Mathematics

Unit T4 **(With calculator)**

Higher Tier

[GMT41]   *GMT41*

MONDAY 11 JANUARY, 9.15 am–11.15 am

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in blue or black ink only. **Do not write with a gel pen.**
Answer **all twenty-one** questions.
All working should be clearly shown in the spaces provided since marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 100.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Functional Elements will be assessed in this paper.
Quality of written communication will be assessed in Questions **10** and **16**.
You should have a calculator, ruler, compasses and a protractor.
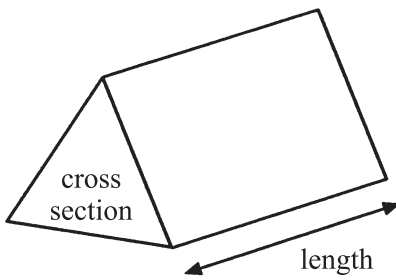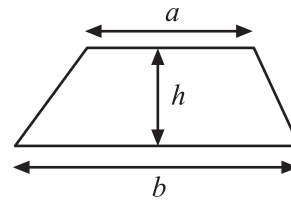The Formula Sheet is on page 2.

Formula Sheet
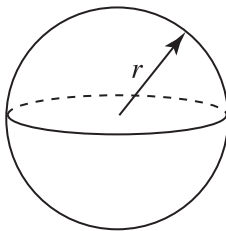
Volume of prism = area of cross section × length

cross section

length

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

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

Quadratic Equation
The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

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

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

Curved surface area of cone $= \pi r l$
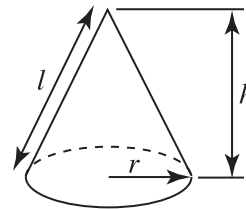
In any triangle ABC

Sine Rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

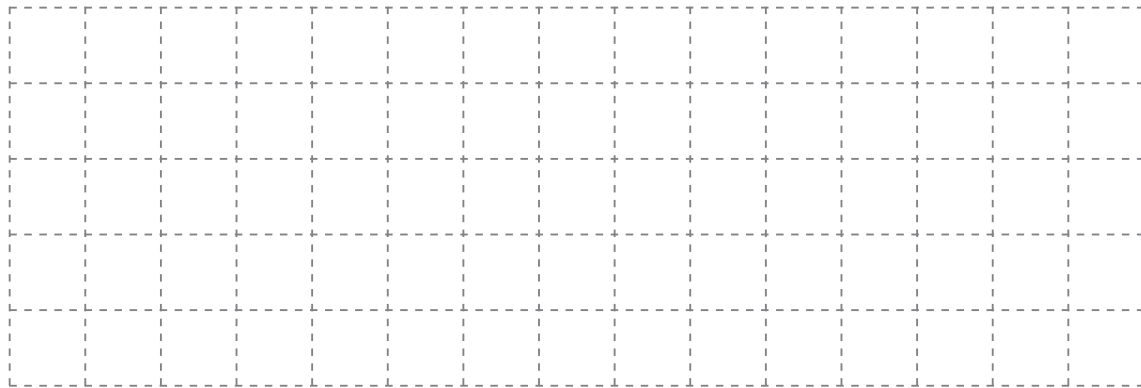**Cosine Rule:** $a^2 = b^2 + c^2 - 2bc \cos A$

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

1 In a group of 11 pupils, the number of days absent from school was recorded as listed below.

12   6   5   2   8   2   3   11   4   10   7

Draw a box plot for this data on the grid.

[4]

9860.05 **R**

24GMT4103

2 Two hundred pupils sat an English test. The cumulative frequency curve for the percentage marks gained is shown.

Number of pupils (y-axis)

Mark (less than or equal to) % (x-axis)
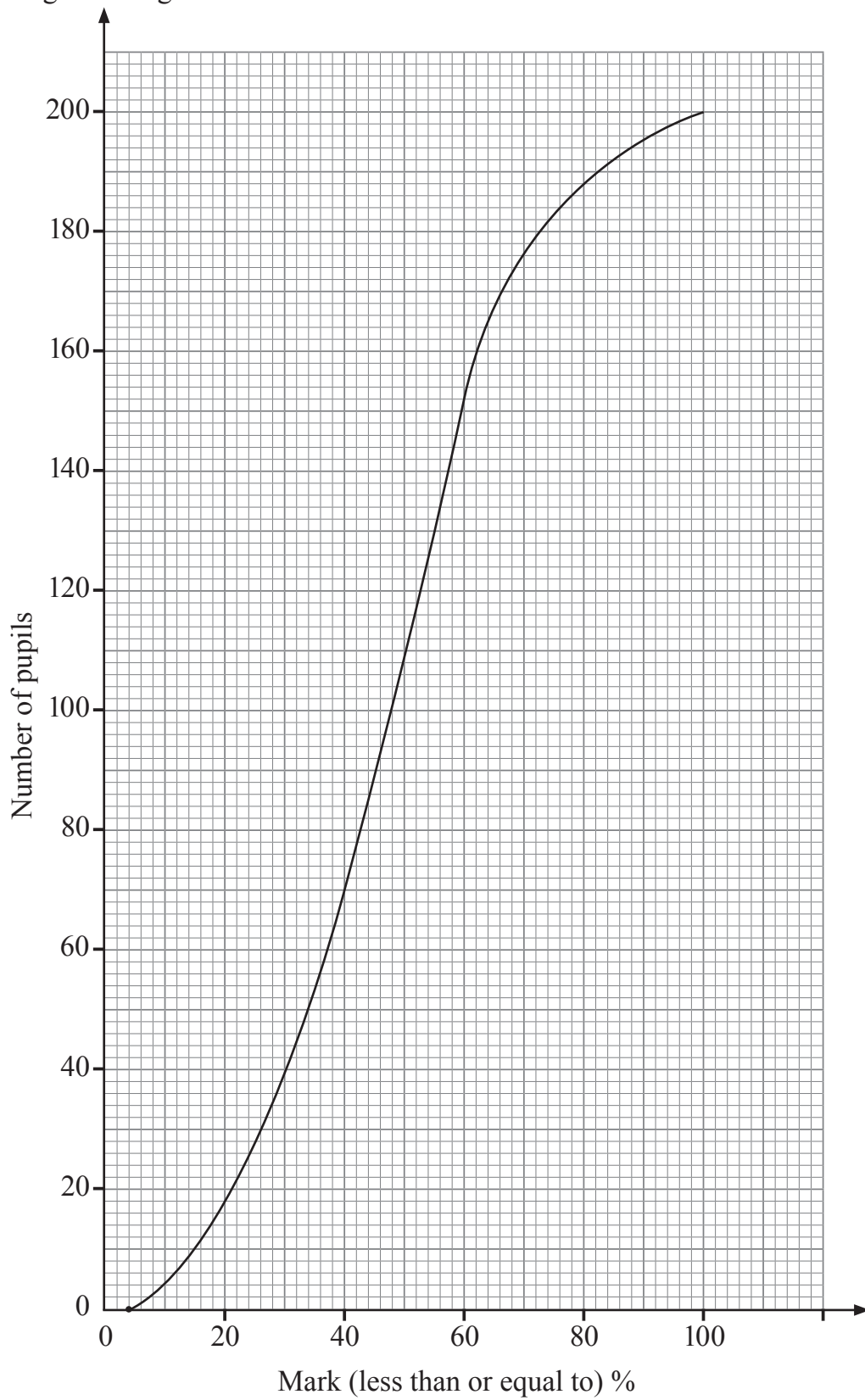
(a) Use the graph to complete table **(i)** and hence table **(ii)** below:

(i)

Percentage Mark	Cumulative Frequency
$\leqslant 20$	18
$\leqslant 40$	70
$\leqslant 60$	
$\leqslant 80$	
$\leqslant 100$	

[1]

(ii)

Percentage Mark	Frequency
$0 < p \leqslant 20$	18
$20 < p \leqslant 40$	52
$40 < p \leqslant 60$	
$60 < p \leqslant 80$	
$80 < p \leqslant 100$	

[2]

(b) Use the graph to estimate the median mark.

Answer _____ [1]

(c) Use the graph to estimate the range of marks for the top 30 pupils.

Answer _____ % [2]

[Turn over

3 The picture shows the dimensions of a label taken from a cylindrical tin of dog food.

The label covers all the curved surface of the tin with no overlap.
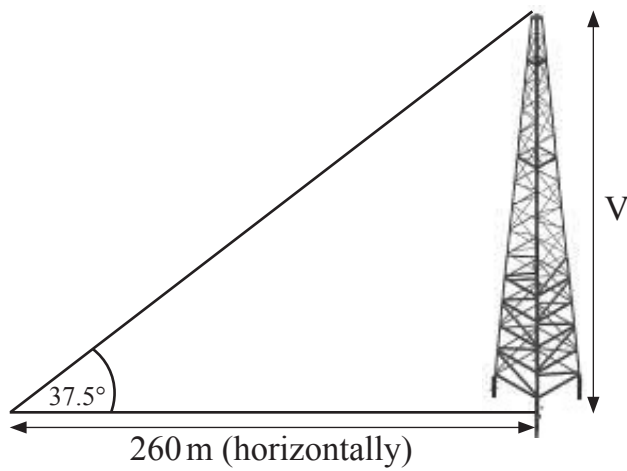
Calculate the volume of the tin.

Doggy Dog Food

10.5 cm

23 cm
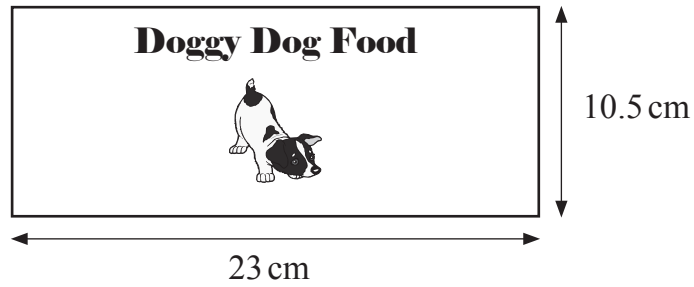
© CCEA

Answer _____ cm³ [4]

4 Calculate the height V of this vertical radio mast.

© CCEA

Answer _____ m [3]

5 The population of a town in 2014 was 80 058

This was a 65% increase on its population in 1994

What was the population in 1994?

Answer _____ [3]

[Turn over

9860.05 **R**

6 (a) Find the equation of the line joining the points A $(0, -1)$ and B $(6, -4)$.

Answer _____ [3]

(b) Find the equation of the line perpendicular to AB which passes through B.

Answer _____ [3]

24GMT4108

7 The total weight of 5 brown and 2 white eggs was 21.6 g.

The total weight of 3 brown and 5 white eggs was 23.6 g.

Write down two simultaneous equations and solve them to find the weight of a brown egg and the weight of a white egg.

You may assume that all brown eggs have the same weight and all white eggs have the same weight.

Show all your working.

Answer Brown egg weighs _____ g

White egg weighs _____ g [5]

[Turn over

8 Solve

$$\frac{3x - 2}{6} - \frac{x - 2}{3} = \frac{7}{4}$$

Show all your working.

A solution by trial and improvement will not be accepted.

Answer $x =$ _____ [4]

24GMT4110

9 The time (T) of swing of a pendulum varies as the square root of the length (L) of the pendulum.

When T = 1.8 seconds the length of the pendulum is 0.81 m.

(a) Find the formula for T in terms of L.

Answer T = _____ [3]

(b) Use your formula to find T when L = 1.21 m.

Answer _____ seconds [1]

(c) Find the value of L for which the time of swing is 0.5 seconds.
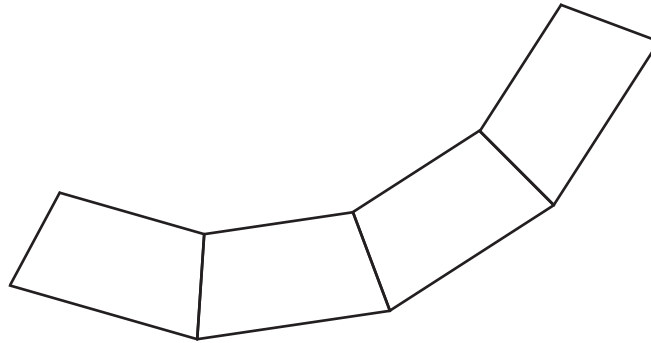
Answer _____ m [1]

[Turn over

Quality of written communication will be assessed in this question.

10 The diagram shows a tile in the shape of an isosceles trapezium.

Some of these tiles are put together as a path all the way around a garden as shown.

How many exterior sides will the path have?

Show all your working clearly.

Answer _____ [3]

11 The angle of elevation of the top of a vertical tower is 27°

From a point 30 metres closer, the angle of elevation is 36°

Calculate the height of the tower.

Answer _____ m [5]

9860.05 **R**

24GMT4113

12 (a) Factorise fully

$$3x^2 - 27y^2$$

Answer _____ [3]

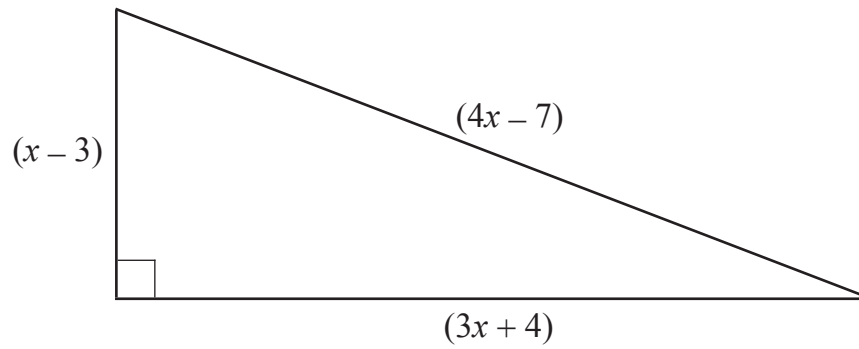**(b)** Simplify fully

$$\frac{3x^2 - 27y^2}{x^2 - 6xy + 9y^2}$$

Answer _____ [3]

13 In the triangle shown find x and hence the length of the longest side.

A solution by trial and improvement will not be accepted.

Show all your working.

Answer $x =$ _____ longest side = _____ [7]

14 A car dealer sells petrol cars and diesel cars.

In 2015 there were 876 petrol cars sold. This was 36.5% of the total number sold.

Janice questions a sample of all the people who had bought a car from this dealer in 2015.

Her sample was stratified by fuel type.

Estimate the number of diesel cars in her sample of 160.

Answer _____ [4]

15 Paula recorded the time, in seconds, of each of the songs stored on her phone.

She plans to draw a histogram for the data. Some of the data is shown in the table.

time (in seconds)	frequency	height of bar (cm)
$90 < t \leqslant 140$	30	6
$140 < t \leqslant 160$	8	
$160 < t \leqslant 200$		1.5

Complete the table. [4]

24GMT4116

Quality of written communication will be assessed in this question.

16 Without using a calculator evaluate
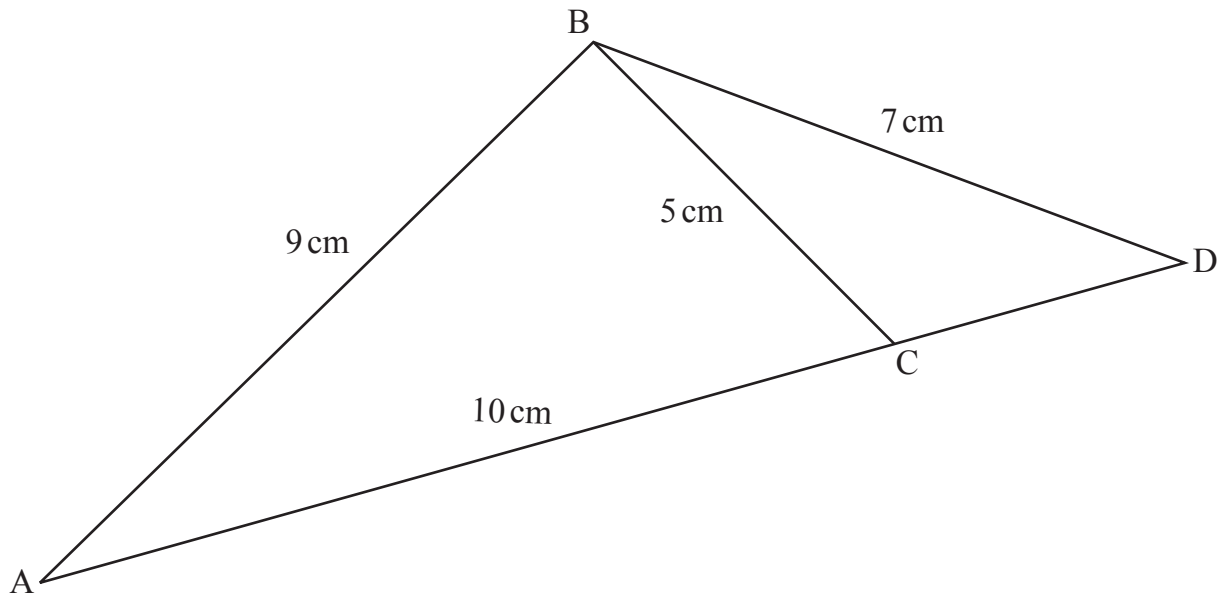
$$32^{\frac{6}{5}} \div 0.25^{-0.5}$$

Show all your working.

Answer _____ [3]

17 The triangle ABC in the diagram shown has sides of 5, 9, 10 cm.
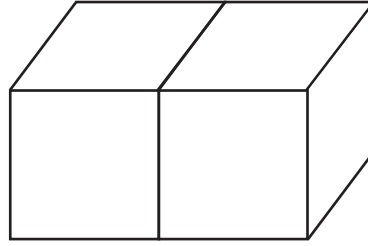
BD has length 7 cm. ACD is a straight line.

Calculate the size of the angle BDC.

Answer _____° [5]

18

Two cubes, each of side 1 cm, are set side by side.

Calculate the angle between the base and the space diagonal from the bottom left hand corner to the top right hand corner.

Answer _____° [3]

19 Solve the simultaneous equations

$$x + 2y = -3 \quad \text{and} \quad x^2 - 2xy = 20$$

Answer _____ [7]

20 An events manager orders 600 sandwiches for a finger buffet. This will give all the guests the same number of sandwiches each.

At the last minute 10 extra guests arrive. This will still give all the guests the same number of sandwiches each, but two less each than previously calculated.

Let n be the original number of guests. Form an equation in n and solve to find n.
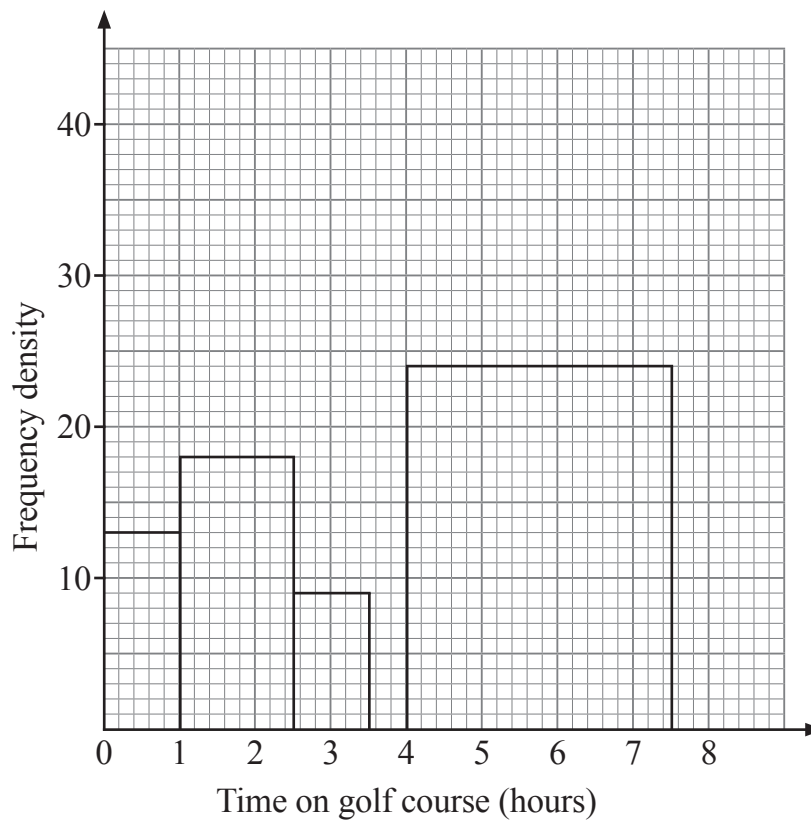
Answer n = _____ [6]

21 The histogram represents some information about the length of time a number of golfers spent on the golf course one Saturday. No one spent more than $7\frac{1}{2}$ hours on the course.

Frequency density (vertical axis, marked 10, 20, 30, 40)

Time on golf course (hours) (horizontal axis, 0 to 8)

The charges for using the golf course are shown in the table below.

Length of time	Up to 2.5 hours	2.5 up to 3.5 hours	3.5 to 4 hours	Over 4 hours
Cost (£)	25	30	35	40

The amount of money raised for the Saturday was £5295

Use all the given information to complete the missing bar on the histogram.

Show all your working clearly.

[7]

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For Examiner's use only	
Question Number	**Marks**
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Total Marks	

Examiner Number

9860.05 **R**

24GMT4124