GCSE

3310U60-1

THURSDAY, 10 NOVEMBER 2022 – MORNING

MATHEMATICS – NUMERACY

UNIT 2: CALCULATOR – ALLOWED

HIGHER TIER

1 hour 45 minutes plus your additional time allowance

A CALCULATOR WILL BE REQUIRED FOR THIS EXAMINATION

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	9	
2.	12	
3.	13	
4.	8	
5.	6	
6.	7	
7.	13	
8.	12	
Total	80	

ADDITIONAL MATERIALS

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

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula Booklet.

A separate Diagram Booklet.

Model for Question 7 (a).

The Diagram Booklet MUST be handed in to the invigilators and sent for marking.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball – point pen, black felt tip or your usual method.

Write your name, centre number and candidate number in the spaces on the front cover.

Answer ALL questions.

Write your answers in the spaces provided.

If you run out of space, use the additional page(s) at the back of the booklet. Question numbers must be given for the work written on the additional page(s).

Take π as $3{\cdot}14$ or use the π button on your calculator.

(Turn over)

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.

1. **IN THIS QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.**

Last year, Viktor's total income before tax was 28 000 euros.

Look at the table for Question 1 in the separate Diagram Booklet. The table shows the tax bands, taxable income and tax rates for last year.

continued on the next page . . .

Question 1 continued

Viktor has already paid 3600 euros towards his income tax bill for last year.

Calculate how much income tax Viktor still owes.

You must show all your working.

(Turn over)

[7 marks + 2 marks OCW]

2. Delyth and Ronnie are both students at the local college.

(a) Look at the diagram for Question 2 (a) in the separate Diagram Booklet. The diagram is NOT drawn to scale.

Their houses and the college are all joined by straight roads, as shown in the diagram.

continued on the next page . . .

Question 2 (a) continued

Delyth usually walks directly to college.

Calculate how much further Delyth has to walk if she passes Ronnie's house on her way to college.

[5 marks]

continued on the next page . . .

Question 2 continued

2. (b) Look at the table for Question 2 (b) in the separate Diagram Booklet.

35 students were asked how far they travelled to the college. The results are recorded in the table.

continued on the next page . . .

Question 2 (b) continued

2. (b) (i) Ronnie is one of these 35 students.

He walks 200 m directly to college.

Does Ronnie travel further than the median distance travelled by these 35 students?

Yes ☐

No ☐

Can't tell ☐

continued on the next page . . .

Question 2 (b) (i) continued

You must give a reason for your answer.

[1 mark]

continued on the next page . . .

Question 2 (b) continued

2. (b) (ii) Calculate an estimate of the mean distance these 35 students travelled to the college.

Estimate of the mean distance travelled by these 35 students is

_____ m [4 marks]

continued on the next page . . .

Question 2 continued

2. (c) There are 140 students who travel by bus to and from college.

Delyth wants to find out why these students do not walk to college.

She has decided to use a systematic sampling method to select 7 of these students to form a discussion group.

continued on the next page . . .

Question 2 (c) continued

The names of all the 140 students are in a list. Delyth has randomly selected the 2nd student in the list to join the discussion group.

Complete the table on the next page to give the positions in the list of the 7 students selected to join the discussion group.

Student	Position in the list
1	2nd
2	
3	
4	
5	
6	
7	

[2 marks]

3. (a) 10 years ago, Matteo bought a car for £4500

His car depreciated in value by 20% in the FIRST year.

In each of the following years, his car depreciated by 14% of its previous year's value.

Show that the value of Matteo's car is now less than £950

You must show all your working.

[3 marks]

continued on the next page . . .

Question 3 continued

3. (b) Matteo's car insurance has increased by 25% from the amount he paid last year.

His car insurance is £750 this year.

Calculate the amount Matteo paid for his car insurance last year.

Matteo paid £ _____

for his car insurance last year.

[2 marks]

continued on the next page . . .

Question 3 continued

3. (c) Look at the diagram for Question 3 (c) in the separate Diagram Booklet. The diagram is NOT drawn to scale.

The diagram shows the front of Matteo's garage, labelled *ABCDE*.

In the diagram,
the total height of the garage is 320 cm

$AB = BC$

$CD = 240$ cm

Angle $BCA = 33°$

continued on the next page . . .

Question 3 (c) continued

Calculate the width of Matteo's garage.

(Turn over)

[5 marks]

continued on the next page . . .

Question 3 continued

3. (d) Look at the diagram for Question 3 (d) in the separate Diagram Booklet. The diagram is NOT drawn to scale.

The diagram shows a plan view of Matteo's car inside his garage.

The length of Matteo's car is 400 cm, correct to the NEAREST 10 cm.

The length of his garage is 550 cm, correct to the NEAREST 10 cm.

continued on the next page . . .

Question 3 (d) continued

When Matteo parks his car, he leaves exactly 70 cm between the car and the back wall of the garage.

Calculate the maximum length of the space between Matteo's car and the garage door.

[3 marks]

4. (a) The population of Barbados in 1644 was said to be 30 000

By 1964, the population of Barbados had increased by 682%.

From 1964 to 2014, the population of Barbados increased by a further 20%.

Calculate the population of Barbados in 2014.

You must show all your working.

[3 marks]

continued on the next page . . .

Question 4 continued

4. (b) The area of Barbados is 432 km^2

The population of Barbados in September 2019 was 287 106

Calculate the population density of Barbados in September 2019.
Give your answer correct to 2 significant figures.

[3 marks]

continued on the next page . . .

Question 4 continued

4. (c) The density of some of the sand in Barbados is 1442 kg/m^3

Express this density in g/cm^3

[2 marks]

5. Look at Diagram 1 and Diagram 2 for Question 5 in the separate Diagram Booklet. The diagrams are NOT drawn to scale.

Gareth's living room is rectangular. It has a doorway close to one of the corners of the room.

Diagram 1 is a plan view of Gareth's living room, showing the position of the open door.

Diagram 2 is the front view of the living room and the position of the open door.

continued on the next page . . .

Question 5 continued

Gareth's living room door is 76 cm wide.

The door hinge is 41 cm from the corner of the room.

When the door is fully open, it touches the wall 64 cm from the corner.

continued on the next page . . .

Question 5 continued

Look at Diagram 3 for Question 5 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

Diagram 3 is a plan view of the door and corner of the room.

The shaded region in Diagram 3 is an unusable part of his living room floor.

By first finding the size of angle *x*, calculate the area of this unusable part of Gareth's living room floor.

_____

_____

(Turn over)

(Turn over)

41

[6 marks]

(Turn over)

6. Rebecca needs to save £10 000 for the deposit to buy a new house. She has opened a savings account with Dragon Building Society. The account has a nominal annual rate of 5•4%, with interest paid on the last day of every month.

Look at the information provided for Question 6 in the separate Diagram Booklet.

continued on the next page . . .

Question 6 continued

Rebecca opened the account on 1st August 2022, depositing £335 into the account.

She will deposit £335 into the account on the 1st day of every month.

(a) At the end of which month, and in which year, will Rebecca have the £10 000 she needs?

You must show all your working.

(Turn over)

Rebecca will have the £10 000 at the

end of _____

in the year _____

[4 marks]

continued on the next page . . .

Question 6 continued

6. (b) Calculate the AER for Rebecca's savings account. Give your answer as a percentage, correct to 2 decimal places.

[2 marks]

continued on the next page . . .

Question 6 continued

6. (c) Rebecca's friend, Seren, opened a similar savings account with Dragon Building Society on 1st June 2020, depositing £300

Seren then deposited £300 into the account on the 1st day of every month.

By 30th November 2021, Seren had £5636.84 in the account.

continued on the next page . . .

Question 6 (c) continued

How much interest had Seren received?

Circle your answer.

£236.84
£636.84
£836.84
£3836.84
£4136.84

50

[1 mark]

7. (a) The Great Pyramid of Giza, in Egypt, is the oldest of the Seven Wonders of the Ancient World.

Ask for the model for Question 7 (a). The model is NOT made to scale. The model represents the Great Pyramid of Giza.

It is a square – based pyramid of base length 230 m.

It stands on horizontal ground.

Each of the sloping EDGES of the pyramid has a length of 217 m.

continued on the next page . . .

Question 7 (a) continued

Calculate the volume of the Great Pyramid of Giza.

(Turn over)

[7 marks]

continued on the next page . . .

Question 7 continued

7. (b) (i) A gift shop in Giza makes souvenir pyramids.

They are based on the Great Pyramid.

The shop paints all the faces of the souvenir pyramids. The base length of a souvenir pyramid is related to the total surface area to be painted by the formula shown on the next page.

continued on the next page . . .

Question 7 (b) (i) continued

$$b = \sqrt{\frac{A}{1 + \tan 58^\circ}}$$

where:

- ***b*** **is the base length**
- ***A*** **is the total surface area to be painted.**

Calculate the total surface area to be painted of a souvenir pyramid that has a base length of 12 cm.

[3 marks]

continued on the next page . . .

Question 7 (b) continued

7. (b) (ii) The Sphinx is another ancient monument that sits next to the Great Pyramid. The shop sells two sizes of Sphinx souvenirs that are mathematically similar.

Look at the diagrams for Question 7 (b) (ii) in the separate Diagram Booklet.

The diagrams are NOT drawn to scale. The diagrams are simplified diagrams of the Sphinx souvenirs.

continued on the next page . . .

Question 7 (b) (ii) continued

The small souvenir has a length of 15 cm and a total surface area to be painted of 400 cm^2

The large souvenir has a length of 31·5 cm.

Calculate the total surface area to be painted of the large souvenir.

[3 marks]

8. Look at the diagram for Question 8 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

Two cruise ships, The Explorer and The Magellan, leave the same port at 06:30

The Explorer sails at a speed of 30 km/h on a bearing of 051°

The Magellan sails at a speed of 35 km/h.

The angle between the courses of the two ships when they set sail is 49°

continued on the next page . . .

Question 8 continued

8. (a) At 11:00, The Magellan comes to a stop due to engine failure. The diagram shows the positions of the two ships at 11:00

Immediately, The Explorer then heads directly towards The Magellan to pick up its passengers.

It travels at a speed of 30 km/h.

continued on the next page . . .

Question 8 (a) continued

Calculate the time, to the nearest minute, when The Explorer will reach The Magellan.

(Turn over)

(Turn over)

Time when the Explorer will reach

The Magellan is _____

[7 marks]

continued on the next page . . .

Question 8 continued

8. (b) Calculate the bearing The Explorer has to sail on from 11:00 onwards to arrive at The Magellan.

(Turn over)

[5 marks]

END OF PAPER

TOTAL 80 MARKS

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

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MATHEMATICS – NUMERACY

UNIT 2: CALCULATOR – ALLOWED
HIGHER TIER

The Diagram Booklet MUST be handed in to the invigilators and sent for marking.

Diagram Booklet

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

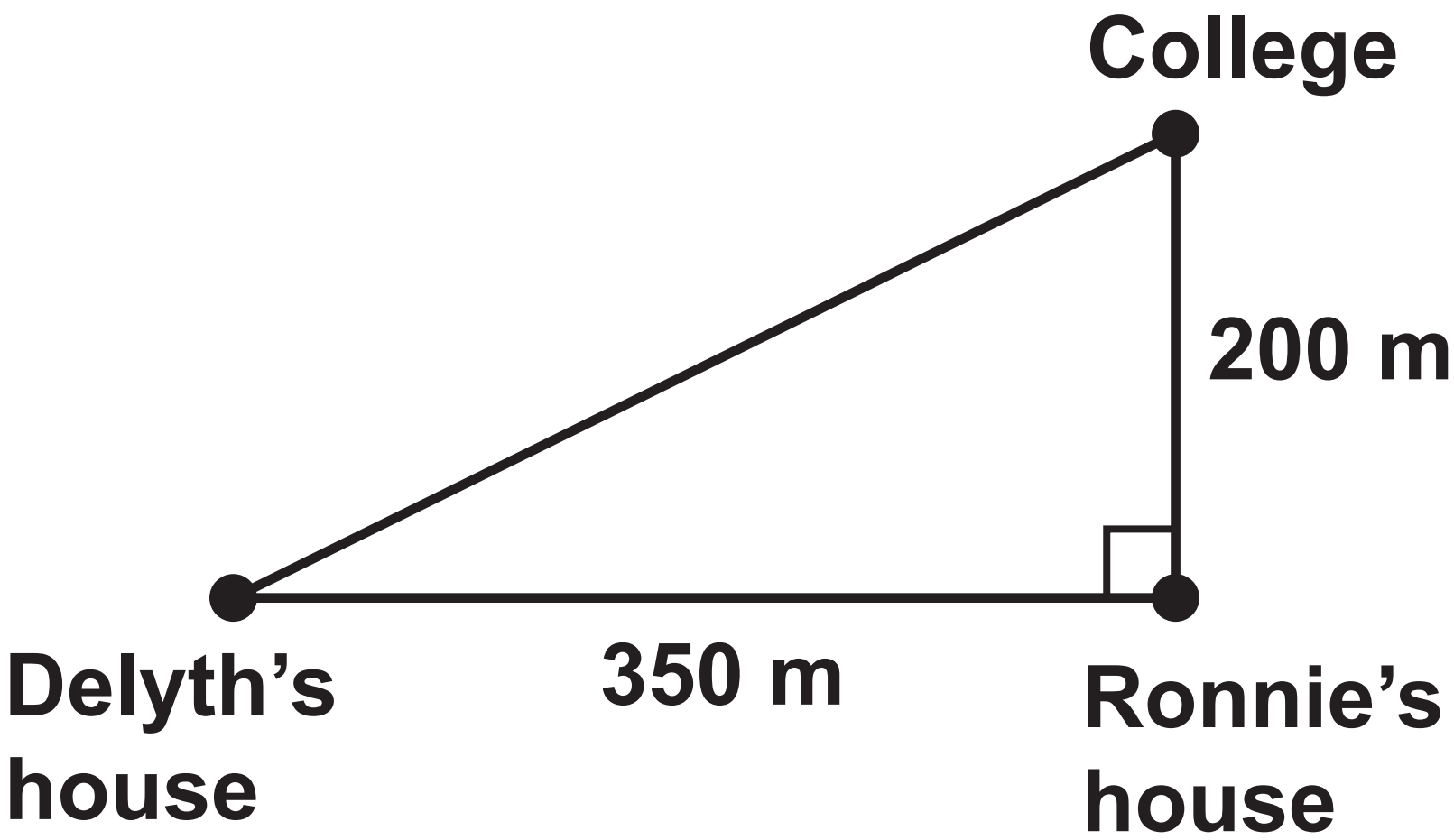
Question 1

Table

BAND	TAXABLE INCOME	TAX RATE
Personal allowance	Up to 10 000 euros	0%
Basic rate	10 000 euros to 25 000 euros	22%
Higher rate	Over 25 000 euros	35%

Question 2 (a)

Diagram NOT drawn to scale



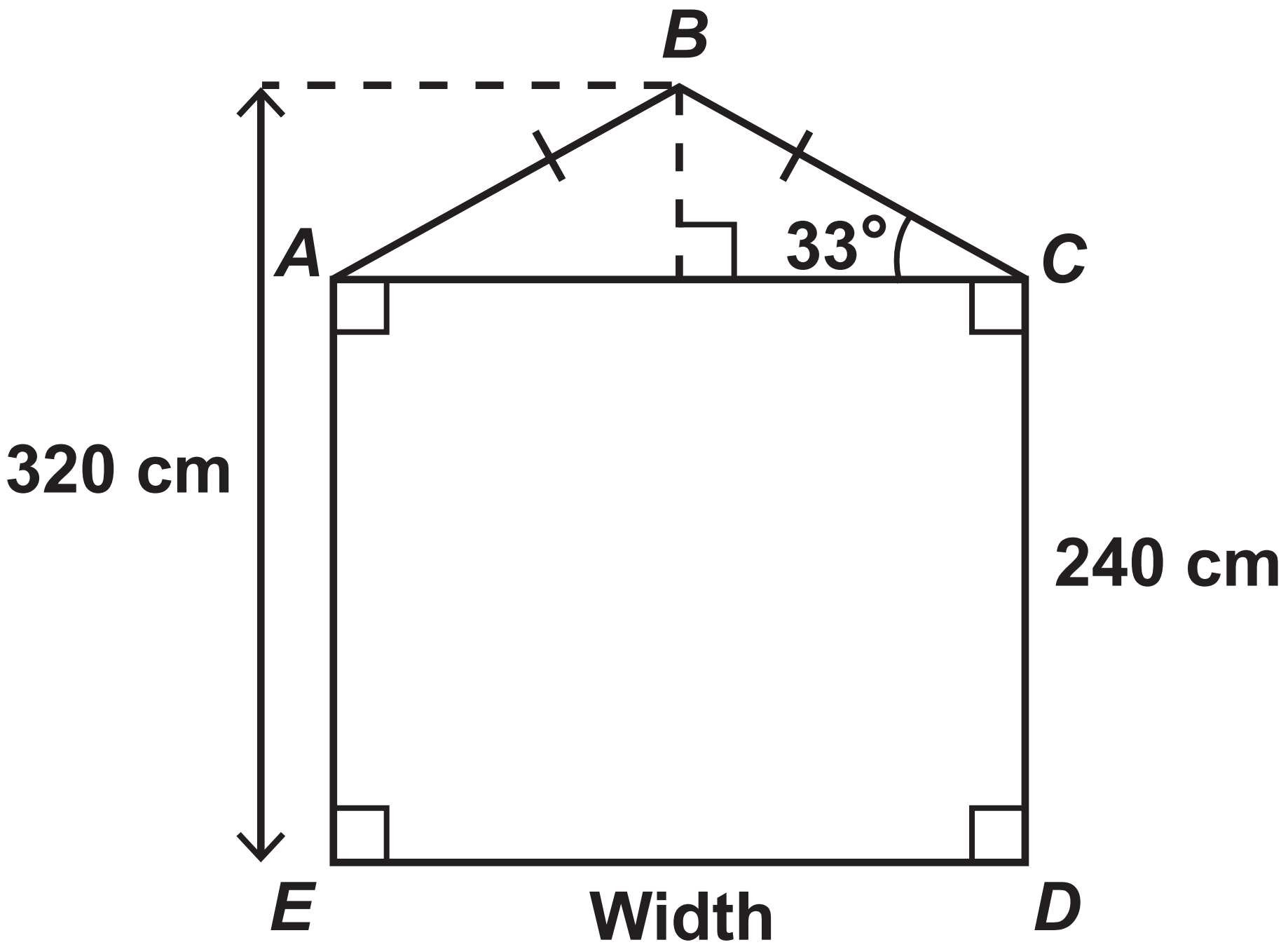
Question 2 (b)

Table

Distance, d (metres)	Frequency
$100 < d \leq 200$	9
$200 < d \leq 1000$	10
$1000 < d \leq 3000$	15
$3000 < d \leq 7000$	1

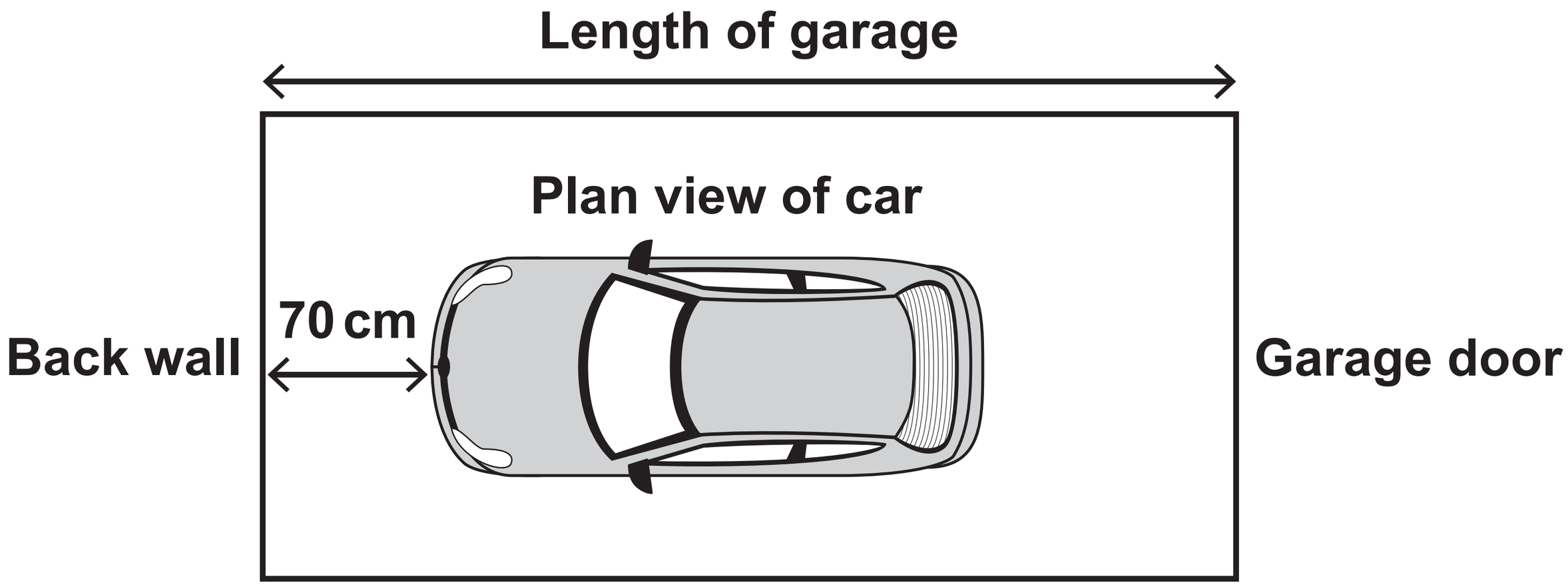
Question 3 (c)

Diagram NOT drawn to scale



Question 3 (d)

Diagram NOT drawn to scale



Question 5

Diagrams NOT drawn to scale

Diagram 1

PLAN VIEW

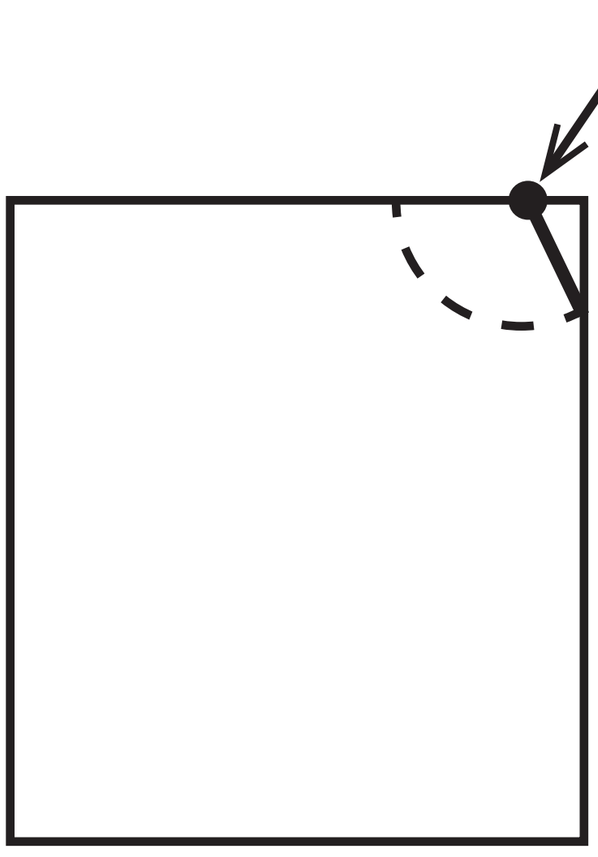
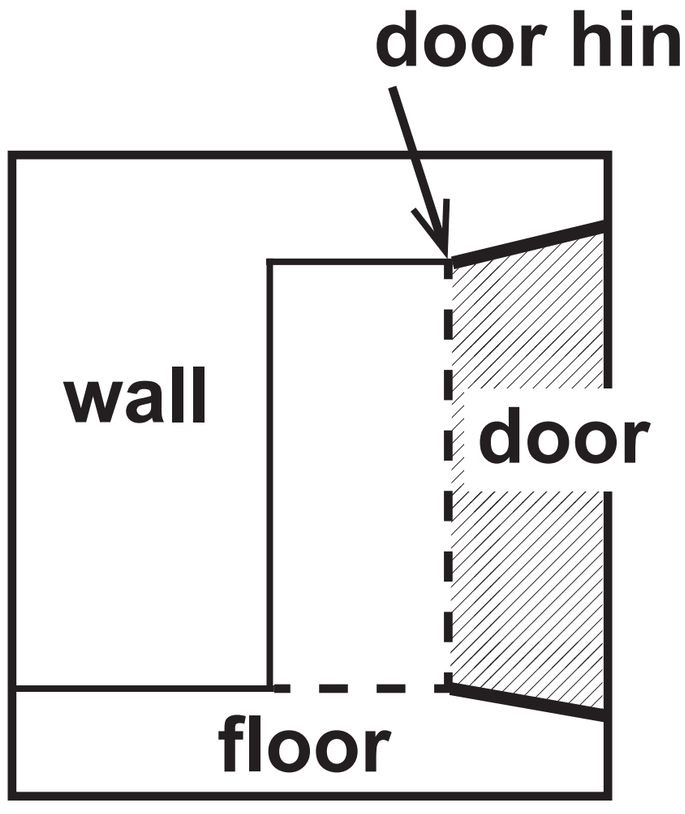


Diagram 2

FRONT VIEW



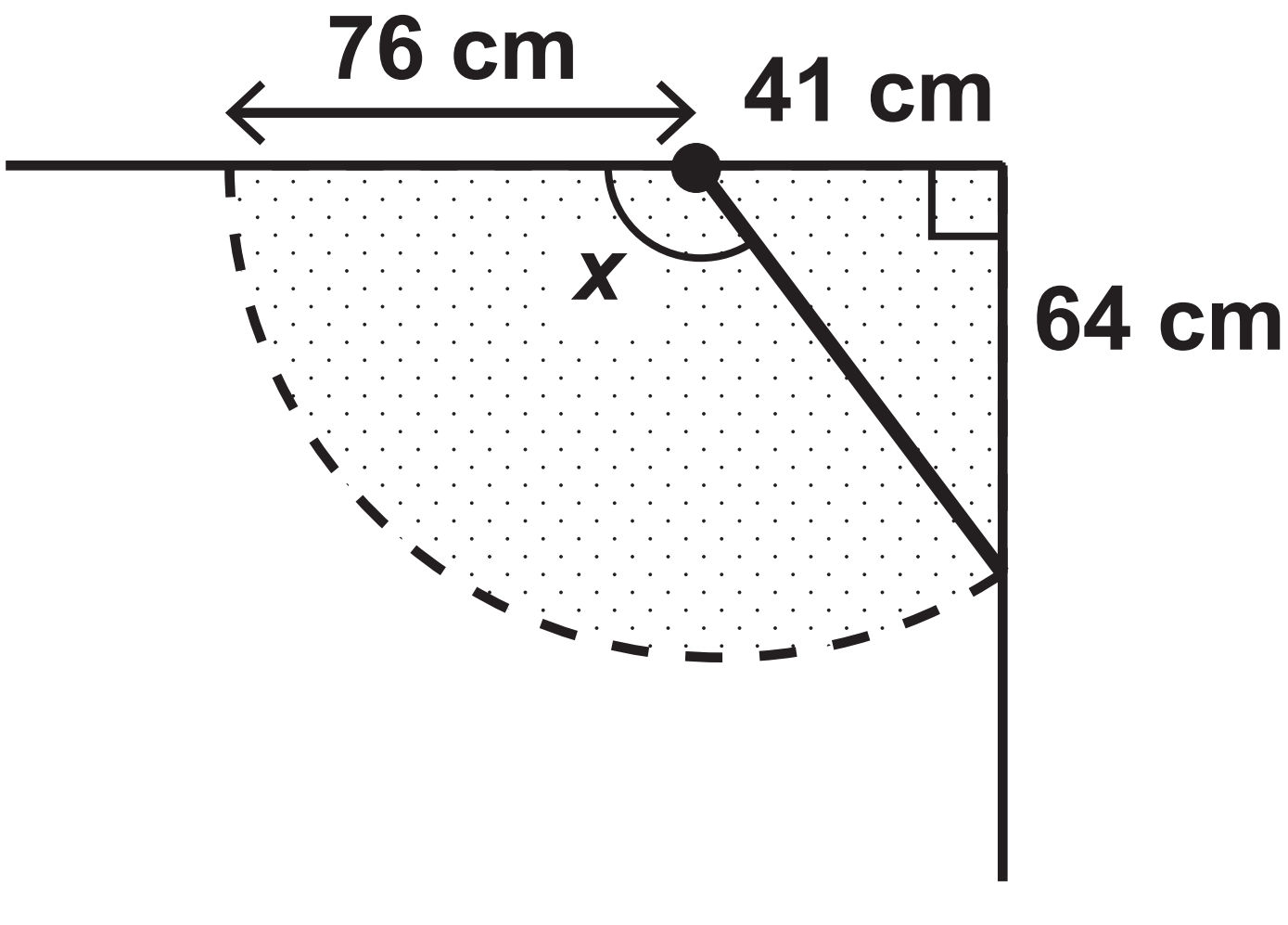
Question 5

Diagram NOT drawn to scale

Diagram 3

PLAN VIEW

Key: ● = door hinge



Question 6

Information

The formula for calculating the amount of money in the account at the end of every month is:

$$A = M\left[\frac{\left((1+r)^n - 1\right)(1+r)}{r}\right]$$

where:

A **is the amount of money in the account at the end of every month,**

M **is the amount deposited into the account on the 1st day of each month,**

r **is the MONTHLY interest rate written as a decimal,**

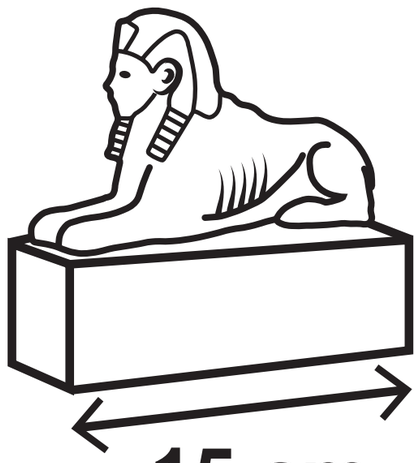
n **is the number of months the account has been open.**

Question 7 (b) (ii)

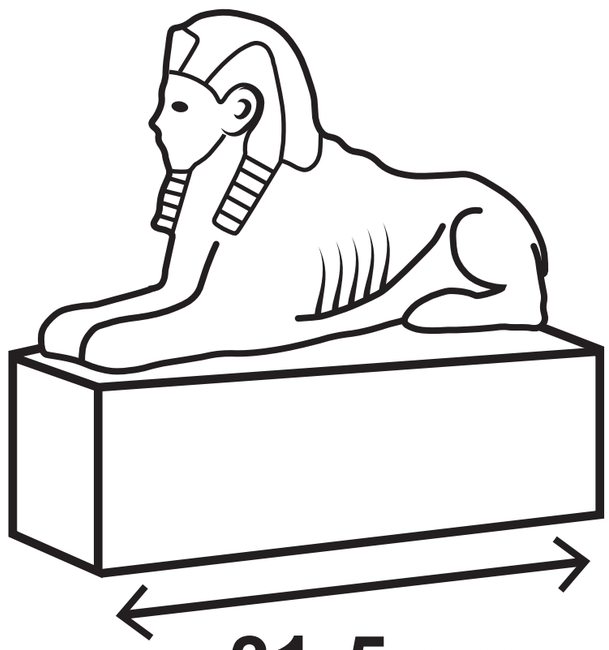
Diagrams NOT drawn to scale

Simplified diagrams of Sphinx souvenirs

Small souvenir

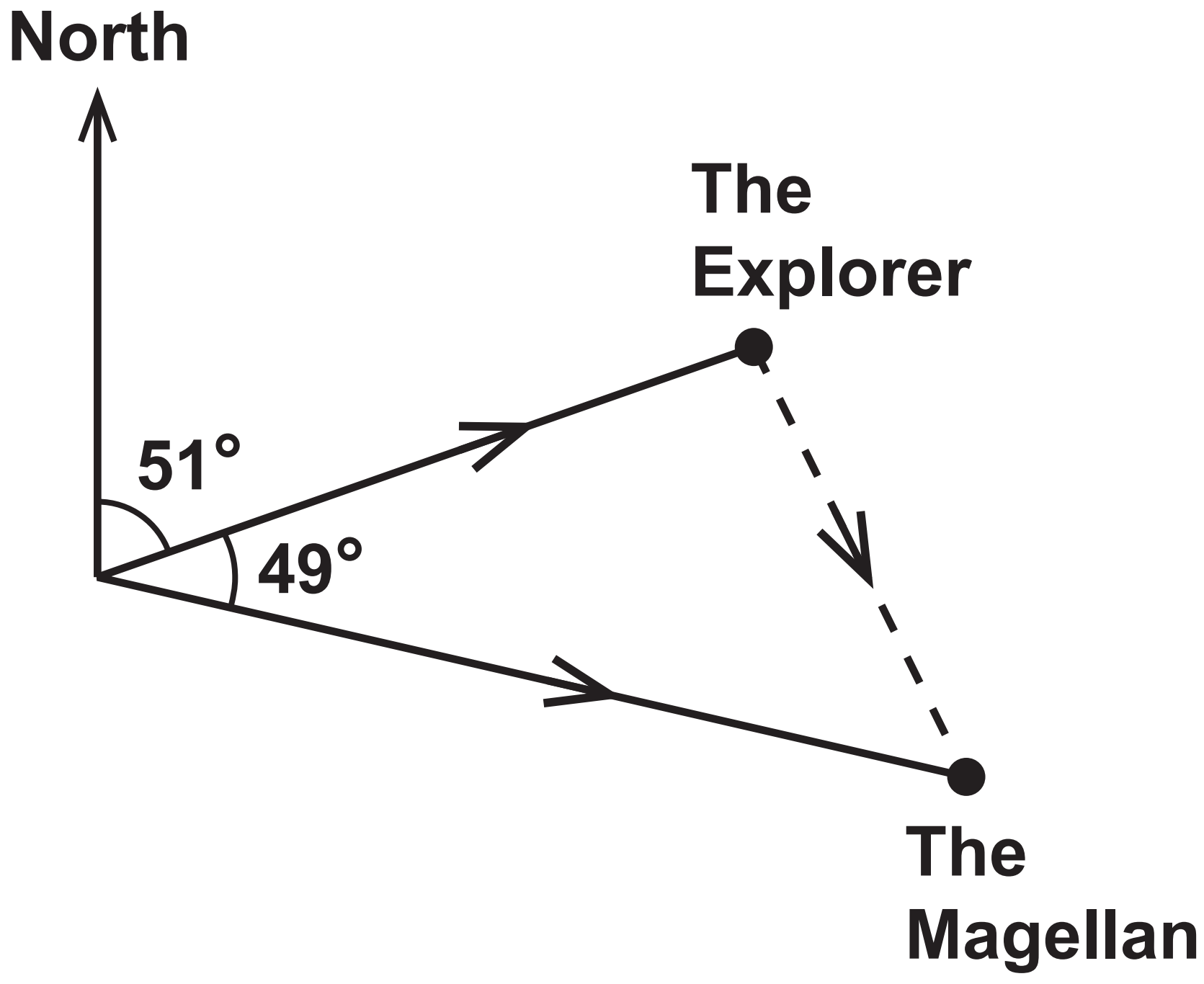


Large souvenir



Question 8

Diagram NOT drawn to scale



GCSE
MATHEMATICS
and
NUMERACY

FORMULA LIST

HIGHER TIER

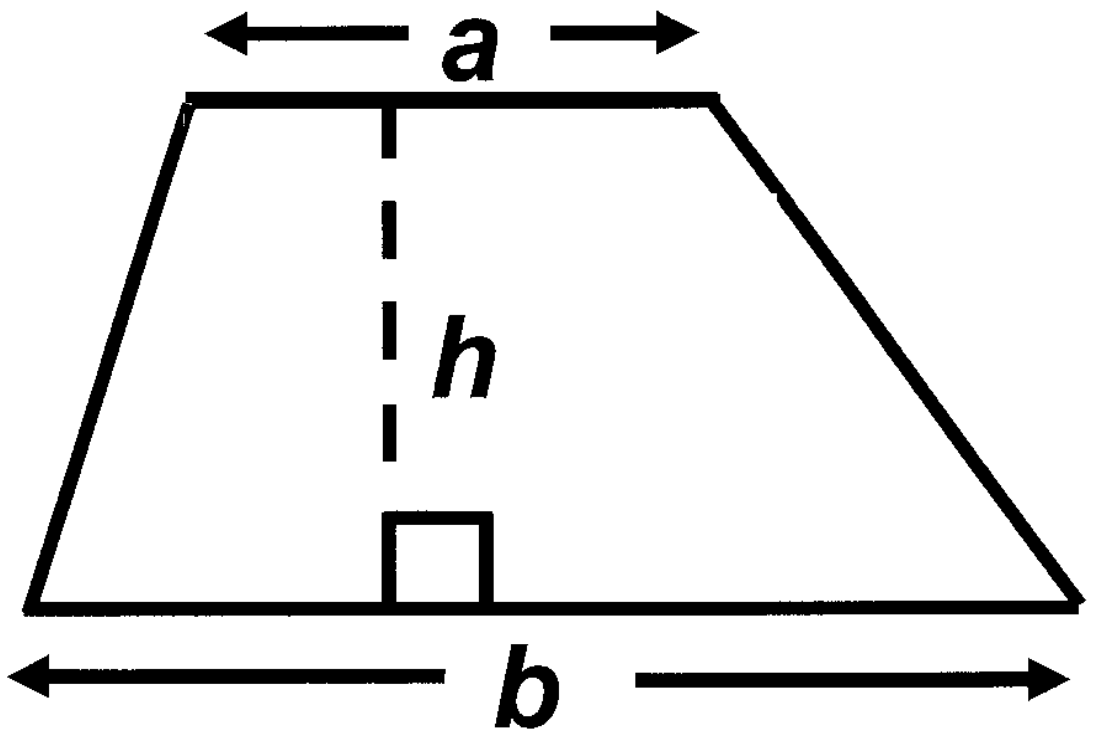
GCSE

You must not write on these formula pages.

Anything you write on these formula pages will gain NO credit.

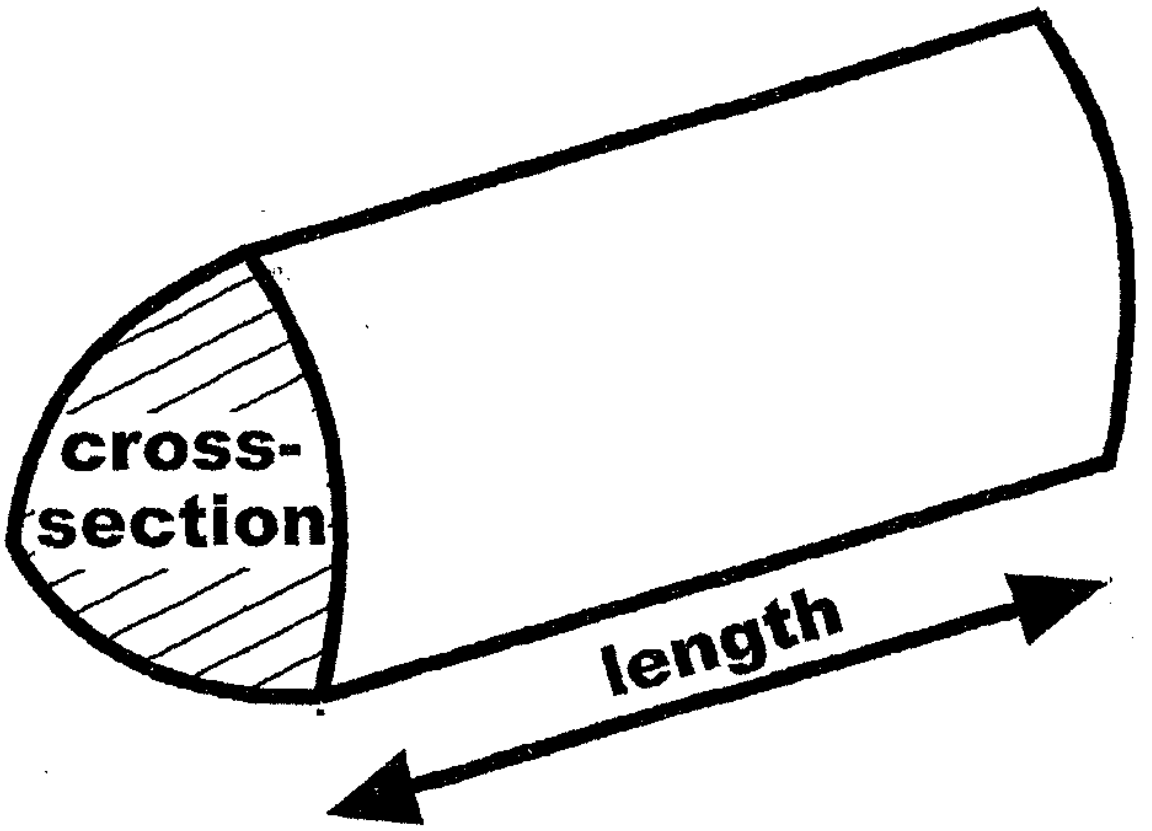
Formula List – Higher Tier

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



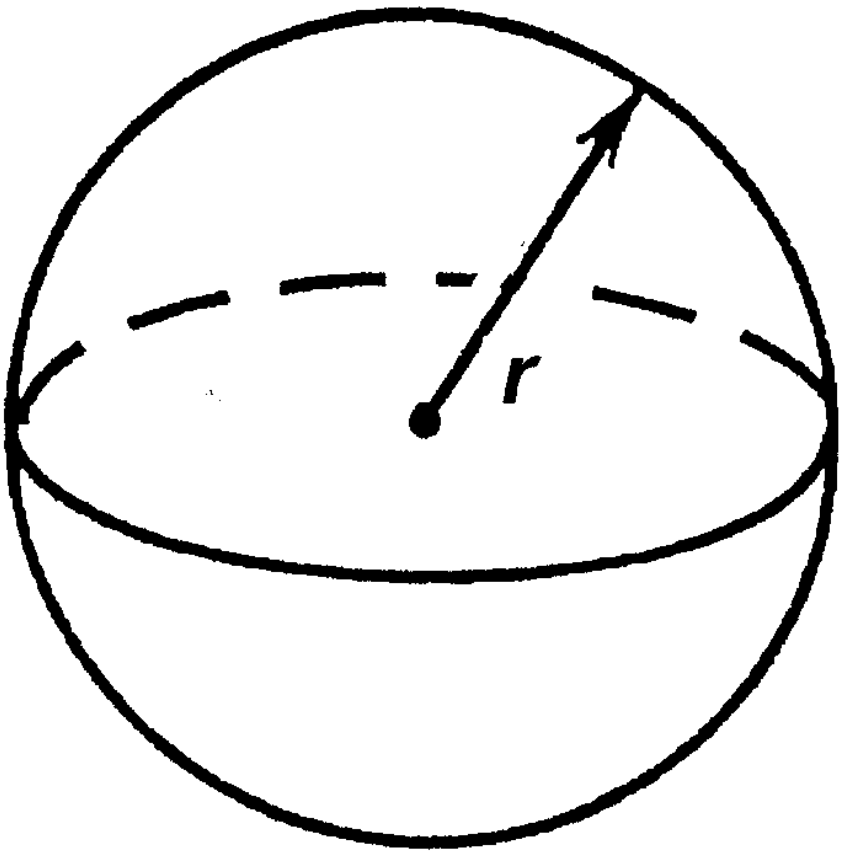
Volume of prism =

area of cross – section × length



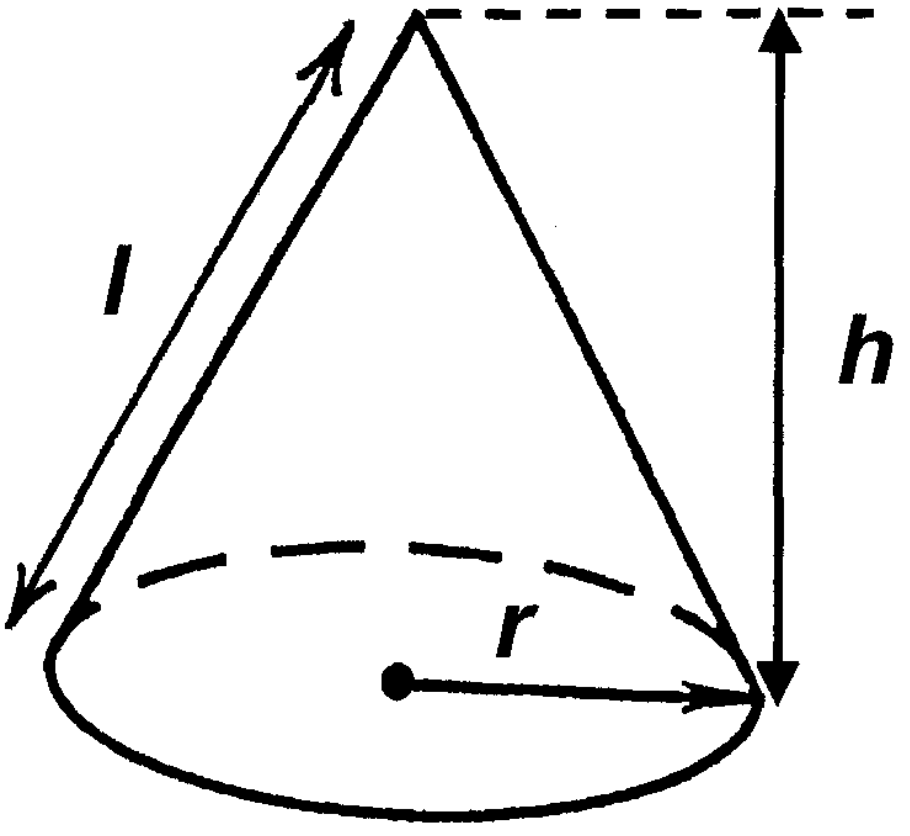
Volume of sphere $= \frac{4}{3}\pi r^3$

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

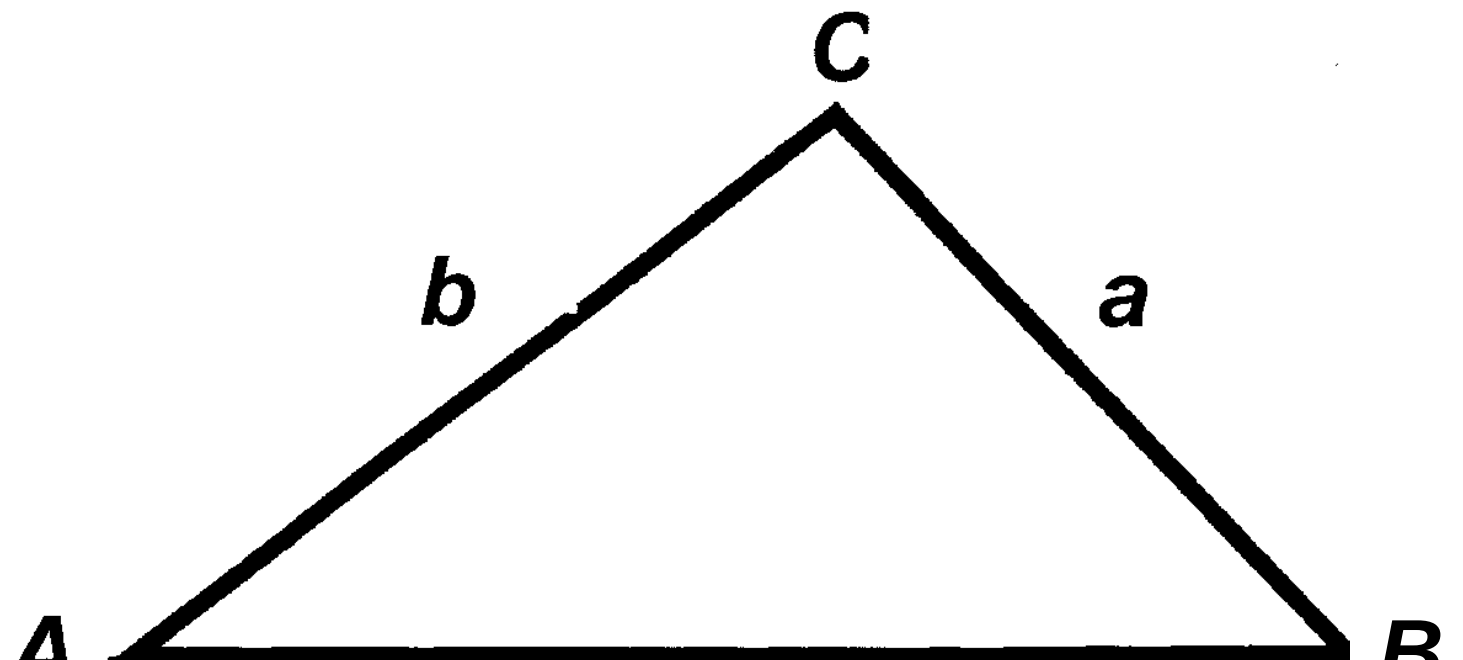


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



In any triangle ABC



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

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

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

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.