GCSE

3300U60-1

WEDNESDAY, 14 JUNE 2023 – 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.	6	
2.	4	
3.	4	
4.	6	
5.	4	
6.	7	
7.	4	
8.	5	
9.	2	
10.	8	
11.	3	
12.	6	
13.	5	
14.	4	
15.	6	
16.	6	
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 14.

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 10 (a), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

1. (a) Solve the equation

$$7 + 5(x - 2) = 3x + 8$$

[3 marks]

continued on the next page . . .

Question 1 continued

1. (b) Make f the subject of the formula

$$h = 13 - 2f$$

[2 marks]

(c) Factorise $15x - 35y$

[1 mark]

2. A large number of prize tokens are placed in a box.

The tokens are identical in shape and size.

GOLD, SILVER, BRONZE or NO PRIZE is written on each token.

One token is chosen at random from the box.

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

The table shows the probability of choosing a GOLD prize token and the probability of choosing a SILVER prize token.

(a) There are three times as many NO PRIZE tokens in the box as there are BRONZE prize tokens.

Complete the table.

[2 marks]

continued on the next page . . .

Question 2 continued

2. (b) There are 15 GOLD prize tokens in the box.

How many SILVER prize tokens are there in the box?

[2 marks]

3. A solution of the equation

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

lies between 2 and 3

Use the method of trial and improvement to find this solution correct to 1 decimal place.

You must show all your working.

[4 marks]

4. (a) Evaluate $\dfrac{\sqrt[3]{154}}{7 \cdot 9 - 3 \cdot 26}$

Give your answer correct to **2** significant figures.

[2 marks]

continued on the next page . . .

Question 4 continued

4. (b) Calculate the reciprocal of 23

Give your answer correct to 3 decimal places.

[2 marks]

continued on the next page . . .

Question 4 continued

4. (c) Circle the correct answer for each of the following.

(i) The Lowest Common Multiple (LCM) of 4 and 6 is:

2	**4**	**6**	**12**	**24**

[1 mark]

(ii) The Highest Common Factor (HCF) of 10 and 15 is:

5	**10**	**15**	**30**	**150**

[1 mark]

5. Solve the following simultaneous equations using an algebraic (not graphical) method. You must show all your working.

$$2x + 3y = 16{\cdot}4$$
$$3x - 2y = 7{\cdot}7$$

[4 marks]

6. **Look at the diagram for Question 6 in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

In the diagram,

AD **is a straight line.**

Angle ***BAC*** **= 90°**

Angle ***BDE*** **= 90°**

Angle ***CBE*** **= 90°**

Angle ***CBA*** **=** ***x*****°**

AC **= 7·7 cm**

BC **= 11·3 cm**

BD **= 13·1 cm.**

(a) Calculate the value of ***x*****.**

[3 marks]

continued on the next page . . .

Question 6 continued

6. (b) Hence find the length DE.

[4 marks]

7. (a) A number is decreased by 5% of its value.

This is done 4 times in total.

Each time, the value decreases by 5%

Circle the multiplier that you would use to find the value after the 4 decreases.

$\times 0{\cdot}05^4$	$\times 0{\cdot}95^4$	$\times 0{\cdot}20$	$\times 1{\cdot}05^4$	$\times 0{\cdot}04^5$

[1 mark]

continued on the next page . . .

Question 7 continued

7. (b) A number has been decreased by 17%

to give an answer of 3569

What was the original number?

[3 marks]

8. **Look at the diagram for Question 8 in the separate Diagram Booklet.**
The diagram is NOT drawn to scale.

The diagram shows a semicircle, with radius r, drawn inside a trapezium.

The area of the semicircle is $77\ \text{cm}^2$

The semicircle touches the line AB.

$AB = 22$ cm.

Calculate the area of the trapezium $ABCD$.

[5 marks]

9. **Look at the diagram for Question 9 in the separate Diagram Booklet.**
The diagram shows a triangle on a grid.

Enlarge the given triangle by a scale factor of -2, using point A as the centre of enlargement.

[2 marks]

10. Look at the diagram for Question 10 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

ABCDE **is a regular pentagon with sides of length 11 cm.**

CDE **is a sector of a circle with centre *D* and radius 11 cm.**

The two shapes are joined together, as shown in the diagram.

(a) IN THIS PART OF THE QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.

Calculate the length of the arc *CE* shown in the diagram.

You must show all your working.

[4 marks + 2 marks OCW]

continued on the next page . . .

Question 10 continued

10. (b) In a shape SIMILAR to the one shown in part (a), the regular pentagon has sides of length 671 cm.

Complete the following statement.

Total area of new shape =

_____ × total area of original shape

You must show all your working.

[2 marks]

11. Make x the subject of the formula

$$ax^2 + x^2 = b$$

[3 marks]

12. (a) Factorise $8x^2 - 18$

[3 marks]

12. (b) Hence solve $8x^2 - 18 = 0$

[1 mark]

continued on the next page . . .

Question 12 continued

12. (c) Hence, sketch the graph of

$y = 8x^2 - 18$ **on the axes provided for Question 12 (c) in the separate Diagram Booklet.**

Mark clearly the coordinates of any point where this graph crosses an axis.

SPACE FOR WORKING:

[2 marks]

13. Look at the diagram for Question 13 in the separate Diagram Booklet.
The diagram shows three spinners.

Catherine has three spinners,
Spinner A, Spinner B and Spinner C.

She spins each spinner once.

(a) Calculate the probability that all three spinners land on prime numbers.

[2 marks]

continued on the next page . . .

Question 13 continued

13. (b) The numbers that the three spinners land on are added together.

Calculate the probability that the total is GREATER THAN 4

[3 marks]

14. Ask for the model for Question 14.

The model is NOT made to scale.

The model is a cube.

The cube has a volume of $10\,648\ cm^3$

Calculate the length of the internal diagonal *AB*.

[4 marks]

15. Use the quadratic formula to solve the equation $\frac{1}{x-2} + \frac{1}{3x-7} = 1$

Give your answers correct to 2 decimal places.

You MUST show all your working.

[6 marks]

16. Look at the diagram for Question 16 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

In triangle ABC shown,

$AB = 13$ cm and

$BC = 11$ cm.

D is a point on AC where

$BD = 7$ cm and

$DC = 5$ cm.

Calculate the size of angle BAD.

You must show all your working.

[6 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

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Diagram Booklet

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

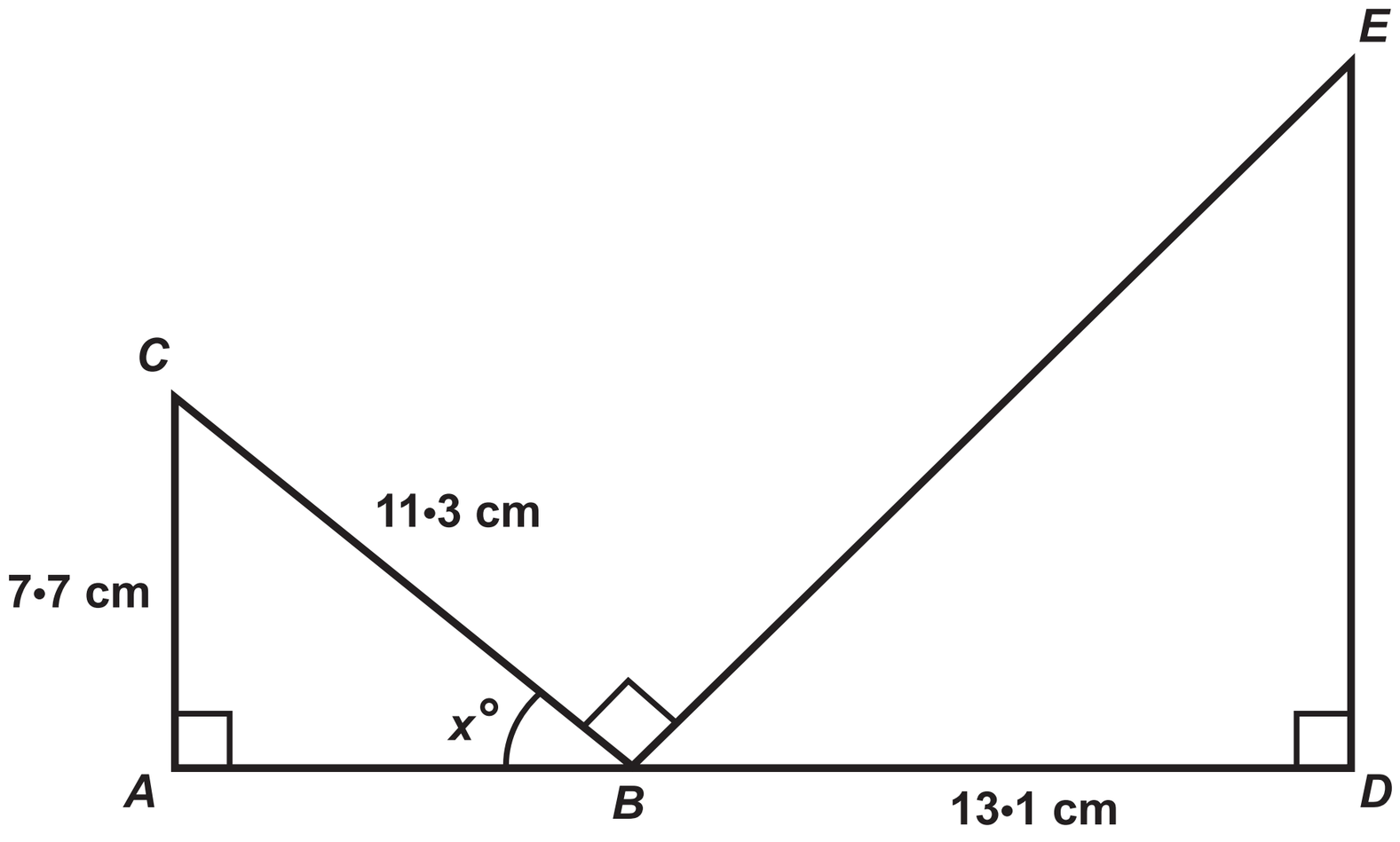
Question 2

Table

TOKEN	Gold	Silver	Bronze	No Prize
PROBABILITY	0•02	0•18		

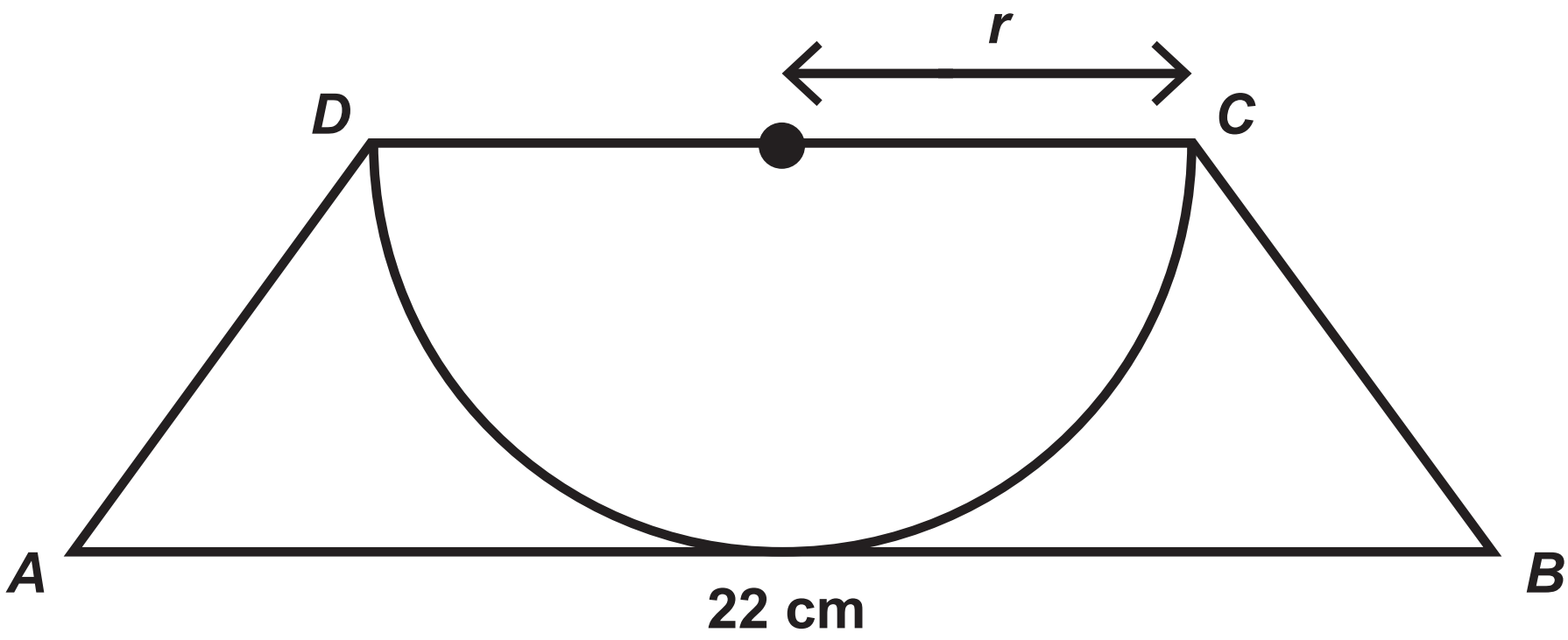
Question 6

Diagram NOT drawn to scale

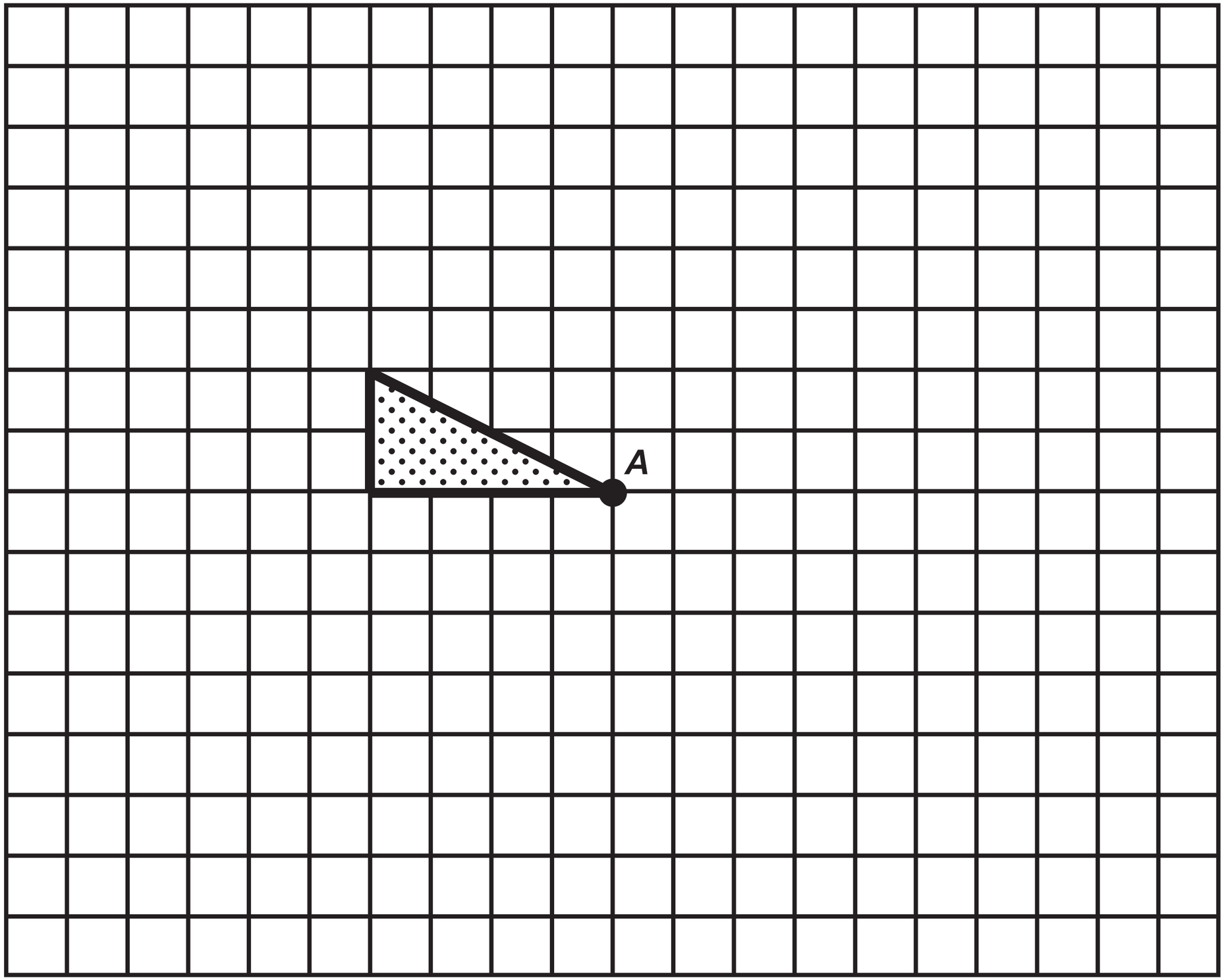


Question 8

Diagram NOT drawn to scale

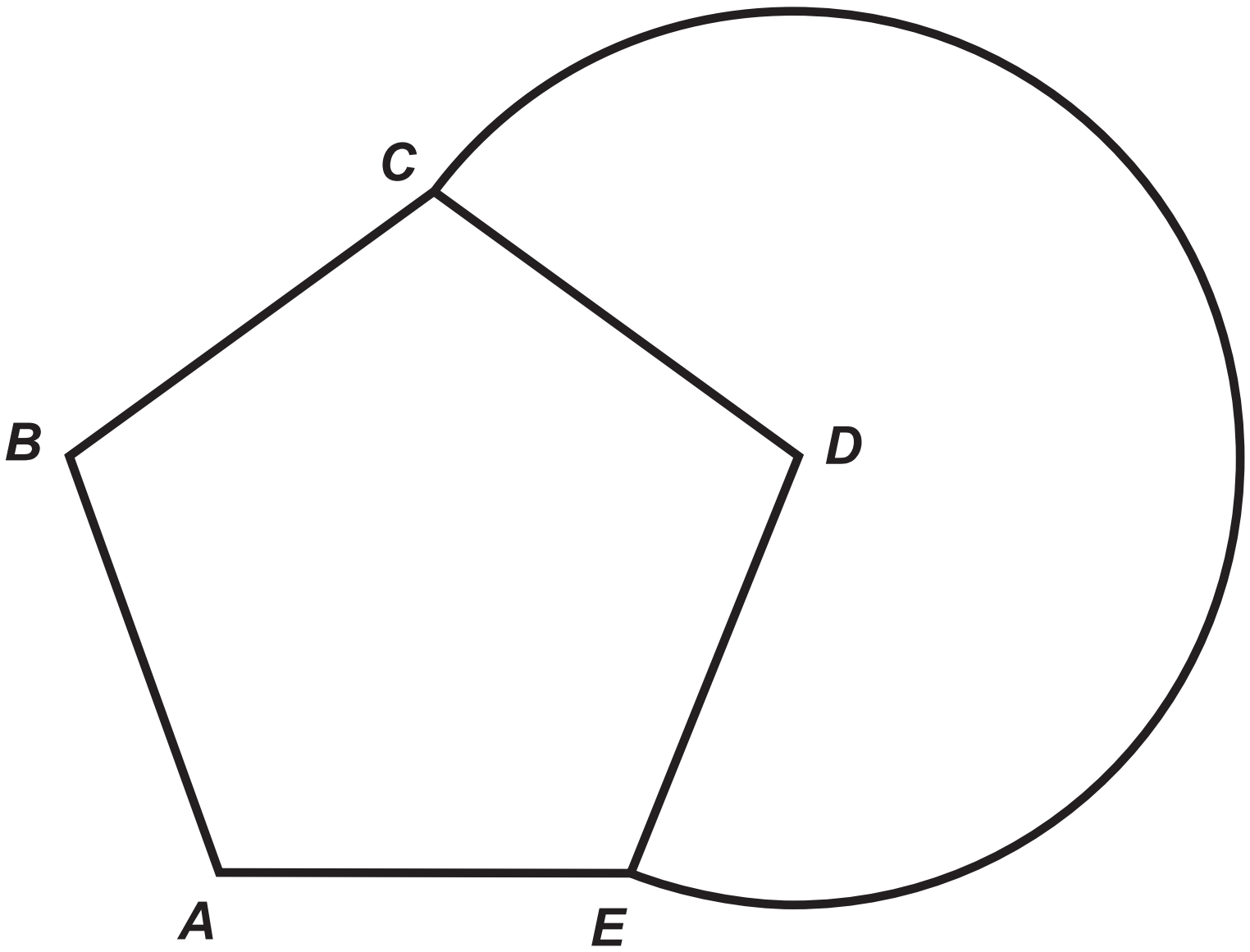


Question 9

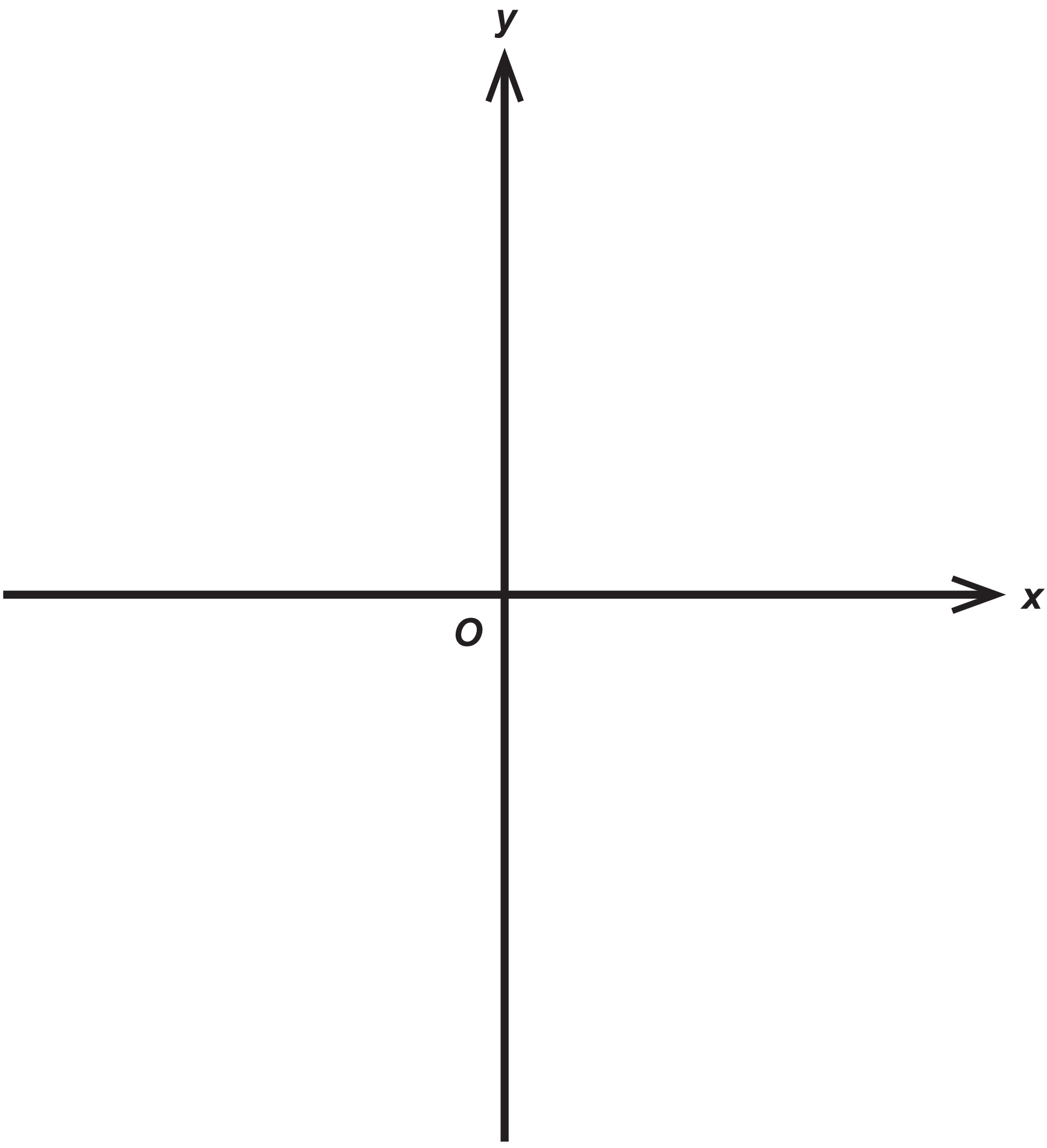


Question 10

Diagram NOT drawn to scale

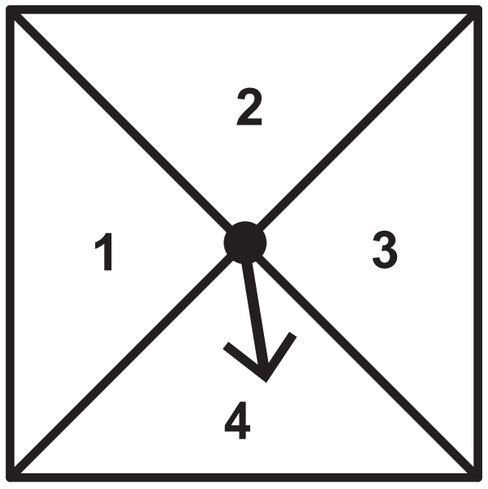


Question 12 (c)

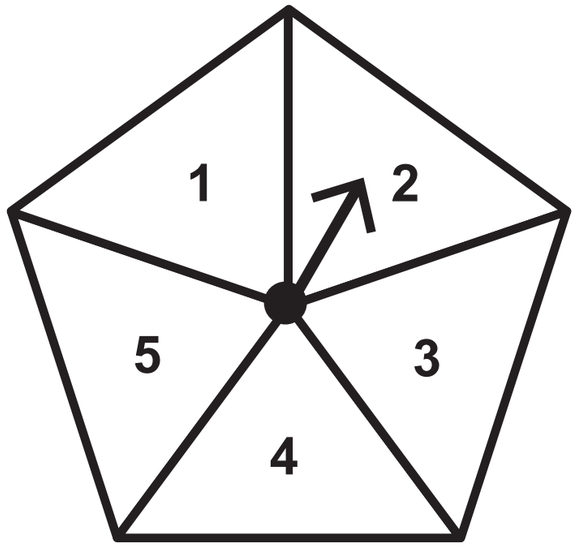


Question 13

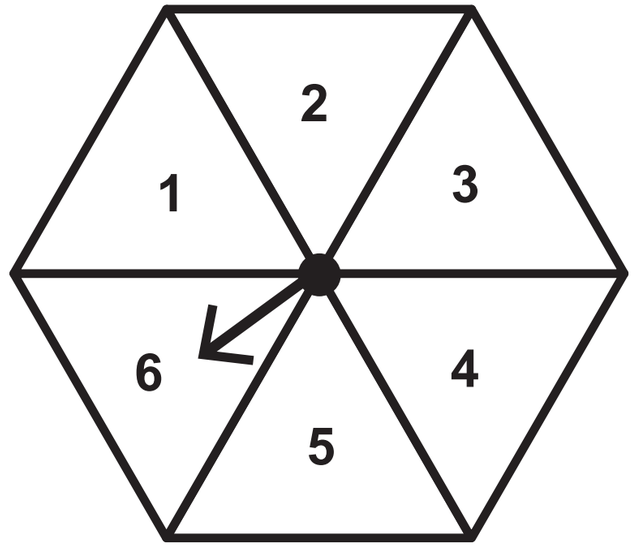
Spinner A



Spinner B

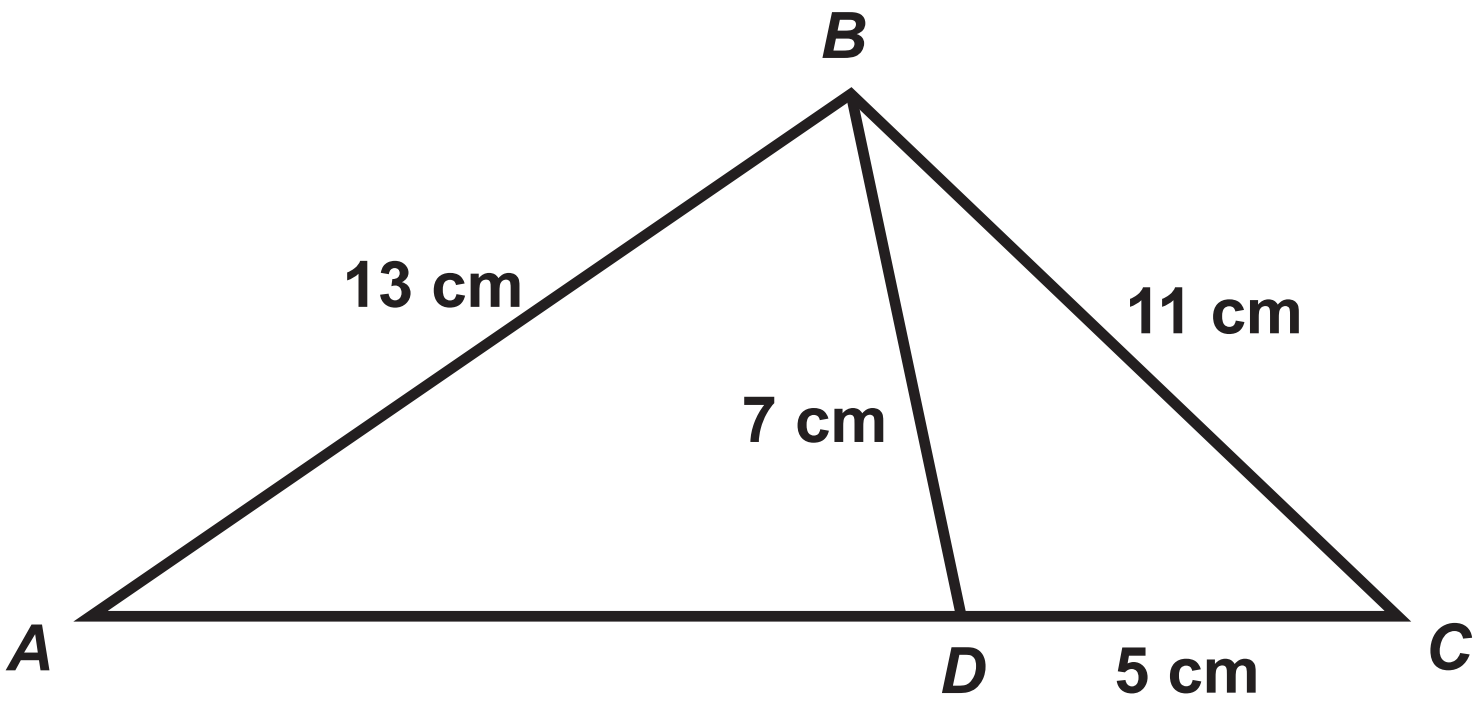


Spinner C



Question 16

Diagram NOT drawn to scale



GCSE
MATHEMATICS
and
NUMERACY

FORMULA LIST

HIGHER TIER

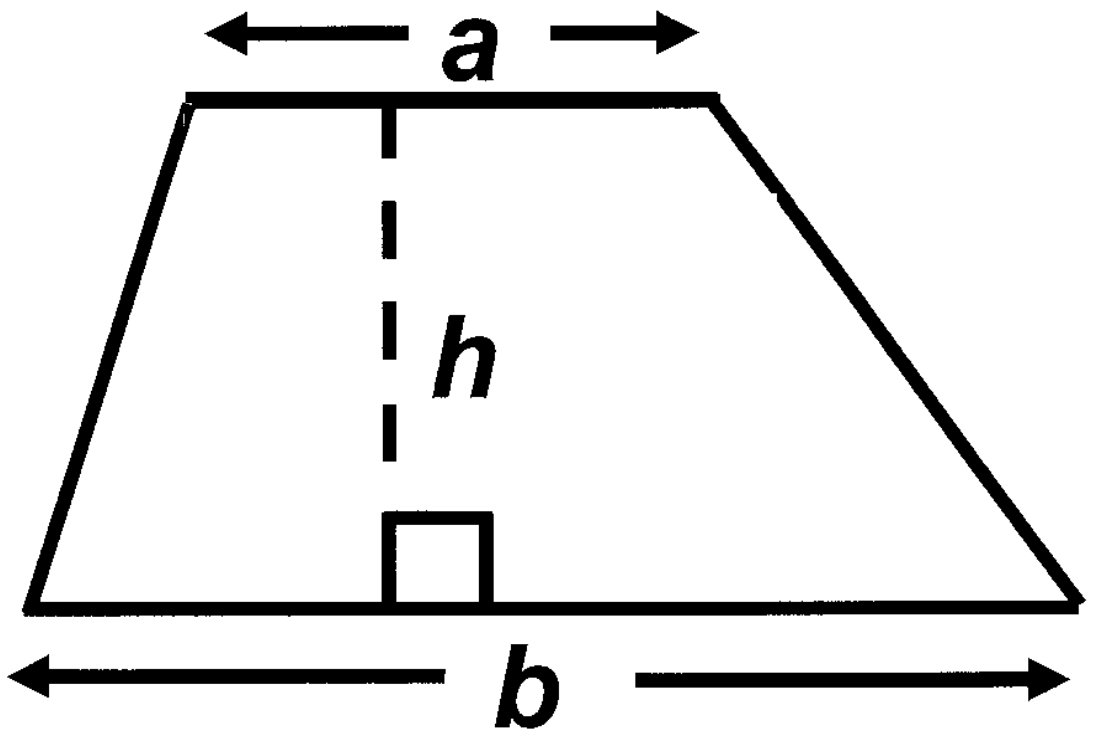
GCSE

You must not write on these formula pages.

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

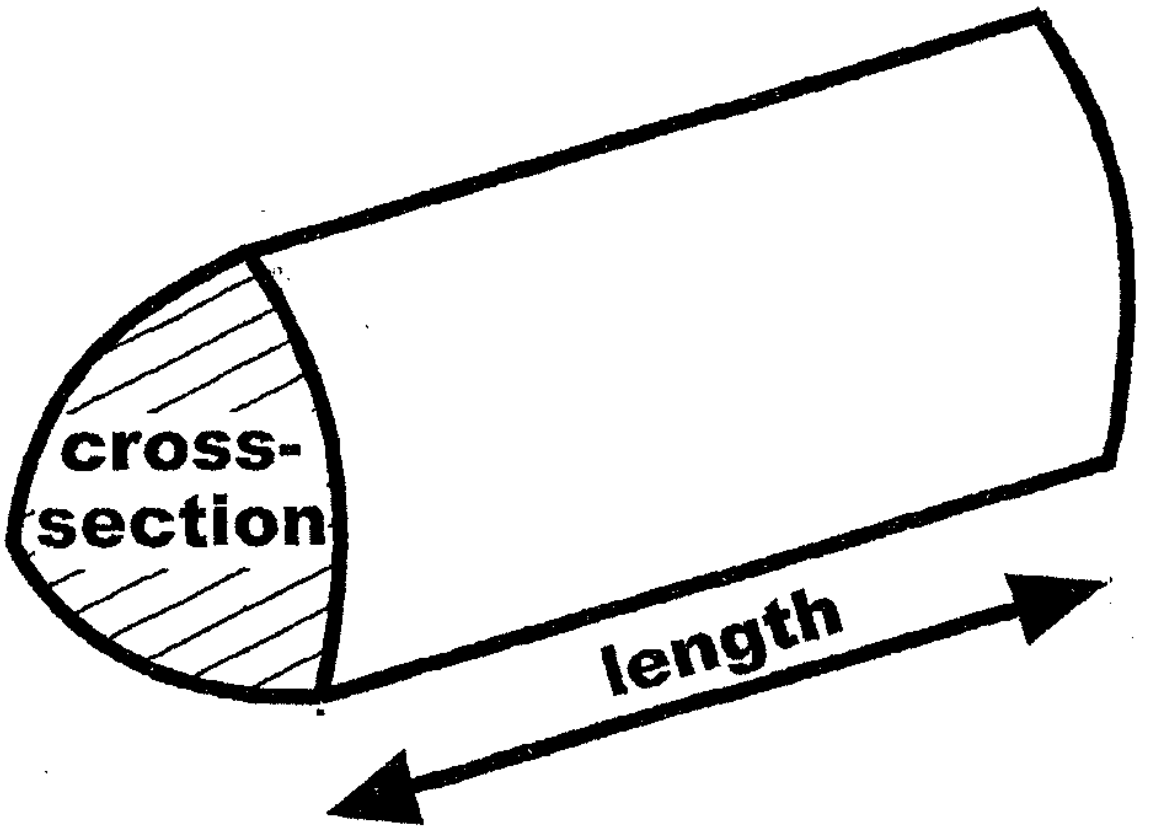
Formula List – Higher Tier

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



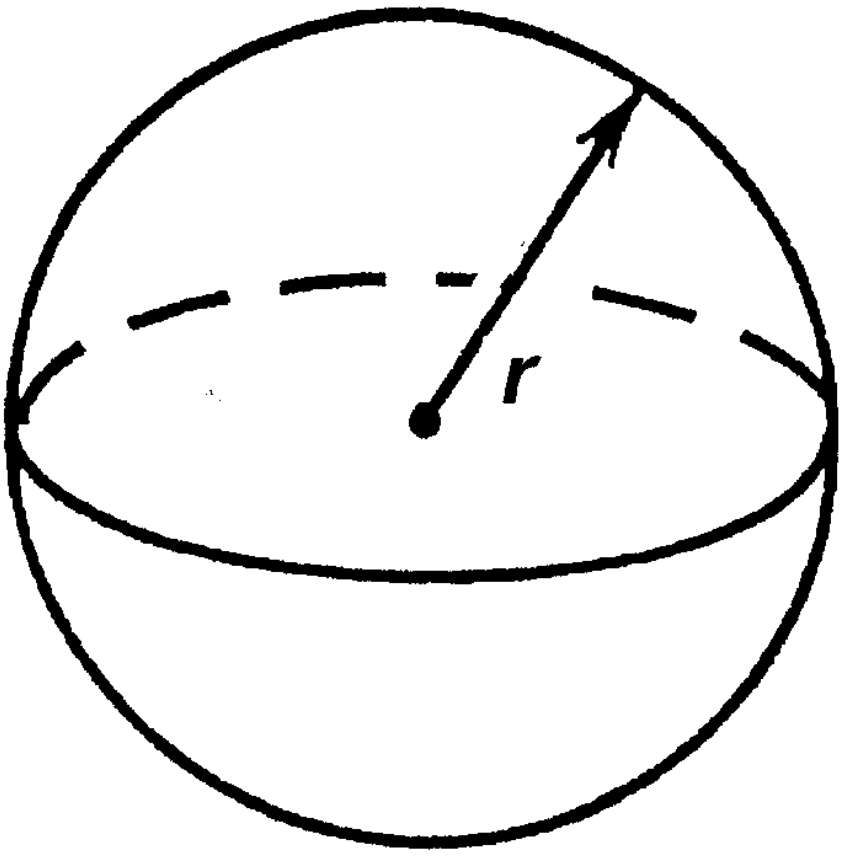
Volume of prism =

area of cross – section × length



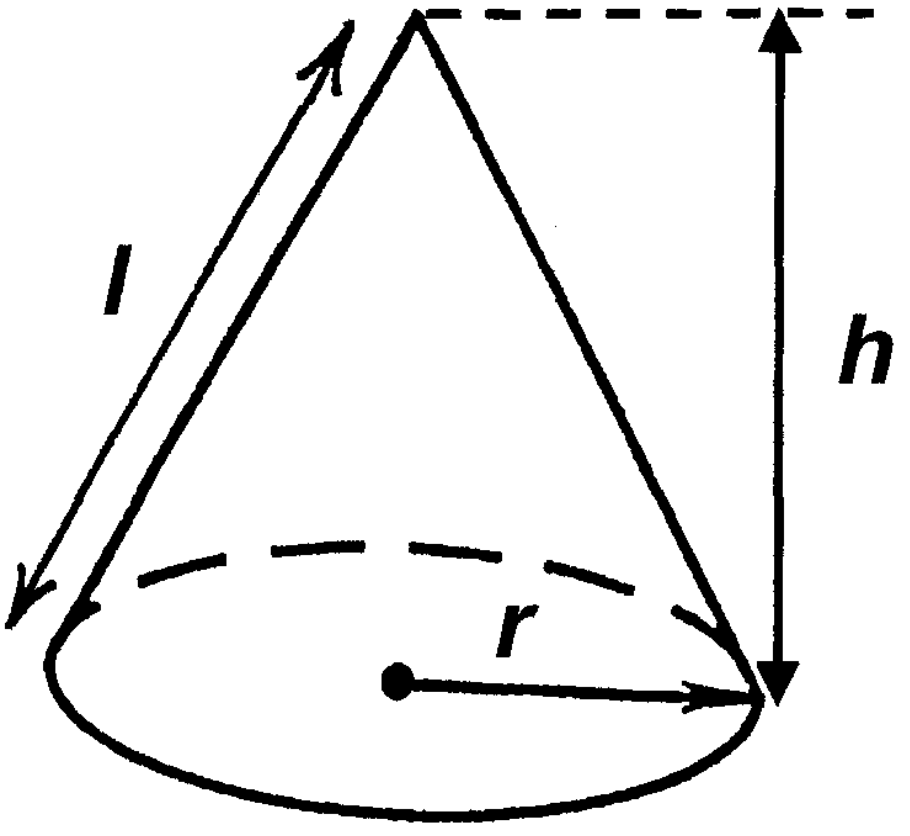
Volume of sphere $= \frac{4}{3}\pi r^3$

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

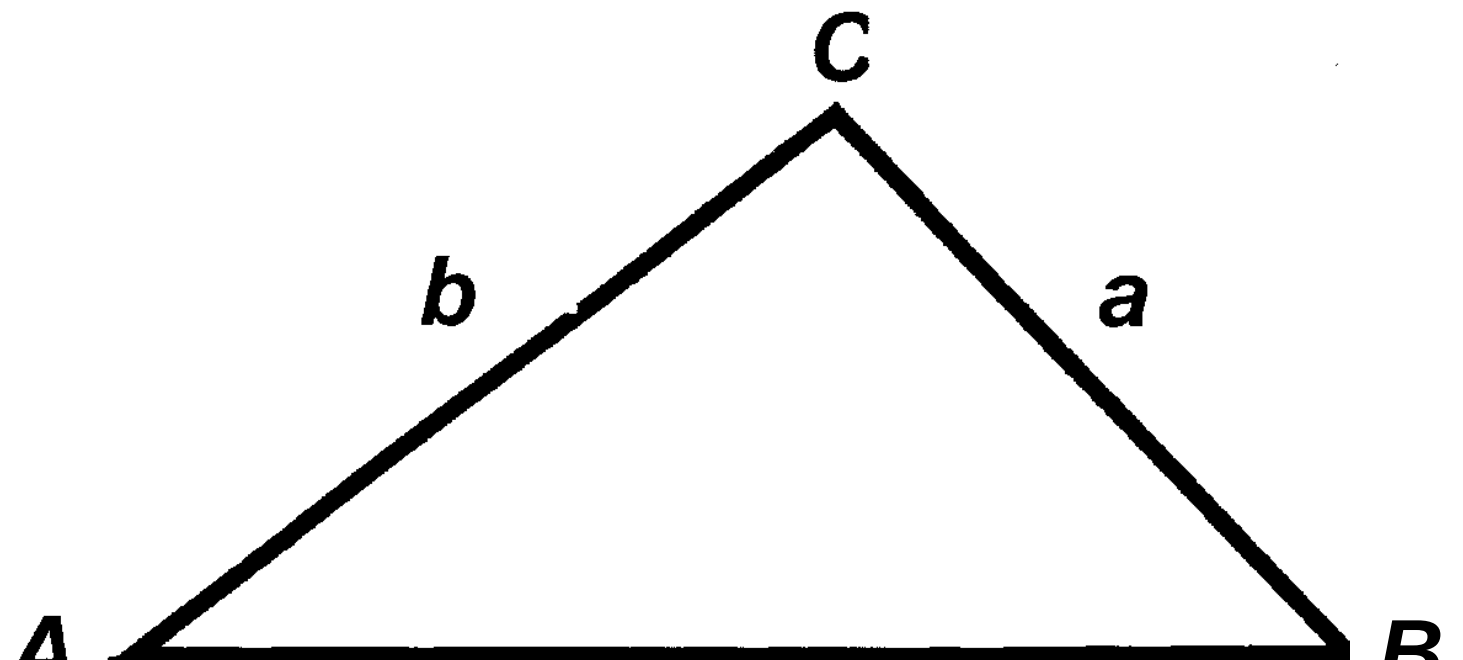


Volume of cone $= \frac{1}{3}\pi r^2 h$

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.