

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4351/02



W16-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. MONDAY, 11 January 2016

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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.

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.

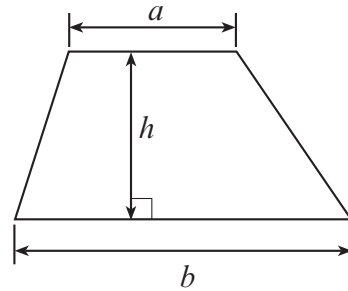
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **8**.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	2	
2.	6	
3.	2	
4.	4	
5.	4	
6.	3	
7.	4	
8.	8	
9.	4	
10.	4	
11.	3	
12.	4	
13.	6	
14.	6	
15.	5	
Total	65	

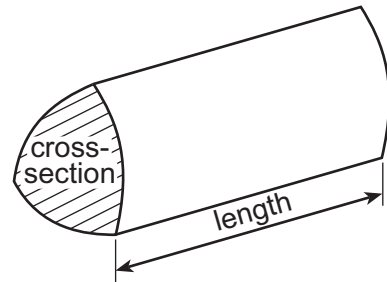
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Formula List

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

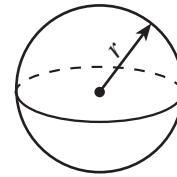


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



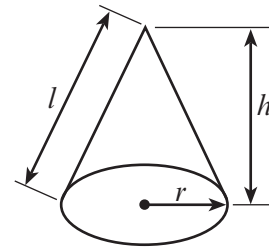
$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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



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

$$\text{Curved surface area of cone} = \pi r l$$

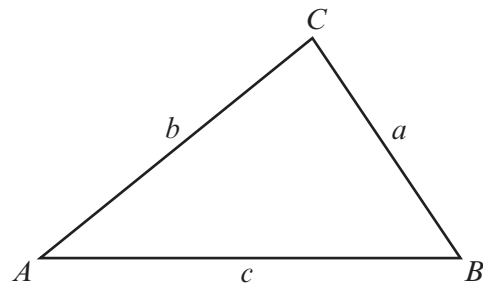


In any triangle ABC

$$\text{Sine rule} \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\text{Cosine rule} \quad a^2 = b^2 + c^2 - 2bc \cos A$$

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

1. A piece of land is to be used as a car park.
The shape and dimensions of the land are shown below.

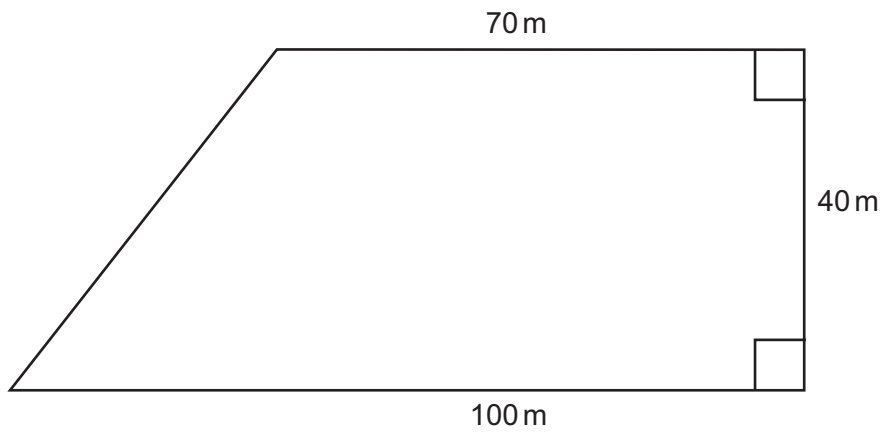


Diagram not drawn to scale

Calculate the area of this piece of land.

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2. A scientist is conducting an experiment where an object is placed in a temperature-controlled container.

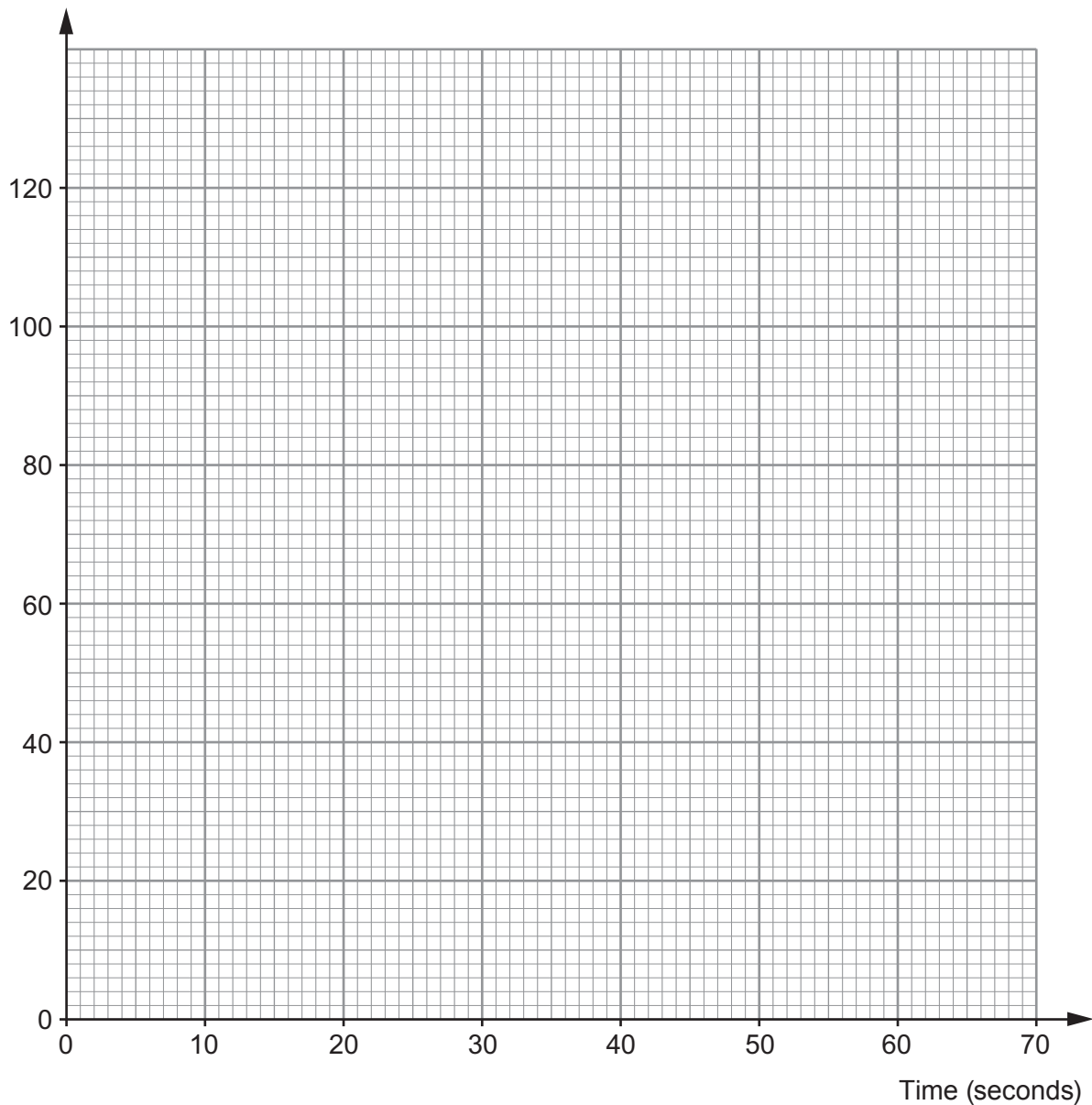
The following four steps are taken after the object is placed in the container.

- Step 1: Set the temperature at 20°C and start the timer.
- Step 2: Increase the temperature at a constant rate of 2°C per second for 30 seconds.
- Step 3: Keep the temperature constant for 10 seconds.
- Step 4: Reduce the temperature at a constant rate so that it is again 20°C at a time of 60 seconds from the start of the experiment.

(a) Show this information on the graph below.

[4]

Temperature ($^{\circ}\text{C}$)



- (b) What was the rate at which the temperature decreased?
Give your answer in °C per second.

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Rate of decrease = °C per second

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3. Calculate $\sqrt[3]{(8.5 - 3.6)^2}$, correct to 2 significant figures.

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4. (a) The Sharks swimming club has 18 members.
The number of medals won by the Sharks over the last year is summarised in the table below.

Medals won	Number of members
5	4
8	6
9	7
13	1

Calculate the mean number of medals won per member of the Sharks club.
You must show all your working.

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- (b) The Dolphins is a different swimming club with 10 members.
They also won some medals last year.
One member of the Dolphins won 8 medals last year.
The range of the number of medals won by members of this club was 4.

Which club had the member with the most medals?
You must explain how you decided on your answer.

[1]

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- 5. Dewi was driving along a 10 mile stretch of road that had a speed limit of 40 mph.

The time was 14:50 as Dewi's car entered this speed limit zone.
As he left the 10 mile zone, the time was 15:10.

Calculate Dewi's average speed over this 10 mile journey.
Could Dewi have driven faster than the speed limit during this journey? Explain your answer.

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- 6. Would a cylindrical can of radius 5 cm and height 14 cm be able to contain 1 litre of liquid?
You must show all your working and explain your decision.

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7. Thomas invests £5720 for 2 years at 3% per annum compound interest.
Find the compound interest earned in the 2 years.
Give your answer correct to the nearest penny.

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8. You will be assessed on the quality of your written communication in this question.

A company has challenged each of its salespeople to show an increase in their sales total each year. This increase should be at least 6% of their sales total for the previous year.

In 2013 both Ms Farah and Mr Price had a sales total of £18 000.

Their sales totals for 2013, 2014 and 2015 were as follows.

	<u>Ms Farah</u>	<u>Mr Price</u>
2013	£18 000	£18 000
2014	£22 000	£20 000
2015	£23 000	£21 500

Write a short note (no more than three lines) to each of these two salespeople to inform them of how well, or otherwise, they have met the challenge given to them each year.

You must show all the calculations necessary to support your notes.

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Dear Ms Farah,

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Dear Mr Price,

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10. A window cleaning company has been asked to clean the glass on 36 identical large greenhouses owned by a fruit farmer.
On the first day, 5 cleaners managed to clean the glass on 15 of the greenhouses in 8 hours.
The cleaning company wishes to complete the cleaning of the remaining 21 greenhouses within 6 hours on the second day.

What is the minimum number of cleaners that should be used on the second day?
You may assume that all the cleaners work at the same rate.

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- 11. The members of a rock band think that they can perform live on stage at two concerts, both held on the same date.
The first concert is held in London and the second in New York.

Use the following information to decide if it is possible.

- The time in London is 5 hours ahead of the time in New York.
- Both concerts start at 6 p.m. and end at 11 p.m. local time.
- The band will perform on stage for 20 minutes at each concert.
- The flight time between London and New York is 7 hours 20 minutes.
- As it is a charity event, the two cities, airports and airline have all guaranteed that
 - (i) the time from leaving the stage in London to the plane taking off will be 1 hour,
 - (ii) the time between the plane landing and the band reaching the stage in New York will be 40 minutes.

You must show all your working and clearly explain how you decided whether it is possible or not possible. [3]

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12. (a)



SALE
45% OFF
Now only £451

What was the original price of the sofa being advertised?

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(b) The following headline is seen in a financial paper.

'Denham Ltd announce a share price of £48.

Up $\frac{1}{3}$ on last year's price.'

What was the share price last year?

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13. (a) Rachel and Eleri both ran in a marathon race.

Rachel completed the race in 2 hours and 54 minutes, measured correct to the nearest minute.

Eleri completed the race in 3 hours and 7 minutes, measured correct to the nearest minute.

What was the maximum possible difference between their race times? [2]

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- (b) The length of a side of a square piece of land is measured correct to the nearest metre.

The largest possible area of this land is calculated to be 756.25m^2 .

What is the least possible area of this land? [4]

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14. (a) A sector of a circle of radius 30 cm subtends an angle of 42° at the centre as shown below.

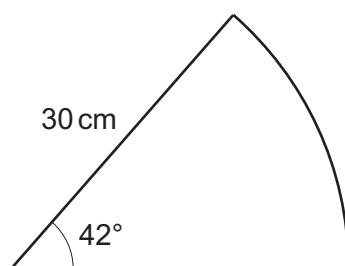


Diagram not drawn to scale

Calculate the total perimeter of the sector.

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- (b) A sector of a circle of radius 30 cm has an area of 534 cm^2 as shown below.

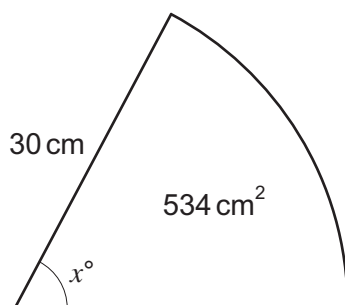


Diagram not drawn to scale

Calculate the size of angle x .

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15. A child’s wooden toy is made up of a solid hemisphere symmetrically attached to one face of a solid cube, as shown below. The radius of the circular face of the hemisphere is r centimetres. The diameter of the circular face has the same length as the sides of the cube.

Examiner only

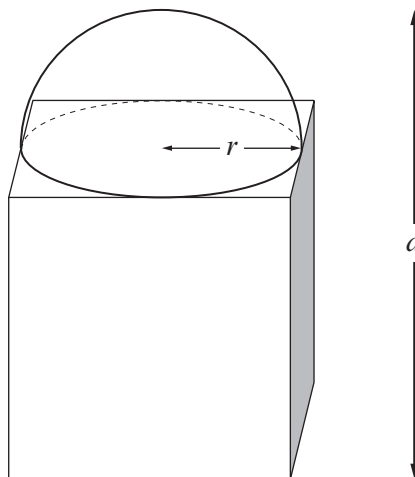


Diagram not drawn to scale

The volume of the whole toy is 1261.8 cm^3 .
Calculate the height, d , of the toy.

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END OF PAPER