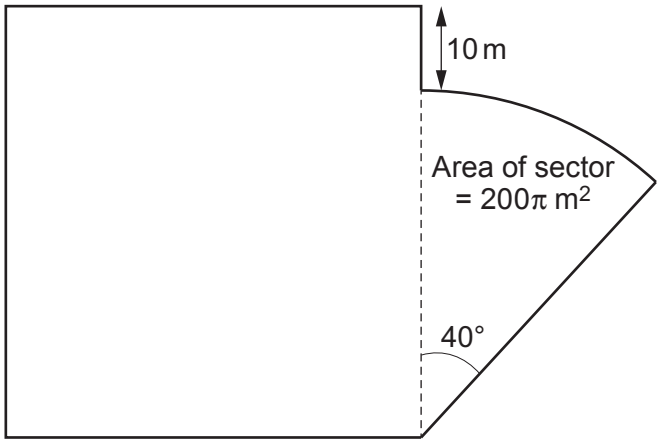

Diagram not drawn to scale

The plan consists of a square and a sector of a circle.

(a) Using the information given in the diagram, calculate the radius of the sector of the circle.

Give your answer in the form $a\sqrt{b}$, where a is an integer and b is a prime number. [5]

Examiner only

(b) The square is to be covered in concrete.

Calculate the area of the square.
Expand any brackets, and simplify your answer. [3]

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

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