GCSE

3300U60-1

WEDNESDAY, 16 NOVEMBER 2022 – MORNING

MATHEMATICS

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.	4	
2.	4	
3.	5	
4.	9	
5.	3	
6.	3	
7.	2	
8.	5	
9.	4	
10.	4	
11.	3	
12.	3	
13.	4	
14.	4	
15.	1	
16.	3	
17.	1	
18.	5	
19.	5	
20.	8	
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.

Models for Question 1 and Question 11.

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.

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 organisation, communication and accuracy in writing.

1. **Ask for the model for Question 1.**

The model is NOT made to scale.

The model represents a metal cylinder.

The solid metal cylinder has a radius of 2·3 cm and a height of 5 cm.

The mass of the cylinder is 423·1 g.

Find the density of the metal.

Give your answer in g/cm^3

[4 marks]

2. A solution to the equation

$$x^3 + 5x - 8 = 0$$

lies between 1 and 2

Use the method of trial and improvement

to find this solution correct to 1 decimal place.

You must show all your working.

[4 marks]

3. A rectangle has a width of $4x - 10$

(a) Given that x is a whole number, explain why the value of x cannot be less than 3

[1 mark]

continued on the next page . . .

Question 3 continued

3. (b) Look at the diagram for Question 3 (b) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows a rectangle.

The perimeter of this rectangle is $14x - 4$

The width of the rectangle is $4x - 10$

Find the length of the rectangle in TERMS OF x.

[4 marks]

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

Look at the diagram for Question 4 in the separate Diagram Booklet.
The diagram is NOT drawn to scale.

***A*, *B* and *C* are points on the circumference of a circle with centre *O*.**

The length of *BC* is 10 cm.

The diameter of the circle is 18 cm.

Angle *ABC* is a right angle.

Calculate the shaded area.
You must show all your working.

[7 marks + 2 marks OCW]

5. **Look at the diagram for Question 5 in the separate Diagram Booklet.**
The diagram is NOT drawn to scale.

In the diagram,

$XZ = 7$ **cm**

Angle $XZY = 41^\circ$

Angle YXZ **is a right angle.**

Calculate the length of the side YZ **in the triangle** XYZ **shown.**

[3 marks]

6. **Two times are recorded correct to the NEAREST 0•1 SECOND.**

12•4 seconds
25•5 seconds

Calculate the greatest possible difference between these times.

[3 marks]

7. A number has been increased by 60%

to give an answer of 64

What was the original number?

[2 marks]

8. Look at the diagram for Question 8 in the separate Diagram Booklet.
The diagram is an incomplete tree diagram.

Bag A and Bag B contain only red and blue balls.

The probability of choosing a red ball from Bag A is $\frac{3}{5}$

The probability of choosing a red ball from Bag B is 0·25

A ball is chosen at random from each bag.

(a) Complete the tree diagram.

[2 marks]

continued on the next page . . .

Question 8 continued

8. (b) Find the probability that the two balls chosen are the same colour.

[3 marks]

9. Solve the following simultaneous equations using an algebraic (not graphical) method. Do not use a trial and improvement method. You must show all your working.

$$3x + 5y = -2$$
$$5x + 4y = -12$$

[4 marks]

10. (a) Expand and simplify $(2h + 3t)(5h - 7t)$

[3 marks]

continued on the next page . . .

Question 10 continued

10. (b) Simplify $\dfrac{7(d+5)^{8}}{(d+5)^{-2}}$

[1 mark]

11. Ask for the model for Question 11.

The model is NOT made to scale.

A cone is joined to a hemisphere, as shown on the model.

Look at the diagram for Question 11 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram is a 2D simplified diagram of the model.

The cone has a base radius of 8 cm and a slant height of 17 cm.

The hemisphere has the same radius as the cone.

Calculate the SURFACE AREA of the composite solid.

[3 marks]

12. Solve the equation $59x^2 - 7x - 13 = 0$

Give your answers correct to 2 decimal places.

You must show all your working.

[3 marks]

13. Two similar shapes have perimeters of 241 cm and 719 cm.

The area of the smaller shape is $2063\ cm^2$

Calculate the area of the larger shape.

Give your answer in m^2

[4 marks]

14. **Look at the diagram for Question 14 in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

DE **is the tangent to the circle at point** ***A*****,**

as shown.

BC **= 7 cm and** ***AC*** **= 13 cm.**

Angle ***BAD*** **= 68° and angle** ***CAE*** **= 80°**

(a) **Find the size of angle** ***ACB*****.**

State the angle property you have used to find your answer.

_____

_____

_____

_____

_____

[2 marks]

continued on the next page . . .

Question 14 continued

14. (b) Calculate the area of the triangle *ABC*.

[2 marks]

15. Write down an IRRATIONAL number whose value is between 9 and 10

Write your answer in the box below.

Irrational number is: ☐

[1 mark]

16. Fully factorise the expression $k^3p - kp^3$

[3 marks]

17. Look at the diagrams for Question 17 in the separate Diagram Booklet.

The diagrams show five different graphs, **A**, **B**, **C**, **D** and **E**.

The equation $y = (x - 3)(x - 7)$ describes only ONE of the graphs.

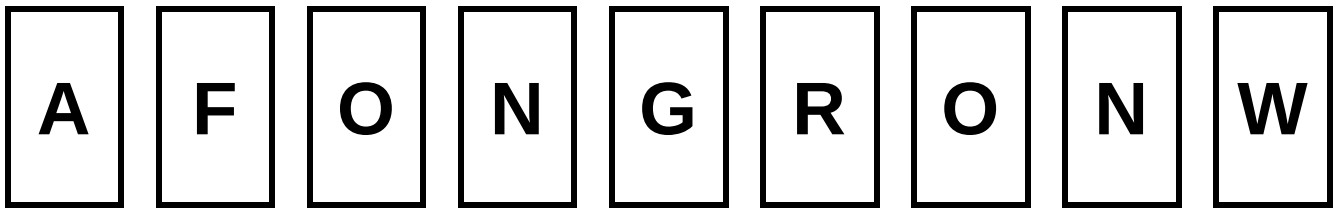
Which graph correctly shows this equation?

Circle your answer.

Graph A
Graph B
Graph C
Graph D
Graph E

[1 mark]

18. The following nine cards are placed in a box.



Catherine chooses THREE cards at random from the box, without replacement.

(a) Calculate the probability that the three cards drawn show the letters 'A', 'F' and 'O' in that order.

_____

_____

_____

[2 marks]

continued on the next page . . .

Question 18 continued

18. (b) Calculate the probability that two of the three cards show the same letter.

[3 marks]

19. Make e the subject of the following formula.

$$c\left(d + e^2\right) + f\left(g - e^2\right) = h$$

[5 marks]

20. Look at the diagram for Question 20 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows a triangle ABC and a circle with centre C.

The points B and D lie on the circumference of the circle.

The length of the line AB is 19 cm.

The length of the line AC is 29 cm.

Angle $BAD = 36^\circ$

The radius of the circle is x cm.

Calculate the area of the shaded sector BCD.

[8 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

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HIGHER TIER

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

Diagram Booklet

Surname: _____

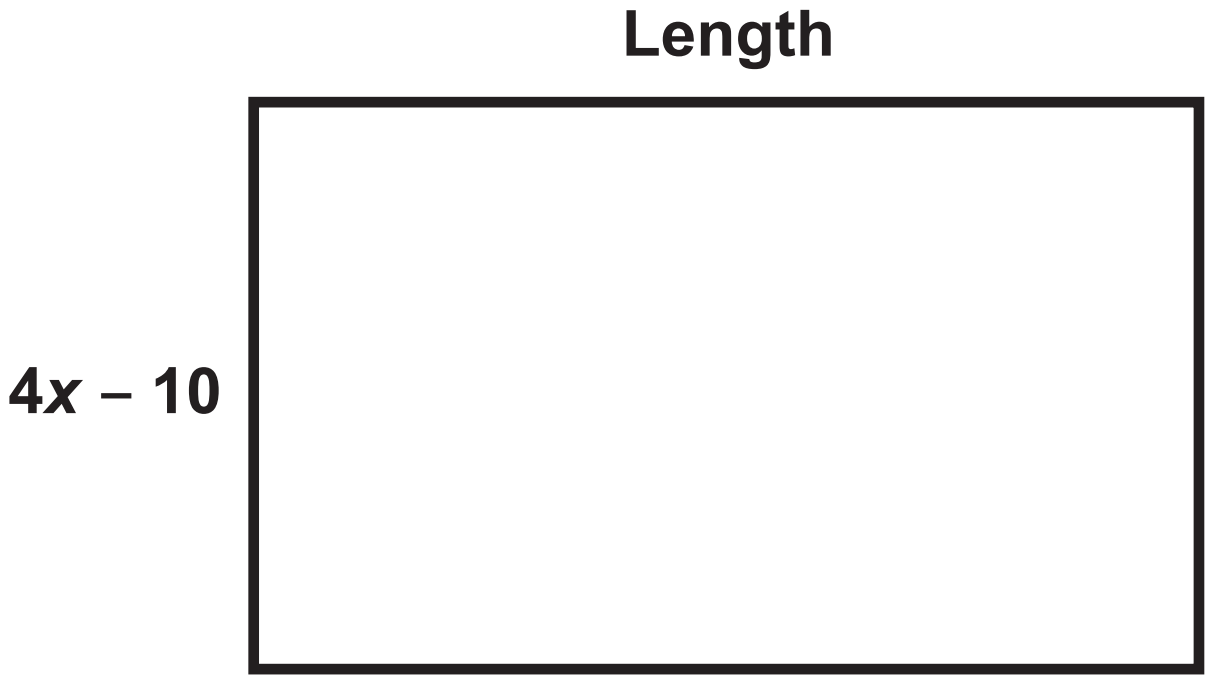
First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

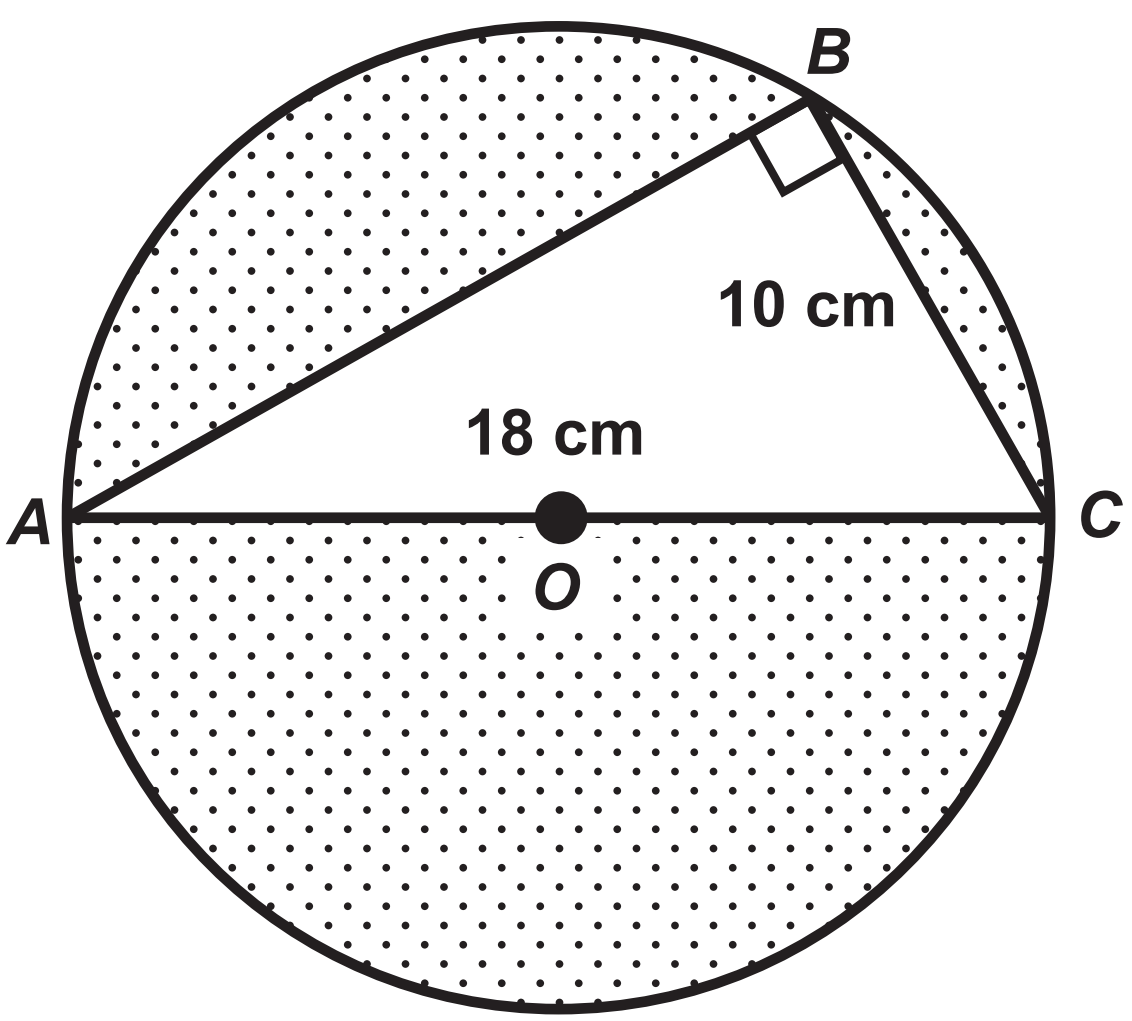
Question 3 (b)

Diagram NOT drawn to scale



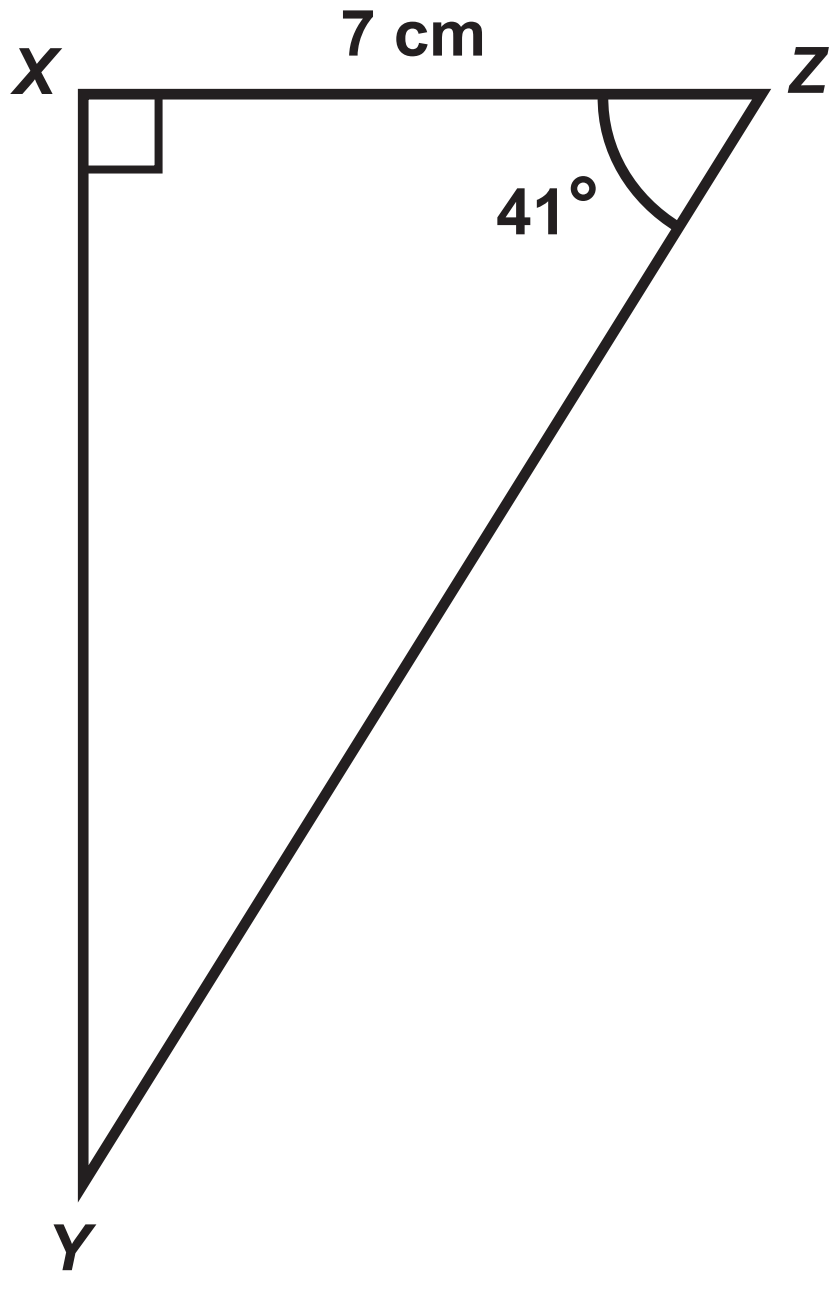
Question 4

Diagram NOT drawn to scale

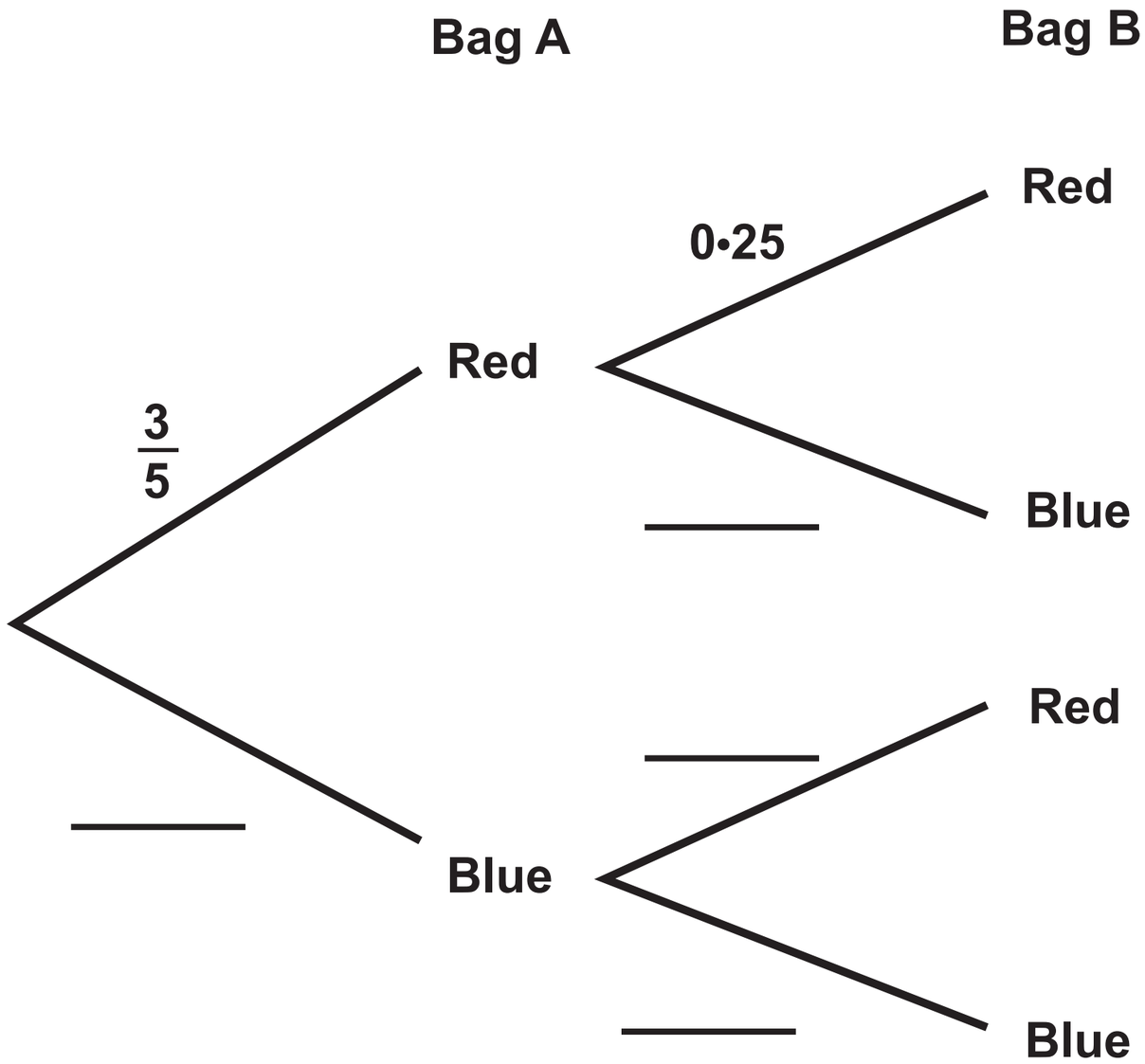


Question 5

Diagram NOT drawn to scale



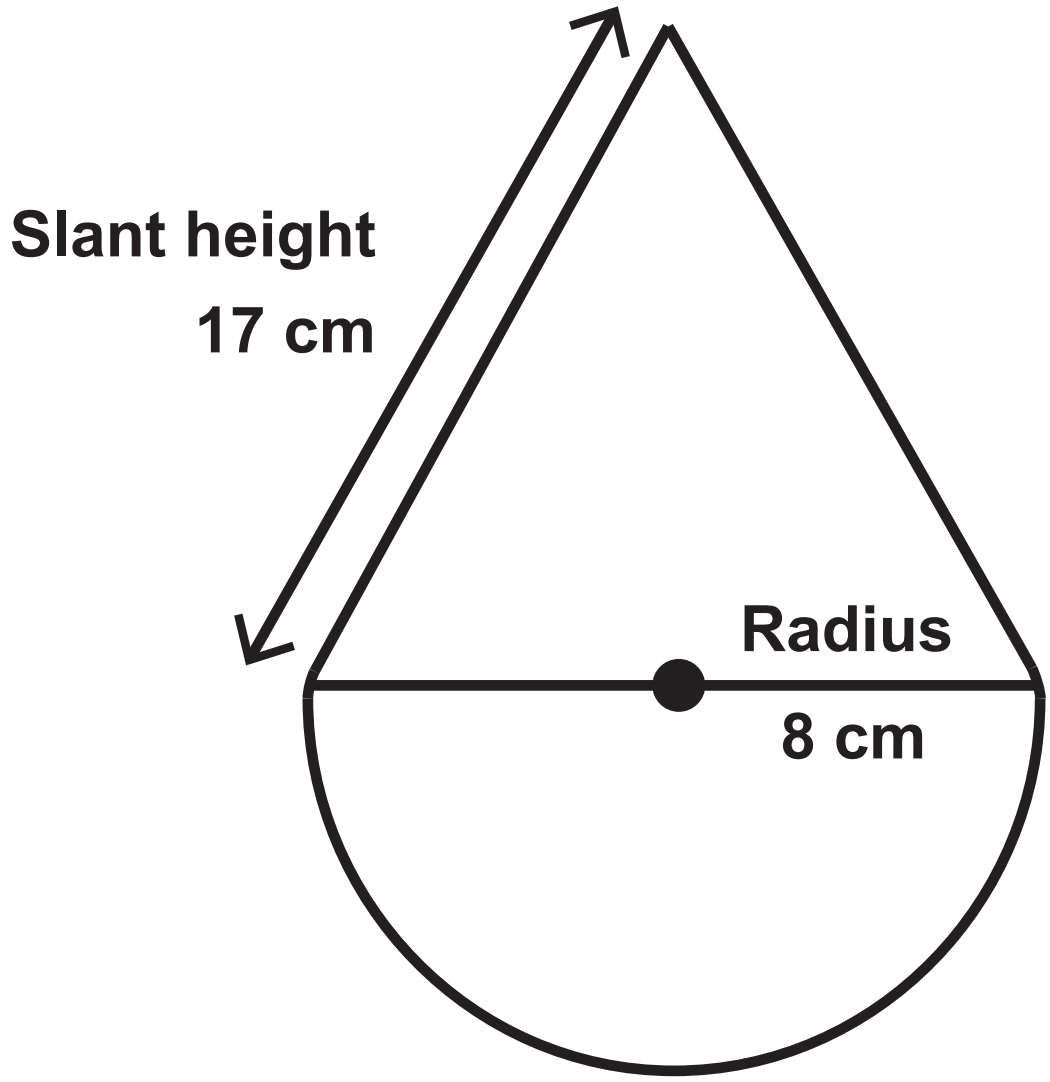
Question 8



Question 11

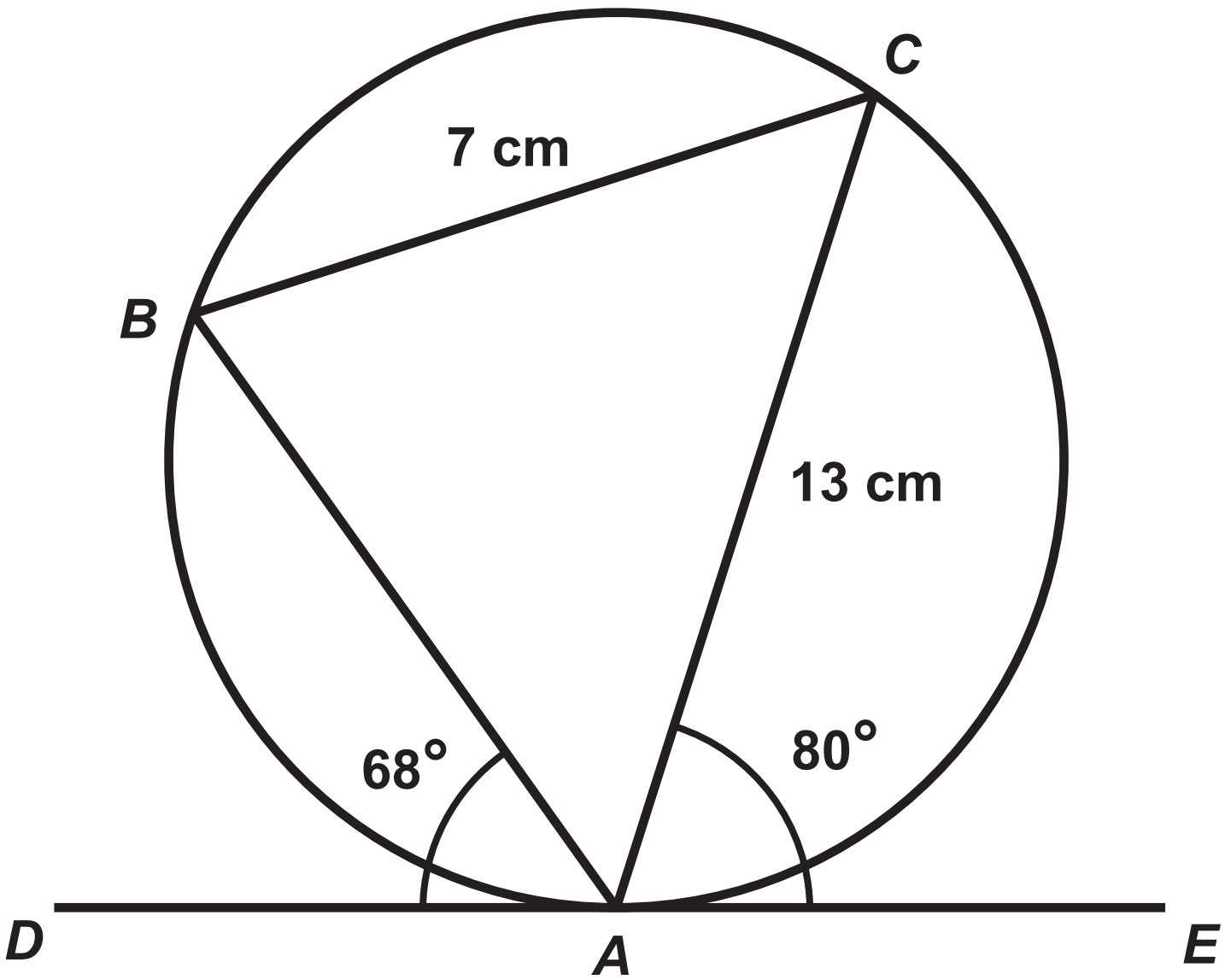
Diagram NOT drawn to scale

2D simplified diagram of the model



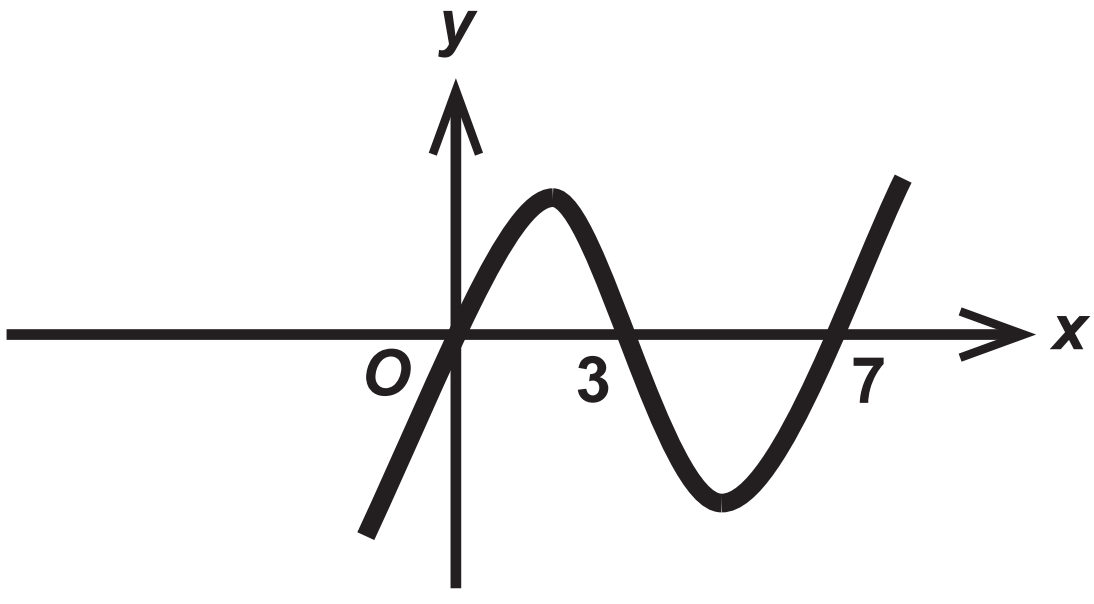
Question 14

Diagram NOT drawn to scale

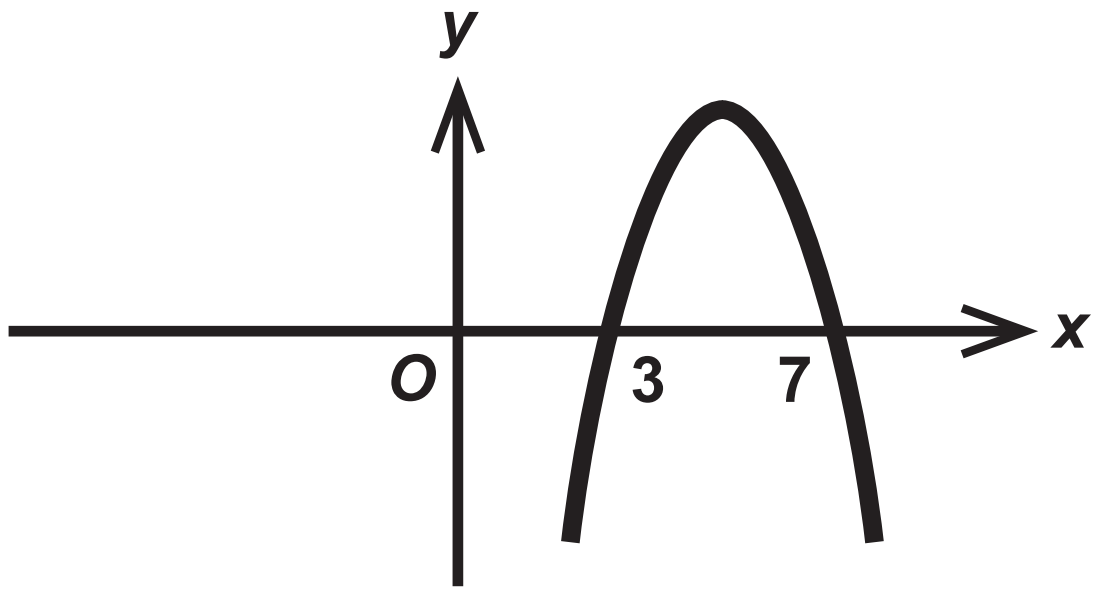


Question 17

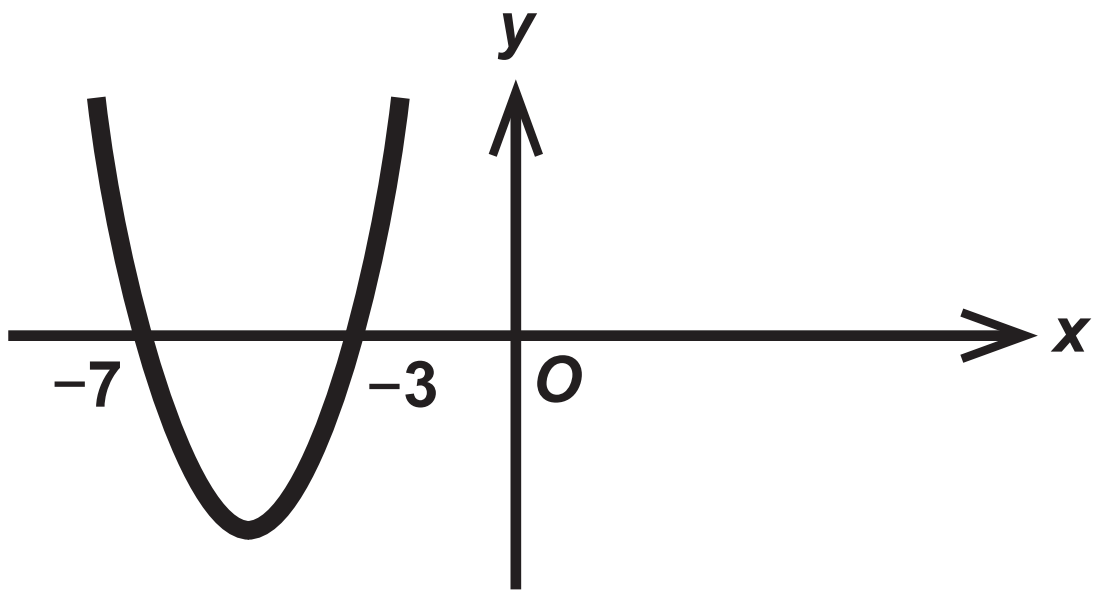
Graph A



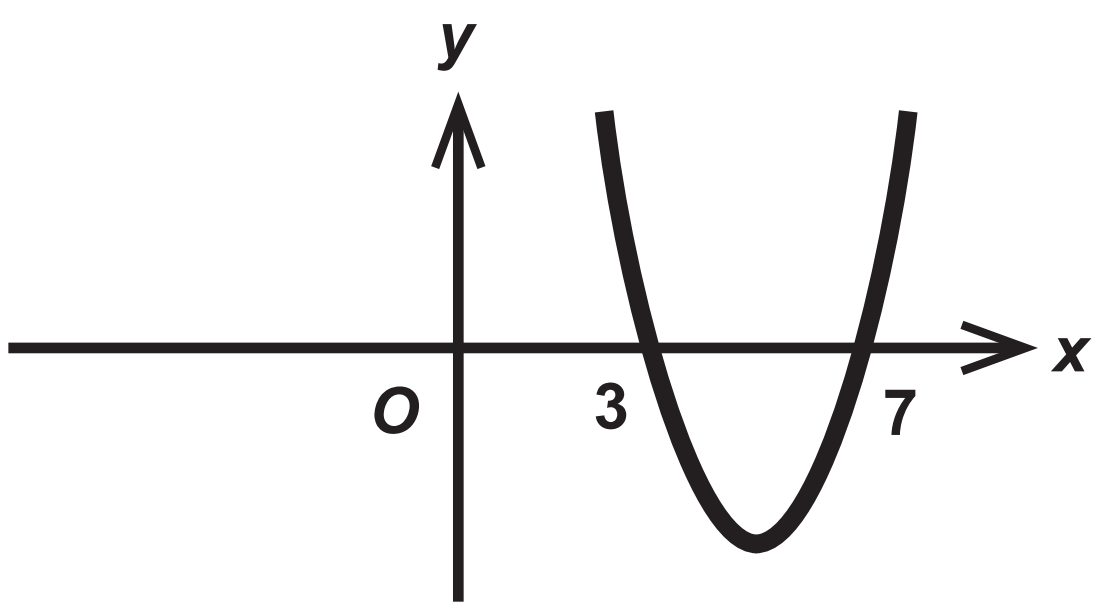
Graph B



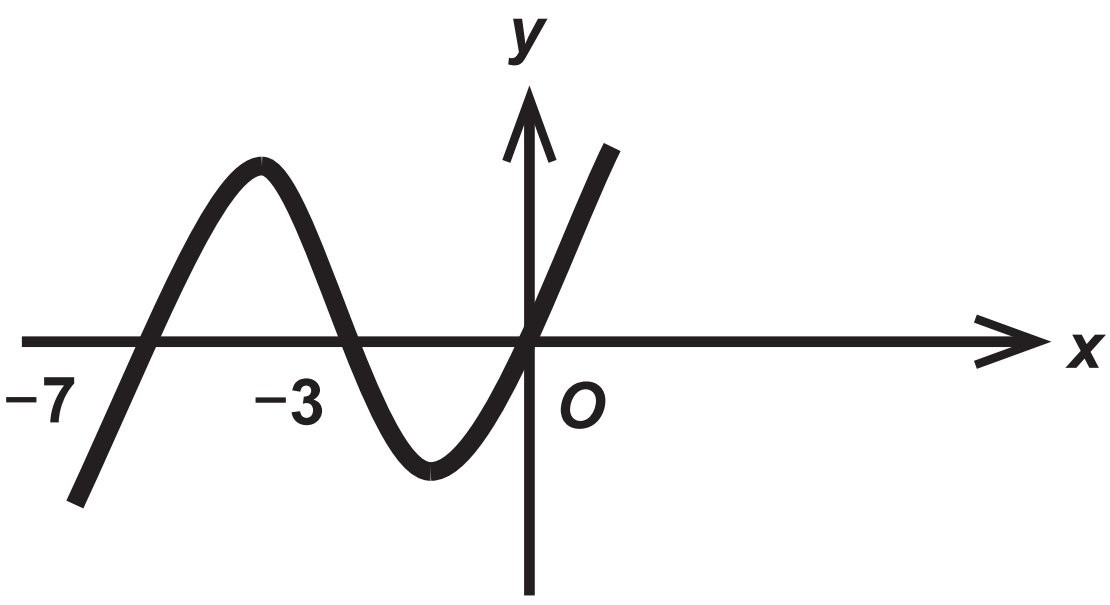
Graph C



Graph D

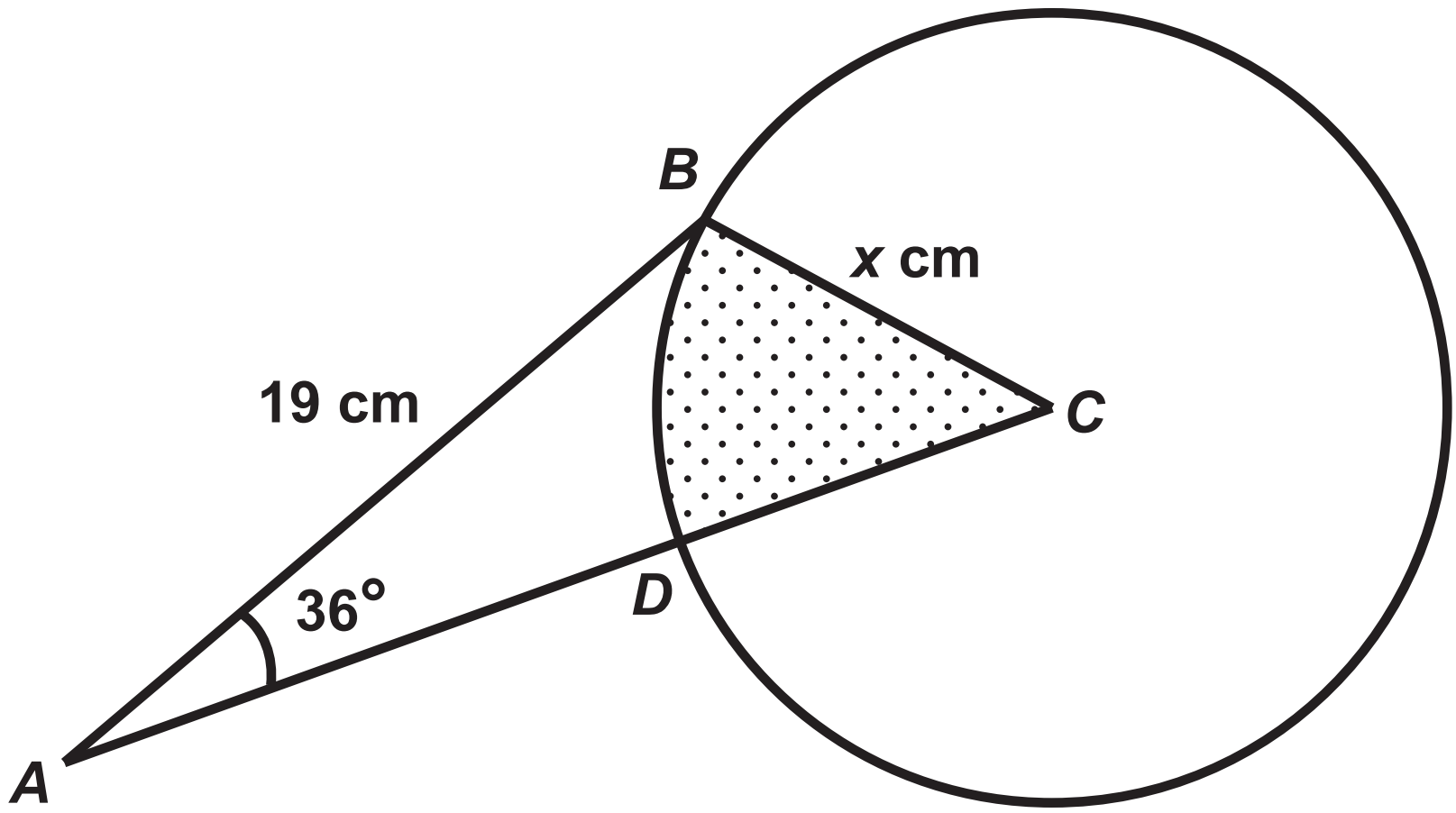


Graph E



Question 20

Diagram NOT drawn to scale



GCSE
MATHEMATICS
and
NUMERACY

FORMULA LIST

HIGHER TIER

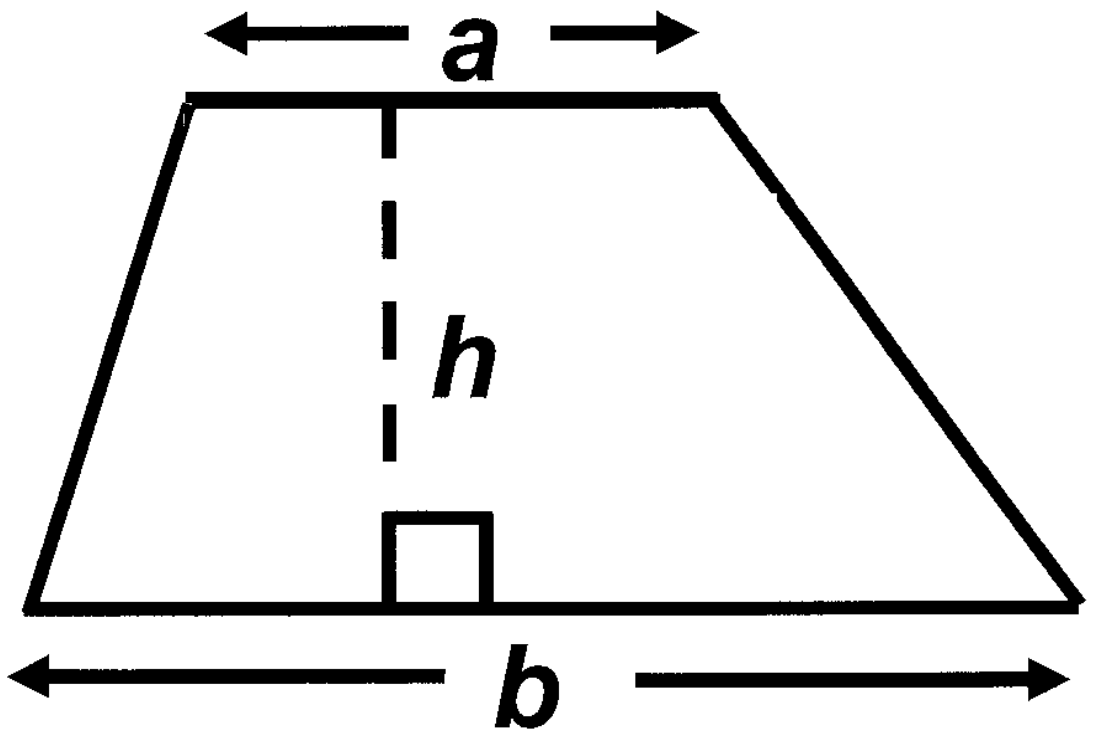
GCSE

You must not write on these formula pages.

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

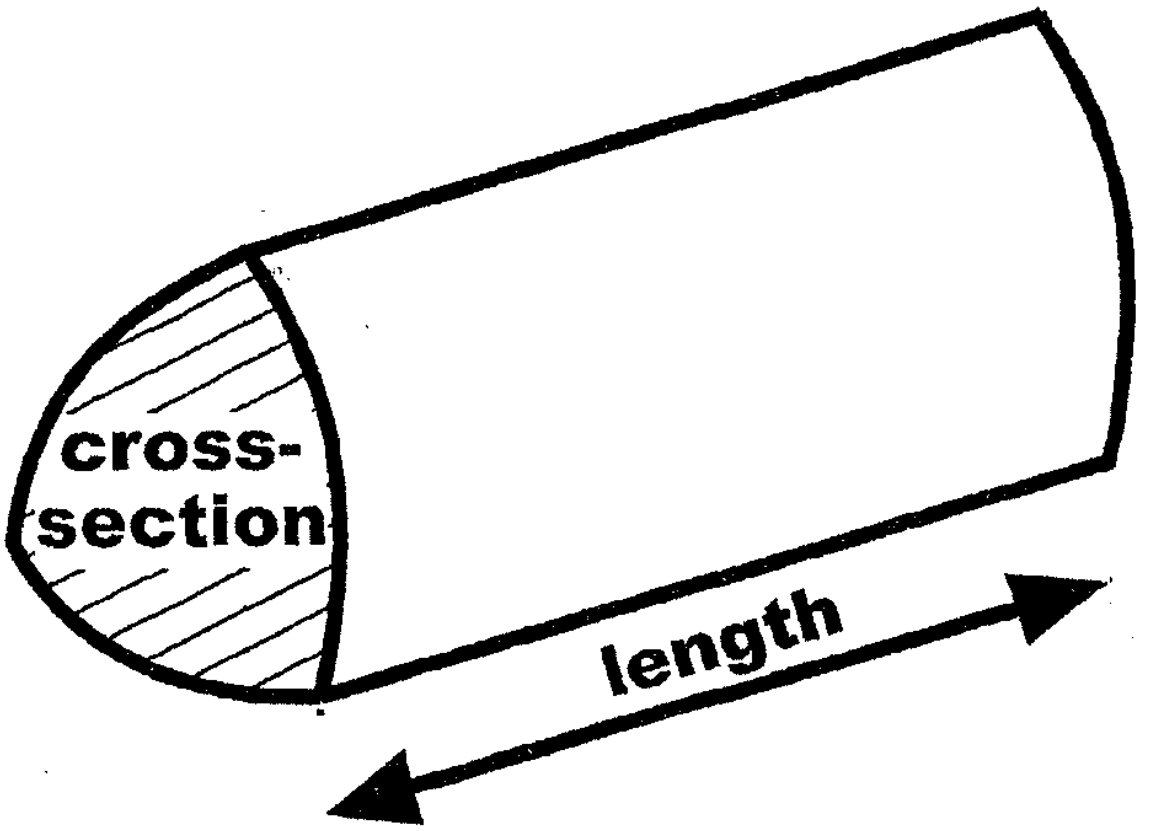
Formula List – Higher Tier

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



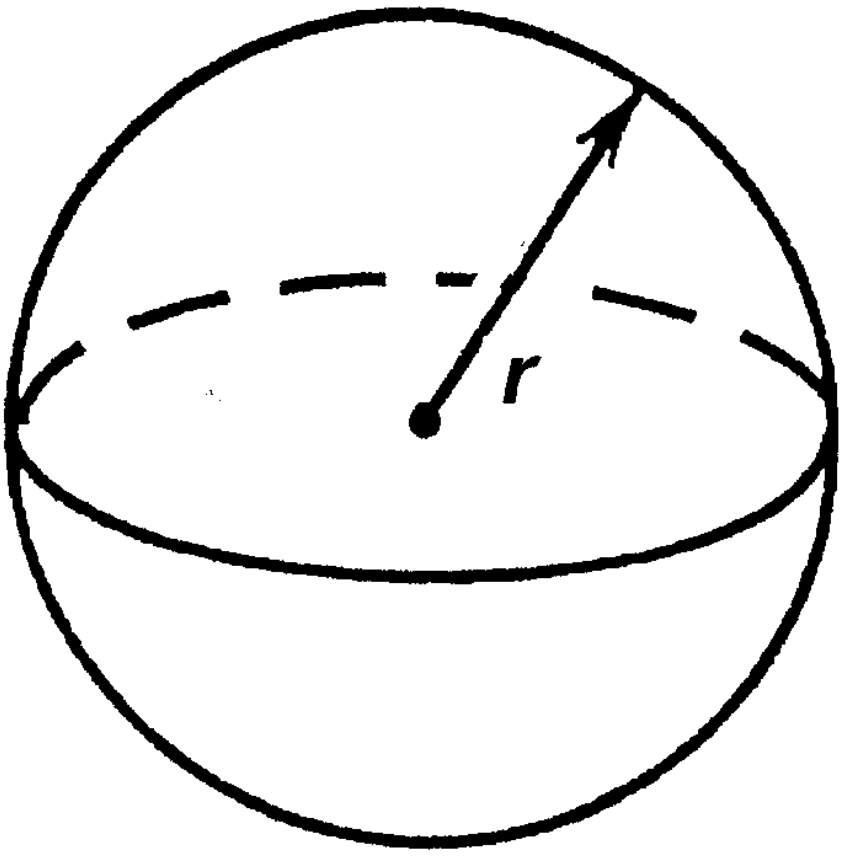
Volume of prism =

area of cross – section × length



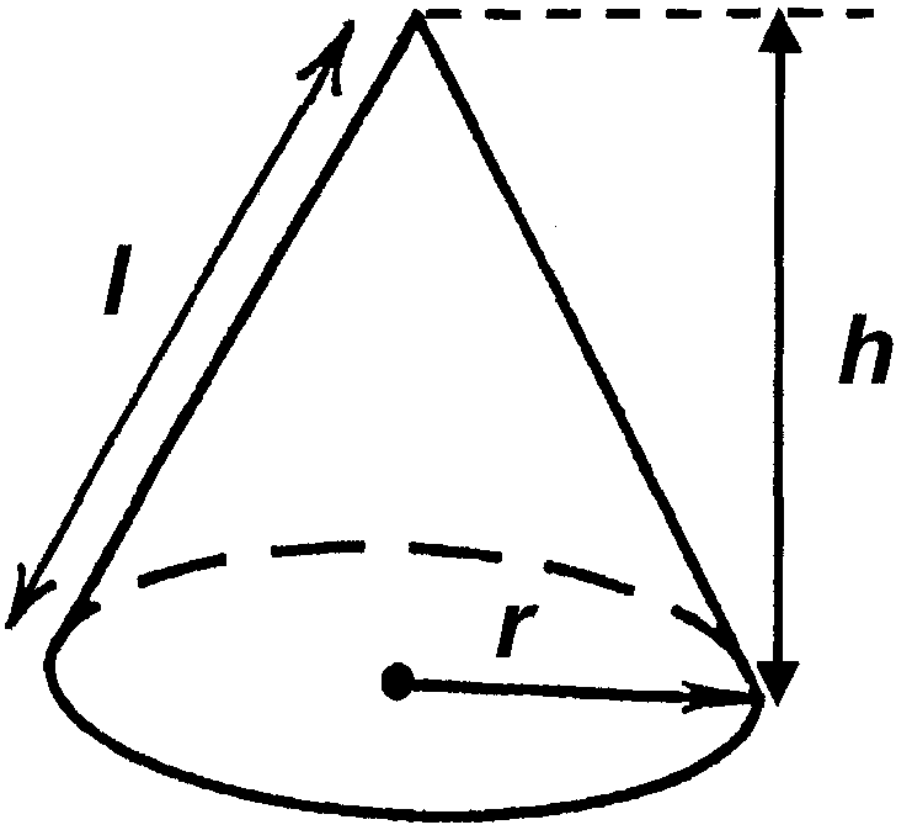
Volume of sphere $= \frac{4}{3}\pi r^3$

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

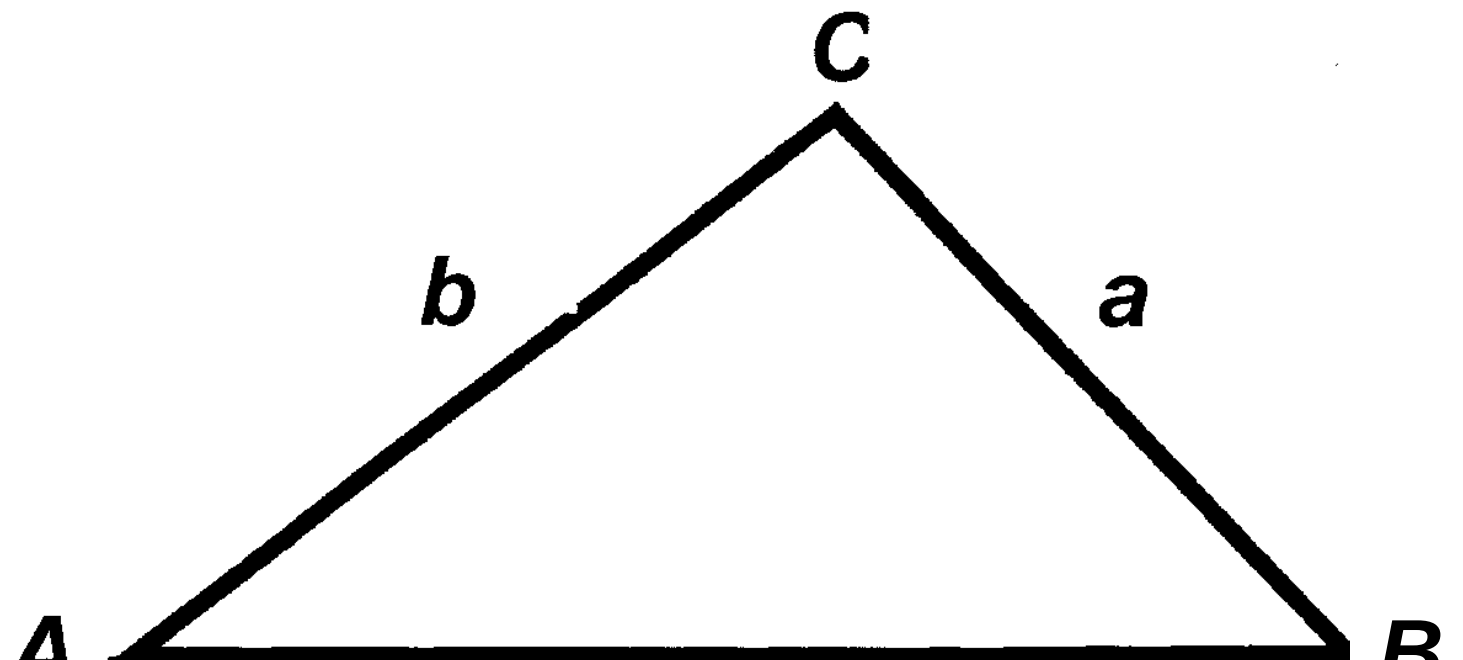


Volume of cone $= \frac{1}{3}\pi r^2 h$

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.