Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U50-1

A24-3310U50-1

TUESDAY, 5 NOVEMBER 2024 – MORNING

MATHEMATICS – NUMERACY
UNIT 1: NON-CALCULATOR
HIGHER TIER

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** 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.

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 **1**, 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.	**2**	
3.	**6**	
4.	**5**	
5.	**8**	
6.	**6**	
7.	**7**	
8.	**10**	
9.	**13**	
10.	**9**	
11.	**7**	
Total	**80**	

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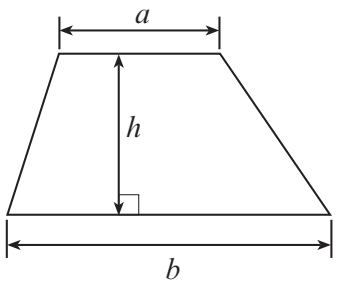
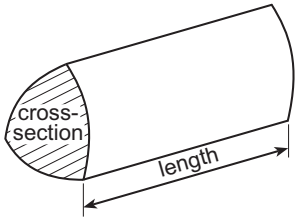
Formula List – Higher Tier

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

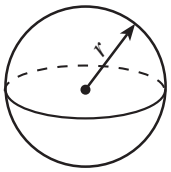


Volume of prism = area of cross-section × length



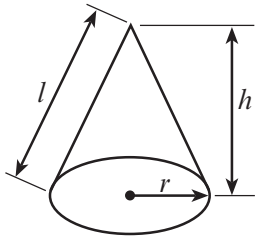
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

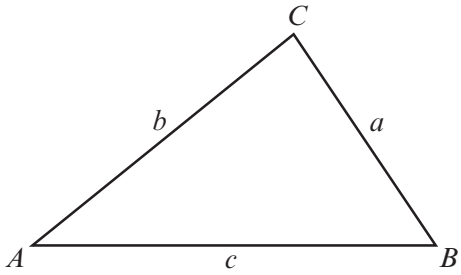


In any triangle ABC

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

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.

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Examiner only

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

Geralllt is planning to go to the Maldives.

His local exchange shop:

- sells **20 Maldivian rufiyaa** (MVR) for **£1**
- takes all possible British notes and coins
- sells MVR notes, but only has 500 MVR and 1000 MVR notes available.

Geralllt has £360 to buy Maldivian rufiyaa (MVR).

Calculate:

- the maximum number of Maldivian rufiyaa (MVR) that Geralllt can buy
- how much this will cost him.

You must show all your working. [5 + 2 OCW]

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Examiner only

2. Eleri is investigating whether people working in offices are happy with the processing speed of their office computer.
She considers the data she needs to collect.

Eleri includes the following two questions in her questionnaire.
For each question, write down one set of possible groups she could use as answer options.
[2]

Question 1: How many days per month do you work in your office?

Possible groups for answer:

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Question 2: How happy are you with the processing speed of your office computer?

Possible groups for answer:

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Examiner only

3. Jamal is paid in dollars.
The income tax rates are as follows:

Band	Taxable income	Tax rate
Personal allowance	Up to 10 000 dollars	0%
Basic rate	10 000 dollars to 30 000 dollars	10%
Higher rate	Over 30 000 dollars	25%

Jamal's total earnings before tax are 36 000 dollars.

Calculate how much tax Jamal is due to pay in total.
You must show all your working. [6]

Examiner only

4. A fire surround is made from concrete.

The fire surround has a uniform cross-section.
The edges of the fire surround are all either horizontal or vertical, as shown in the diagram.

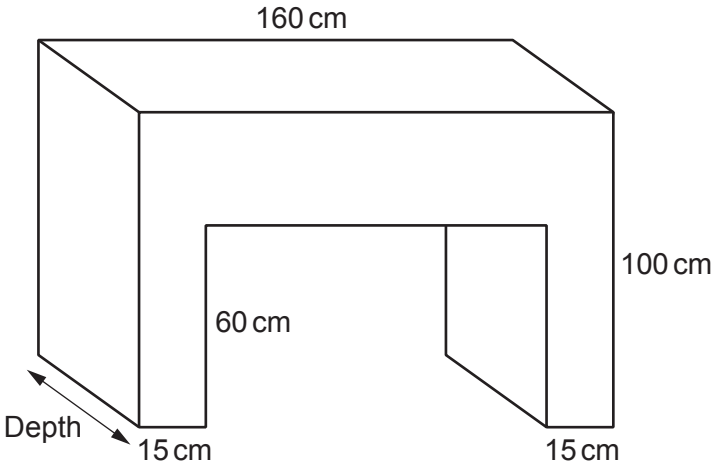

Diagram not drawn to scale

The volume of the concrete in the fire surround is 164 000 cm^3.

Calculate the depth of the fire surround.
Give your answer in centimetres.
You must show all your working. [5]

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Depth of fire surround is ..... cm

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Examiner only

5. (a) Delia invests £4000 in an account that pays 3% compound interest per annum. She does not withdraw money or make any other payments into her account.

How much will Delia have in her account after **two years**? [3]

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Amount in Delia's account after two years £ .....

(b) Delia bought a gold bracelet at a car boot sale a few years ago.

(i) Delia's bracelet has increased in value by 40%.
Her gold bracelet is now worth £42.

Calculate how much Delia paid for the bracelet in the car boot sale. [2]

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Delia paid £ .....

Examiner only

(ii) The density of the gold in Delia's bracelet is $20\,g/cm^3$.
The bracelet has a mass of 6×10^{-3} **kilograms**.

Calculate the volume of Delia's bracelet.
Give your answer in cm^3. [3]

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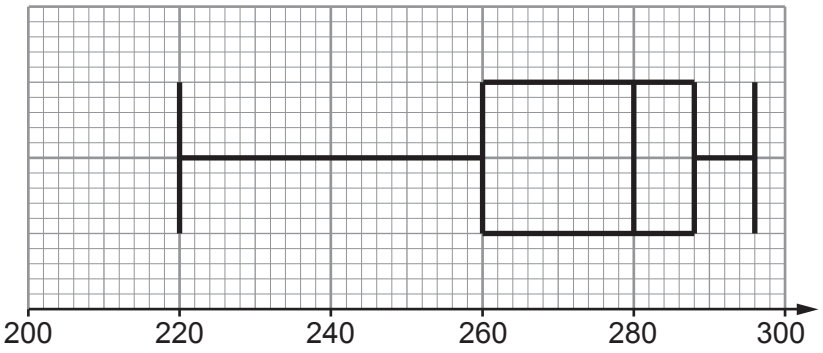
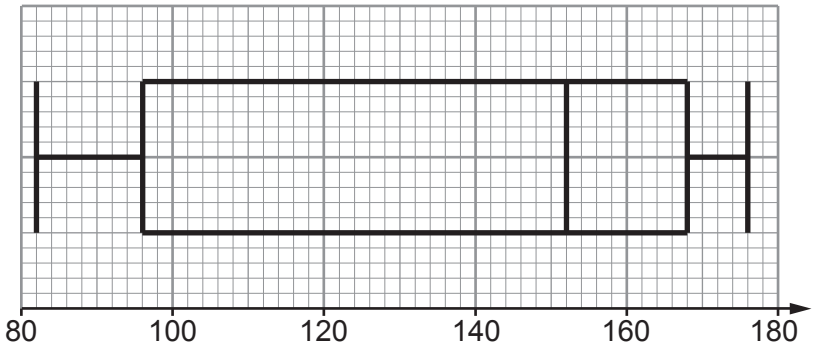
6. Geraint has collected data on some adult gulls.
He weighed 400 slender-billed gulls, 400 little gulls, and 400 black-headed gulls.

He has constructed box-and-whisker diagrams to display the masses of the gulls.

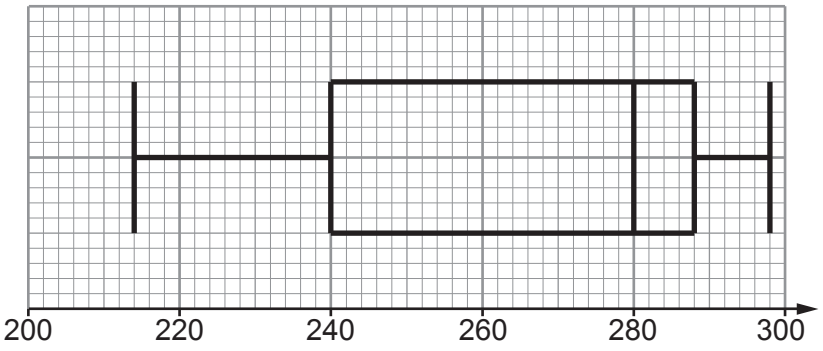
Slender-billed gulls



Little gulls



Black-headed gulls



Examiner only

(a) What is the range of the masses of the slender-billed gulls? [1]

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Range of the masses ..... g

(b) How many of the little gulls have a mass greater than or equal to 96 g? [2]

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(c) Write down the percentage of little gulls that have a mass greater than or equal to 168 g. [1]

..... %

(d) From the box-and-whisker diagrams, Geraint notices that two of the types of gull have the same median mass.
He makes the following statement about these two types of gull.

"The diagrams suggest that one of these two types of gull generally has a greater mass than the other."

(i) Which type of gull appears to have the greater mass? [1]

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(ii) Geraint based his statement on **one** of the following measures.
Which measure did Geraint use?
Circle your answer. [1]

Range Median Lowest mass Lower quartile Upper quartile

Examiner only

7. Shipping containers are used to transport goods around the world.
The dimensions of a shipping container are as follows:

- The height is 2·59 m, correct to the nearest centimetre.
- The width is 2·43 m, correct to the nearest centimetre.
- The length is approximately double the width.

(a) What is the least possible **width** of this shipping container?
Circle your answer. [1]

2·425 m 2·42 m 2·435 m 2·426 m 2·424 m

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(b) An end view of a stack of these shipping containers is shown below.

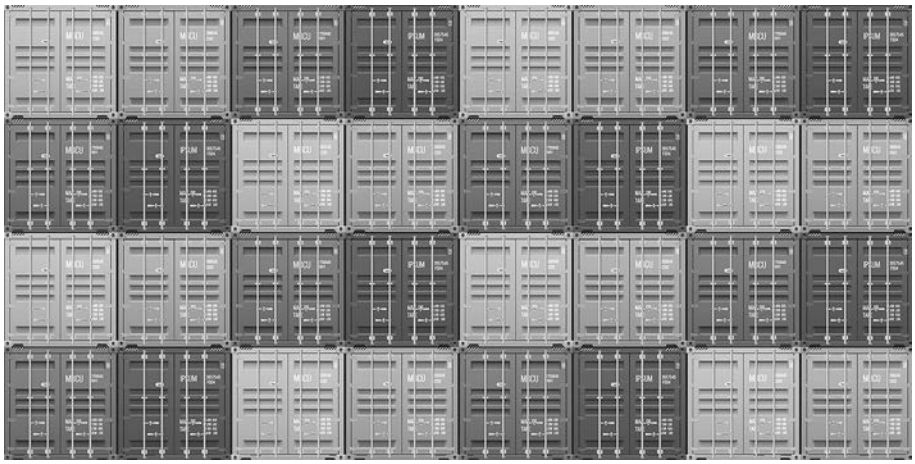

Diagram not drawn to scale

Calculate the greatest possible **height** of the stack of shipping containers.
Give your answer in metres. [3]

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Examiner only

(c) In 2012, there were 2×10^7 shipping containers in the world.

Joshua says,

> By 2025, I think that the number of shipping containers in the world will reach $1{\cdot}2 \times 10^8$.

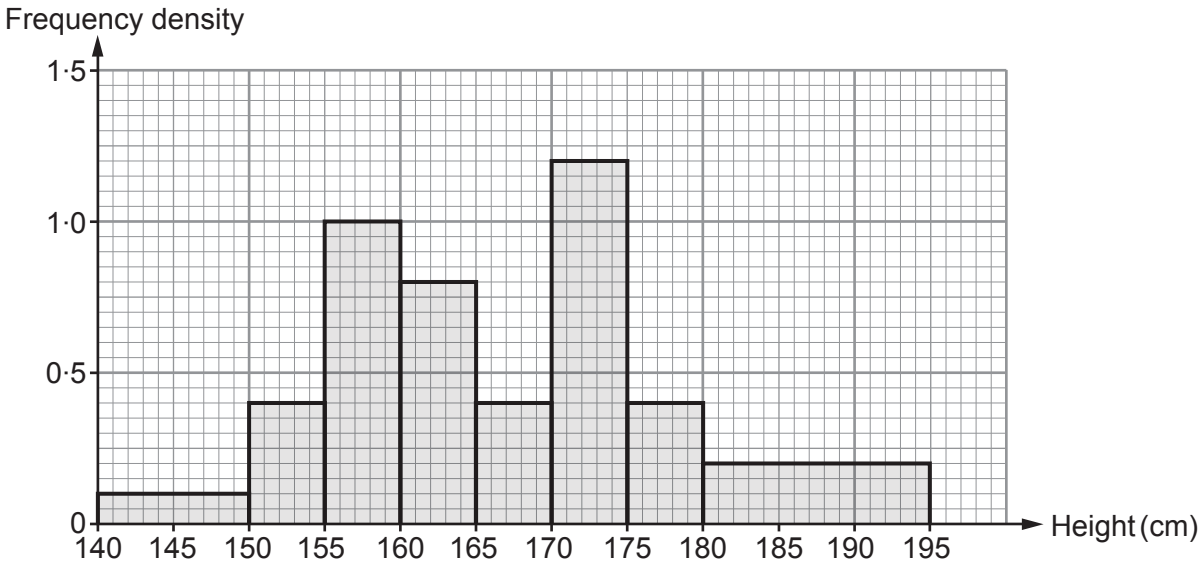
Assuming Joshua is correct, complete the statement below.

"By 2025, the percentage increase in the number of shipping containers in the world since 2012 will be ..... %."

You must show all your working. [3]

Examiner only

8. Nerys is a member of a junior athletics club.
She measured the heights, in centimetres, of all the 16-year-old girl athletes in the club.
Nerys drew the following histogram of the results.



(a) (i) Show that the number of 16-year-old girls in the athletics club is 25. [3]

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(ii) The average height of a 16-year-old girl in the UK is 162·5 cm.
Calculate an estimate of the percentage of 16-year-old girls in the athletics club who are taller than 162·5 cm.
You must show all your working. [3]

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Examiner only

(b) Grace is a member of the same junior athletics club.
She uses Nerys's histogram to draw a different histogram.
Grace uses the groups shown in the table below.

Height (cm)	Frequency	Frequency density
$140 \leqslant \text{height} < 155$	.....	.....
$155 \leqslant \text{height} < 165$	.....	.....
$165 \leqslant \text{height} < 175$	.....	.....
$175 \leqslant \text{height} < 195$	.....	.....

(i) Complete Grace's table. [2]

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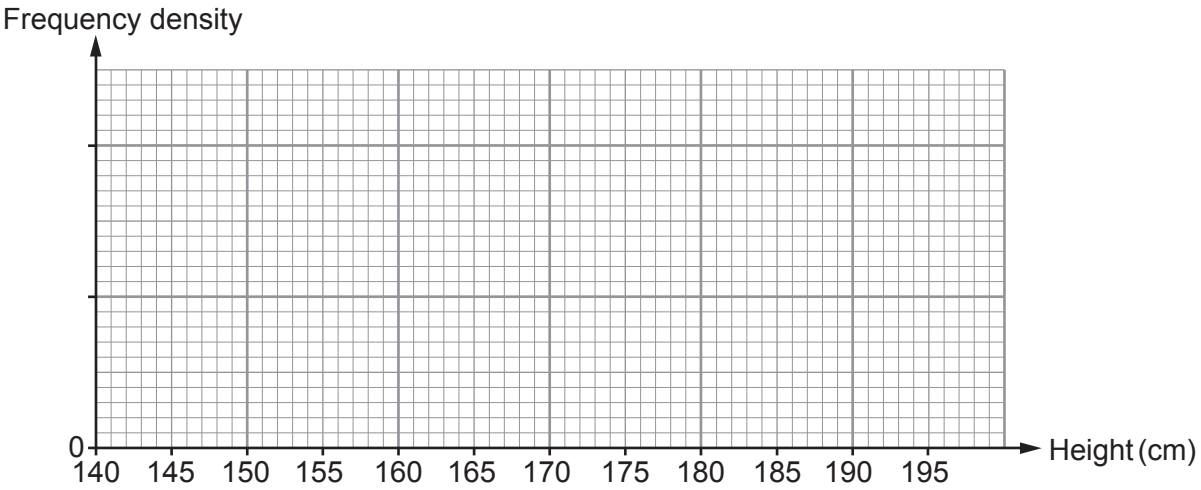
(ii) Use the graph paper below to draw Grace's histogram. [2]



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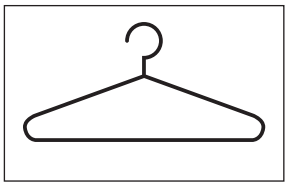
9. Hang-Up is a company that makes clothes hangers.
One type of hanger is made from a single length of metal wire that is bent to form the hanger.



(a) (i) The design for the main part of the hanger is shown below.
This part of the hanger is symmetrical.
It has straight sections of length 24 cm and 38 cm.
It also has curved sections that are arcs of a circle of radius 3 cm.

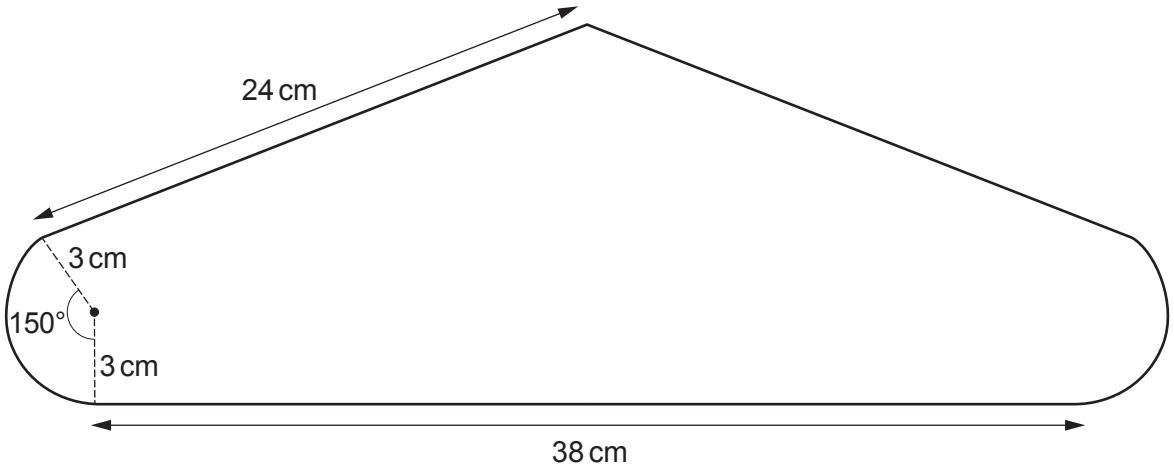


Diagram not drawn to scale

Calculate the length of metal wire needed for the main part of the hanger.
Give your answer in terms of π in its simplest form. [4]

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Examiner only

(ii) The length of wire needed for the hooked part of this hanger is $0\cdot1\dot{3}$ of the total length of wire needed for a hanger.

Write $0\cdot1\dot{3}$ as a fraction in its simplest form. [3]

(b) Hang-Up makes metal hangers in batches of 80.
Every 3 hours, it randomly samples 8 hangers from one batch of 80 for quality assurance.

The following numbers are taken from a table of random digits.

299986 890791 810130 955579 268884 301244

Use these numbers to choose 8 hangers from a batch of 80 hangers.
You must start with the first number in the list.
Describe clearly how you use the numbers to select the sample. [3]

Hangers chosen:

Examiner only

(c) Hang-Up also makes plastic hangers of various sizes.
Two of its plastic hangers have main parts that are mathematically similar.
These are shown below.

Diagram not drawn to scale

The total surface area of the larger hanger is 1·44 times the total surface area of the smaller hanger.

The height of the smaller hanger is 9 cm.
Calculate the height of the larger hanger. [3]

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Examiner only

10. Square-Off is a company that has designed new offices for its workers.

(a) The main building has a square floor with an area of 500 m^2.
The reception has a square floor with an area of 80 m^2.
The triangular region outside the buildings is paved.
A plan view of the buildings and the paved region is shown below.

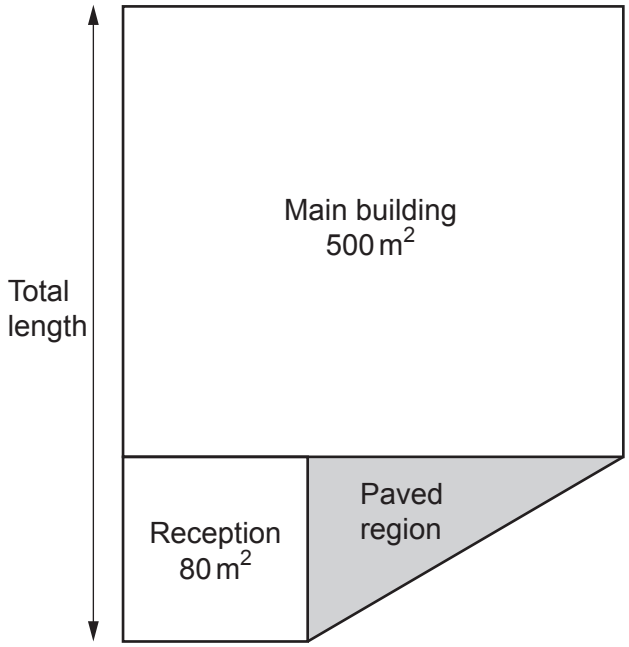

Diagram not drawn to scale

(i) Calculate the total length of the two buildings.
Give your answer in the form $a\sqrt{b}$, where a and b are integers and b is a prime number. [3]

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(ii) Calculate the area of the paved region.
You must show all your working. [2]

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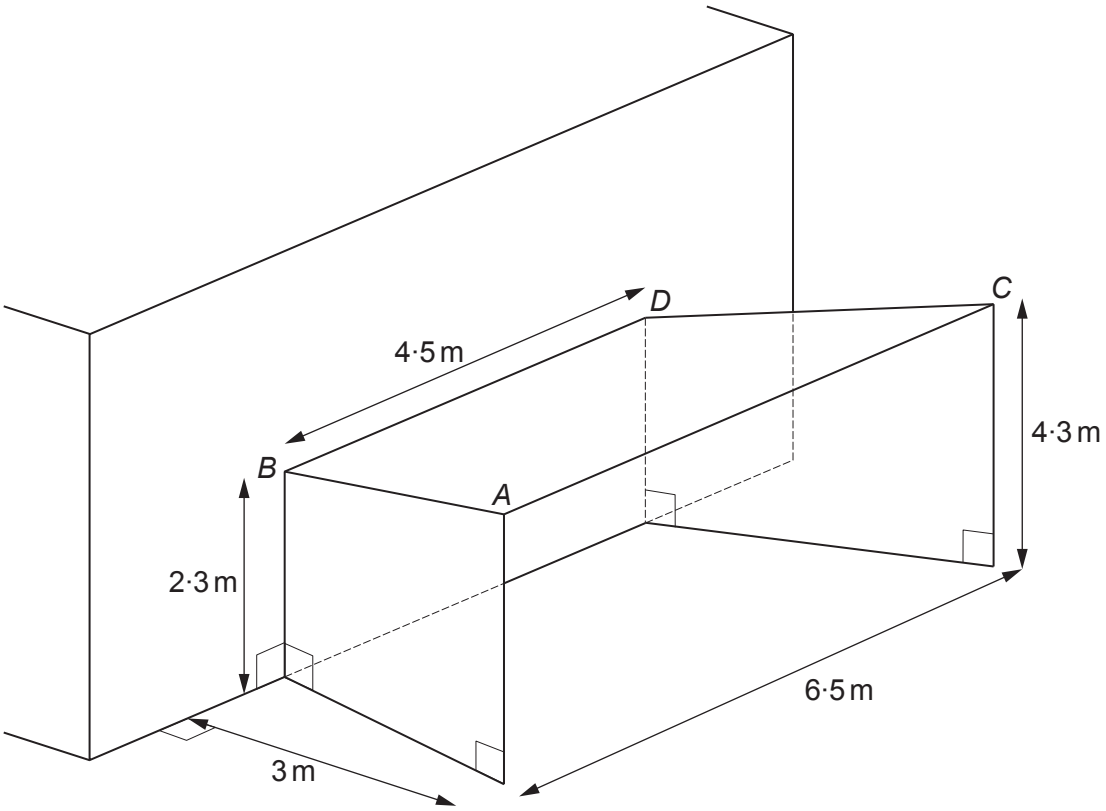
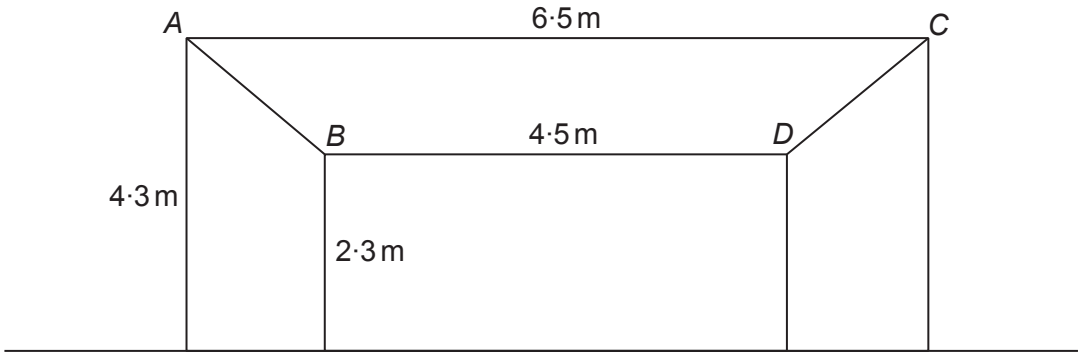
(b) Square-Off has designed an entrance to the reception.

The symmetrical structure is made from 3 connected metal sheets, each in the shape of a trapezium.



FRONT VIEW



Diagrams not drawn to scale

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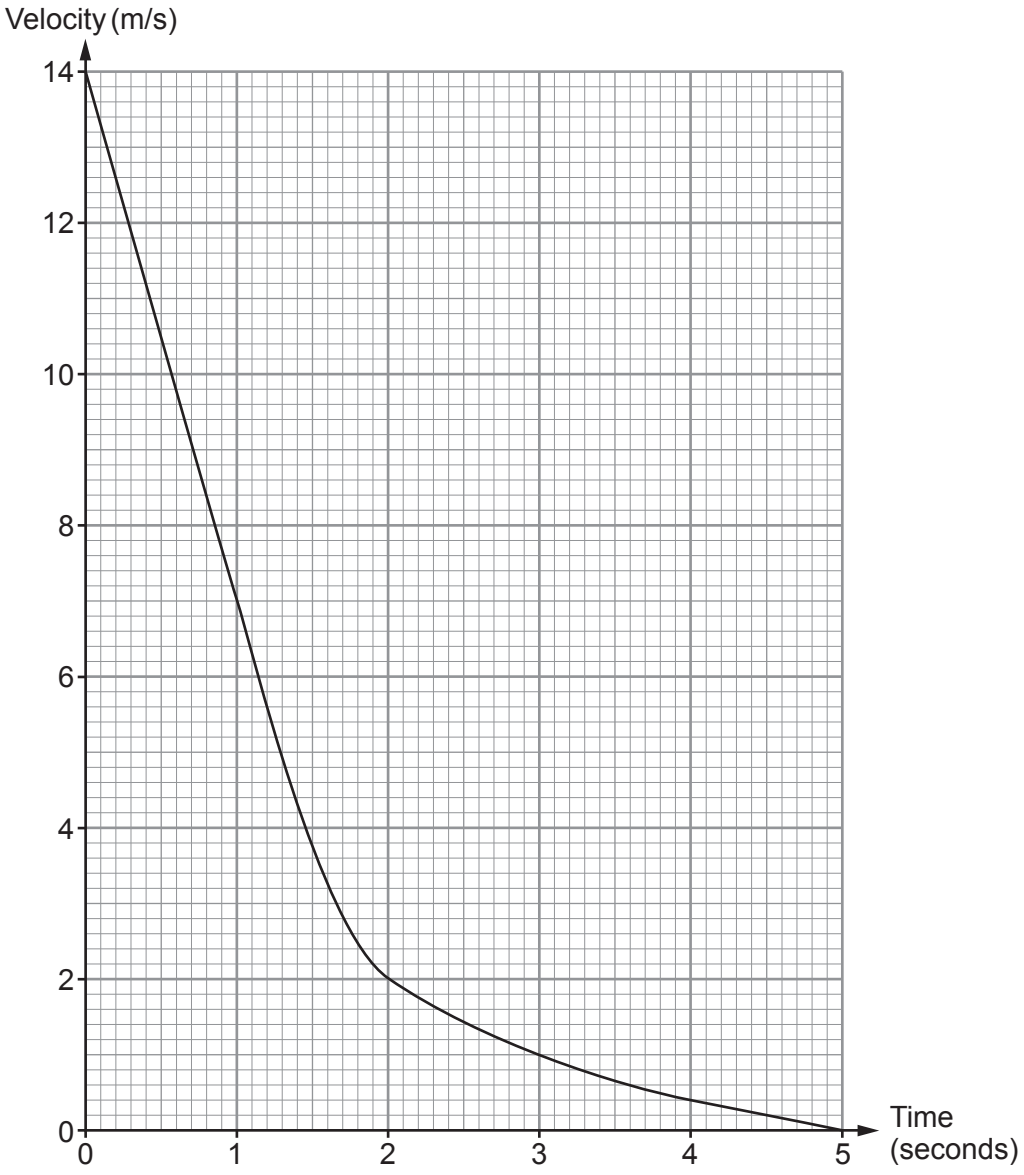
The 3 metal sheets are connected to each other along the edges *AB* and *CD*.
Adhesive strips are needed along the entire length of these edges.

Calculate the length of the adhesive strip *AB*.
Leave your answer as a surd. [4]

11. Ravi is driving his car to work.
He brakes sharply to stop at a set of traffic lights.

The velocity-time graph below shows the last 5 seconds of his journey before the car stops at the lights.



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(a) (i) Using 5 strips of equal width, calculate an estimate of the distance the car travelled in these 5 seconds. [3]

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(ii) Is your answer to part (a)(i) an overestimate or an underestimate?
You must give a reason for your answer. [1]

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(b) Estimate the deceleration of Ravi's car at time 2 seconds.
Give your answer in its simplest form. [3]

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END OF PAPER

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

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