Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U50-1

A19-3310U50-1

TUESDAY, 5 NOVEMBER 2019 – 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** the questions in the spaces provided.

If you run out of space, use the additional page at the back of the booklet. Question numbers must be given for the work written on the additional 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**, 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.	**2**	
2.	**8**	
3.	**6**	
4.	**8**	
5.	**6**	
6.	**7**	
7.	**5**	
8.	**11**	
9.	**14**	
10.	**8**	
11.	**5**	
Total	**80**	

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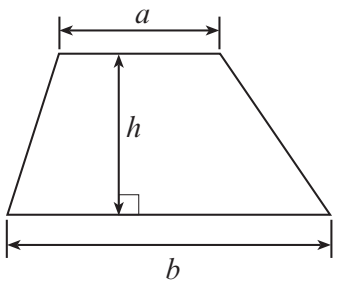
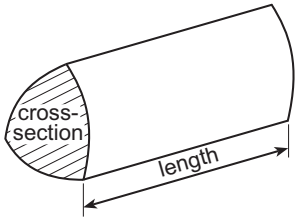
Formula List - Higher Tier

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

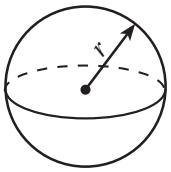


Volume of prism = area of cross-section × length



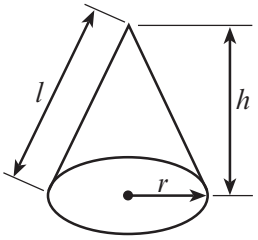
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

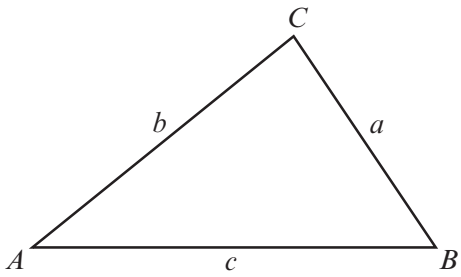


In any triangle ABC

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.

Examiner only

1. Catrin considers the data she needs to collect to find out if people are happy with their bank.

Catrin includes the following questions in her questionnaire.

Write down one set of possible groups that could be used as answer options for each of these questions. [2]

Question 1: How old are you?

Groups:

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Question 2: If you have a bank account, how happy are you with your bank?

Groups:

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Turn over.

Examiner only

2. Sioned and Rhodri are making a kite.

A diagram of the kite they are making is shown below.
AC and *DB* are the diagonals of the kite.
AE = 22 cm, *EC* = 28 cm and *DE* = 20 cm.

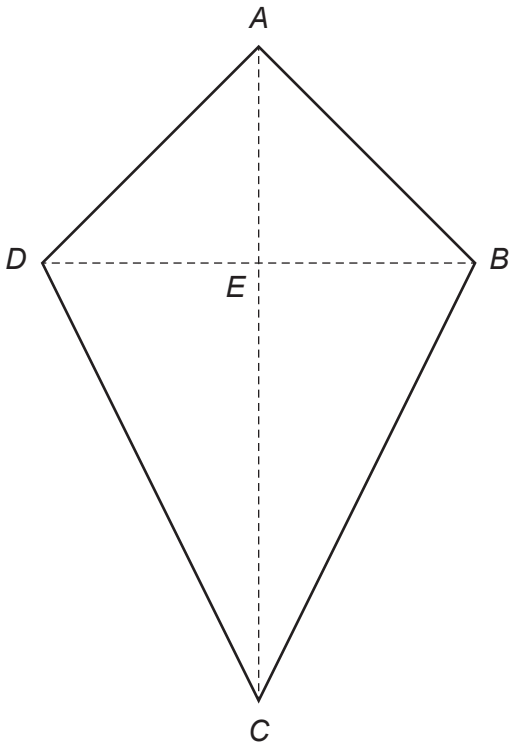

Diagram not drawn to scale

(a) Rhodri makes a statement about their kite being able to fly in strong wind,

"The length of the long diagonal must be at least 120% of the length of the short diagonal."

Assuming Rhodri is correct, should their kite be able to fly in strong wind?
You must show all your working. [4]

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Examiner only

(b) Sioned says,

"The best length for the tail on a kite depends on the area of the kite."

Sioned refers to the table below that she has seen on the internet.

Area of the kite, A	Best length for the tail
$A < 500\,\text{cm}^2$	2 m
$500\,\text{cm}^2 \leqslant A < 900\,\text{cm}^2$	2·4 m
$900\,\text{cm}^2 \leqslant A < 1200\,\text{cm}^2$	3·1 m
$1200\,\text{cm}^2 \leqslant A$	3·5 m

Work out the best length of tail for Sioned and Rhodri's kite.
You must show all your working. [4]

Examiner only

3. *(a)* An old recipe is given below.

Arrabiata pasta sauce
Serves 4 people

1 onion
2 × 0·88 lb tins of tomatoes
3 chillies

How many **kilograms** of tinned tomatoes are needed to make Arrabiata pasta sauce to serve 20 people? [3]

(b) A pasta factory in Italy produces 5 km of spaghetti per day.
How many centimetres of spaghetti will this factory produce in 7 days?
Give your answer in standard form. [3]

Examiner only

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

Agata is paid in pesos.

The tax rates are as follows:

Band	Taxable income	Tax rate
Personal allowance	Up to 200 000 pesos	0%
Standard rate	200 000 pesos to 500 000 pesos	10%
Further rate	over 500 000 pesos	35%

Agata's total earnings before tax are 600 000 pesos.

Calculate how much tax Agata is due to pay.
You must show all your working. [6 + 2 OCW]

Examiner only

5. *(a)* Gwilym is stacking 6 boxes in his garage.

The height of his garage is 2·5 m, correct to the nearest 10 cm.
5 of Gwilym's boxes each have a height of 40 cm, correct to the nearest 10 cm.
The other box has a height of 55 cm, correct to the nearest 5 cm.

Calculate the maximum possible gap between the stack of 6 boxes and the garage ceiling. [4]

Examiner only

(b) Inside one of the boxes is an old clock.
Gwilym takes the clock to be valued.
It is valued at £56.
The clock has decreased in value by 30% from last year.

Calculate how much the clock was worth last year. [2]

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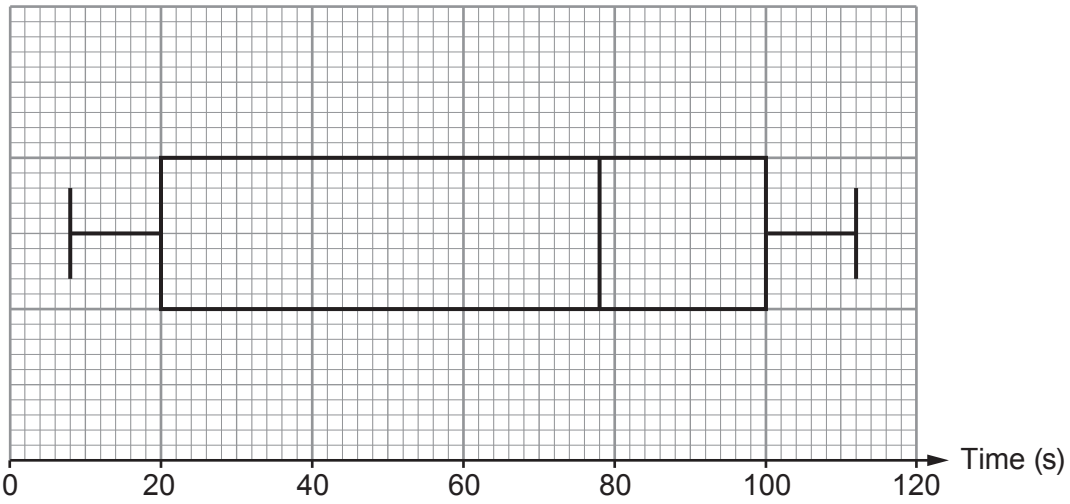
Turn over.

Examiner only

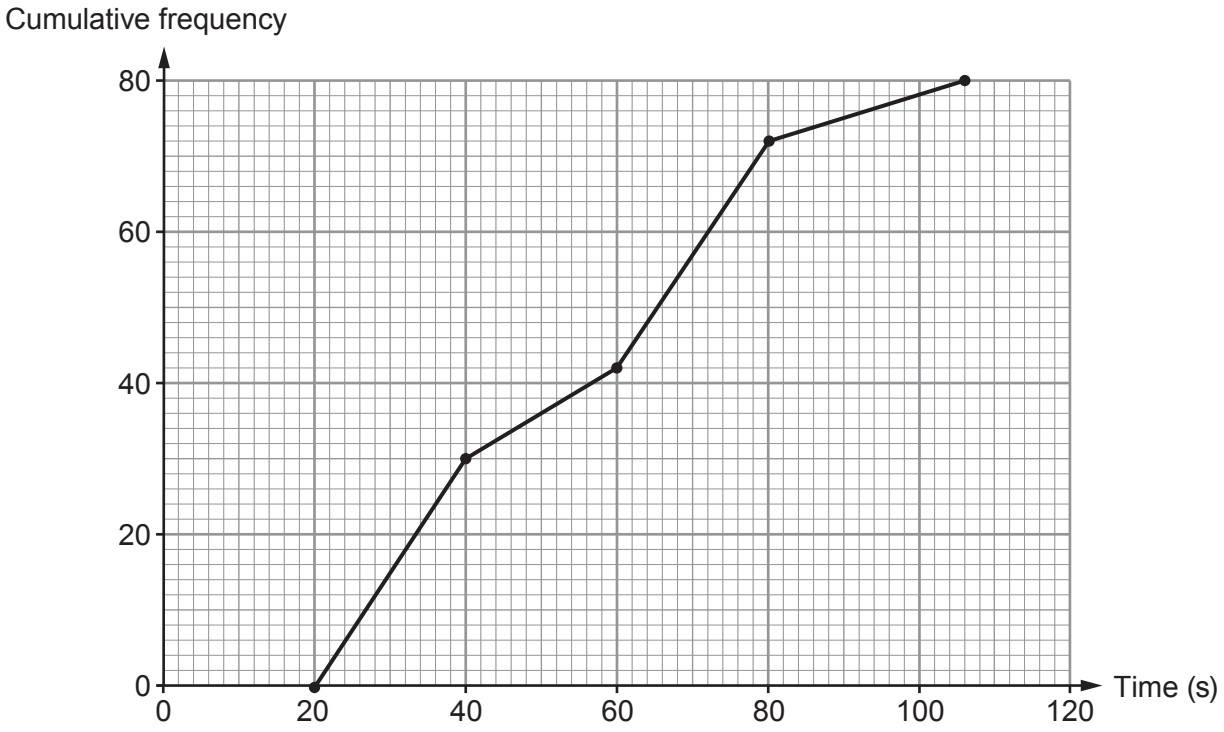
6. On 1st July every year, *Trefor* estate agents record the time from when a phone rings to when it is answered.
The time taken to answer the phone is recorded in seconds.

Trefor displays the data for their agents to see.
The displays for 1st July 2018 and 1st July 2019 are shown below.

1st July 2018
Time taken to answer the phone in seconds



1st July 2019
Time taken to answer the phone in seconds



Examiner only

Use the diagrams on the previous page to answer the following questions.

(a) What is the range of times taken to answer the phone for 1st July 2018?
Circle your answer. [1]

101 seconds 80 seconds 78 seconds 106 seconds 104 seconds

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(b) What is the maximum possible range of times taken to answer the phone for 1st July 2019?
Circle your answer. [1]

86 seconds 106 seconds 80 seconds 56 seconds 83 seconds

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(c) The manager of *Trefor* estate agents claims that there has been an improvement in the median time taken to answer the phone from 1st July 2018 to 1st July 2019.
Is this true?

Yes ☐ No ☐

You must show all your working. [2]

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(d) Complete the following statements.

(i) 'On 1st July 2018, 75% of the phone calls were answered within ..... seconds.' [1]

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(ii) 'On 1st July 2019, 75% of the phone calls were answered within ..... seconds.' [2]

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Examiner only

7. Mr Aston lives at 137 Ffordd Uchel.
He is ordering some new signs for his house and for his gatepost from a website.

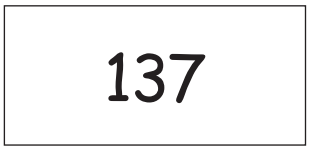

Diagram not drawn to scale

All the signs available on the website are **mathematically similar**.

He selects a rectangular sign for the front of his house.
It has a length of 42 cm and a height of 24 cm.
The digits 1, 3 and 7 on the sign are all 18 cm high.

The rectangular sign Mr Aston is considering for his gatepost has a height of 20 cm.

(a) Calculate the height of the digits 1, 3 and 7 on the sign Mr Aston is considering for his gatepost. [2]

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Height of the digits 1, 3 and 7 is ..... cm

Examiner only

(b) Mr Aston's gatepost is 30 cm wide.
Will the sign he is considering fit his gatepost?

Yes ☐ No ☐

You must show all your working and give a reason for your answer. [3]

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Examiner only

8. A boat company runs trips from Tenby to Caldey Island every day during the summer.

The company wants to provide services suited to its passengers. On one day, the company recorded the ages of its passengers.

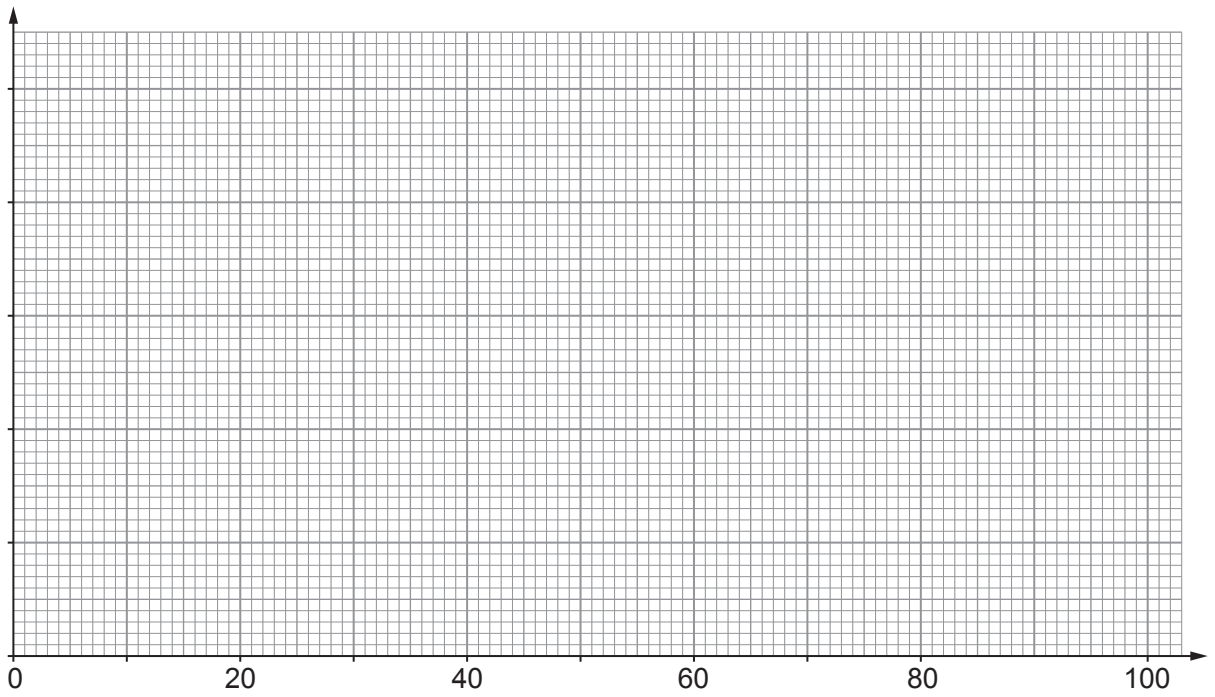
The table below shows the **frequency densities** of the different age groups recorded.

Age, x (years)	Frequency density
$0 \leqslant x < 20$	1·8
$20 \leqslant x < 35$	2·4
$35 \leqslant x < 50$	2
$50 \leqslant x < 70$	1·5
$70 \leqslant x < 100$	0·6

(a) Calculate an estimate of the **percentage** of passengers who were aged 60 or more. [5]

(b) On the graph paper opposite, draw a histogram to show the distribution of the ages of the passengers. [3]

Examiner only



(c) Next week, the boat company will give out a questionnaire.
The questionnaire will be given to a random sample of passengers from the first 40 passengers who board the boat.

Use the following list of random numbers to select a sample of 6 passengers from these 40 passengers.
You must start with the first number in the list.
Explain clearly how you are using the numbers to select the sample. [3]

4120	0558	8945	9111	7539
5286	6020	3730	5032	9937

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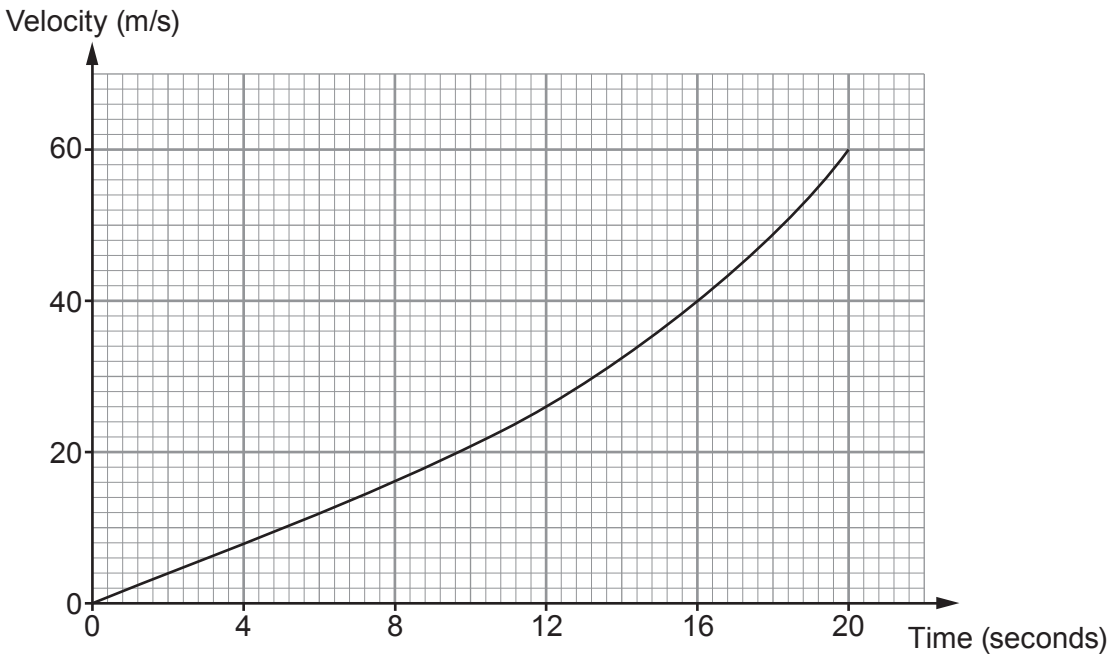
Passengers chosen ....

Turn over.

Examiner only

9. The velocity-time graph below shows the velocity of an aircraft for the first 20 seconds of take-off.



(a) Calculate an estimate of the acceleration of the aircraft at time 16 seconds. [3]

(b) Calculate an estimate of the distance travelled by the aircraft during the first 20 seconds of take-off.
Use 5 strips of equal width.
You must convert your answer into **miles**. Give your answer as a decimal. [5]

Examiner only

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Distance is ..... **miles**

(c) The aircraft carries cargo.
One customer wants to use the aircraft to transport a new product that is to be packaged in cuboid boxes, as shown below.

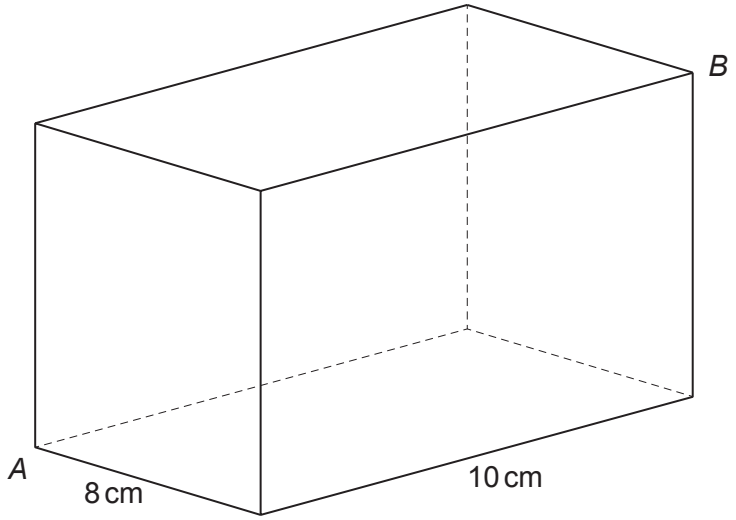

Diagram not drawn to scale

The boxes will meet the following conditions:

- The boxes will be of width 8 cm and length 10 cm.
- The length of the diagonal *AB* will be 14 cm.

Calculate the height of a box.
Give your answer in the form $a\sqrt{b}$ cm, where a and b are integers, and b is as small as possible. [6]

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Examiner only

10. Nicola makes party hats for young children.
The hats are in the shape of cones.
Nicola's design is shown below.

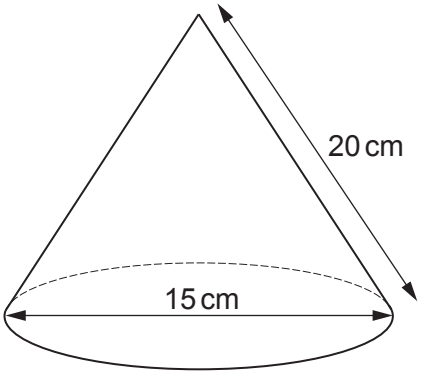

Diagram not drawn to scale

Nicola makes the hats by folding pieces of card that are in the shape of sectors of a circle.
The hats are formed when the straight edges meet.

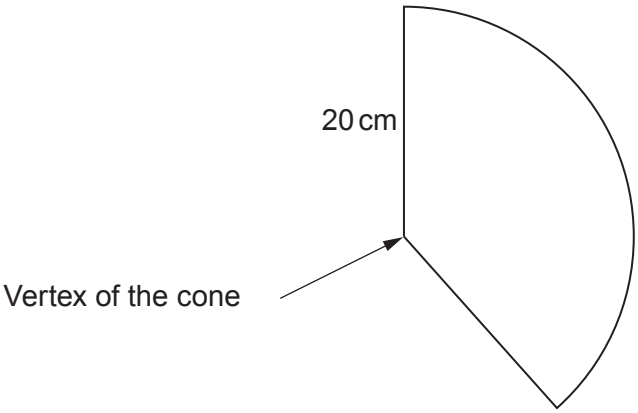

Diagram not drawn to scale

(a) Calculate the sector angle Nicola uses in her design. [4]

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Examiner only

(b) Nicola also makes party hats for adults.
They are made from pieces of card that are sectors of a circle, with **radius** 24 cm and sector angle 150º.

Nicola cuts each sector of a circle from a sheet of rectangular card that measures 24 cm by 50 cm.
Calculate the area of card that is wasted from each rectangular sheet.
Give your answer in terms of π in its simplest form. [4]

Examiner only

11. A company makes steel solids that each have a mass of 1 kg.
One of their solids is a square-based pyramid joined to a cuboid as shown below.

The base edges of the pyramid are of length 5 cm, and the height of the cuboid is 4 cm.
The density of the steel used by the company is 8 g/cm^3.

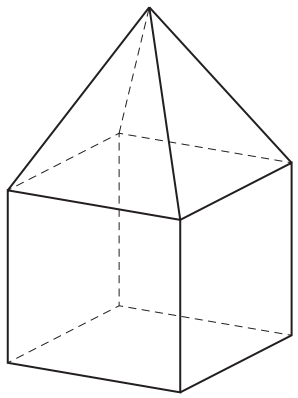

Diagram not drawn to scale

The complete solid has a mass of 1 kg.
Calculate the vertical height of the pyramid. [5]

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

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