

First name	
Last name	
School	

CE AT 13+

MATHEMATICS



Additional Specimen Paper

Date

Time allowed: 60 minutes

Instructions

Calculators may be used on any question.

Answer as many questions as you can. This may be done in any order.

Concentrate on complete solutions to questions rather than fragmentary answers.

Final answers should be double-underlined.

Answers should include correct units where necessary.

Answers given as fractions should be reduced to lowest terms and written as mixed numbers where appropriate.

Unless specified, where not exact, answers should be given to 3 significant figures.

Diagrams are not drawn accurately unless specified.

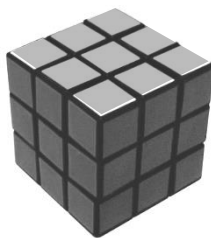
You are encouraged to cross out mistakes neatly, not erase them.

All working and answers are to be written in this booklet, but lined paper is available on which to continue or redo questions.

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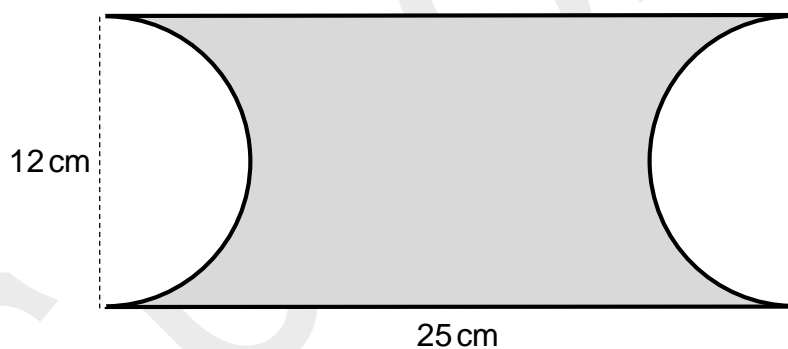
1. This cube with sides 3 cm is made of lots of 1-cm cubes.
The outside is painted red.



- (a) How many of the 1-cm cubes have **three red faces**?
(b) How many of the 1-cm cubes have **two red faces**?
(c) How many of the 1-cm cubes have **at least one red face**?

[5]

2. An axe blade, made for a play, has semicircular pieces cut from a rectangle as shown.

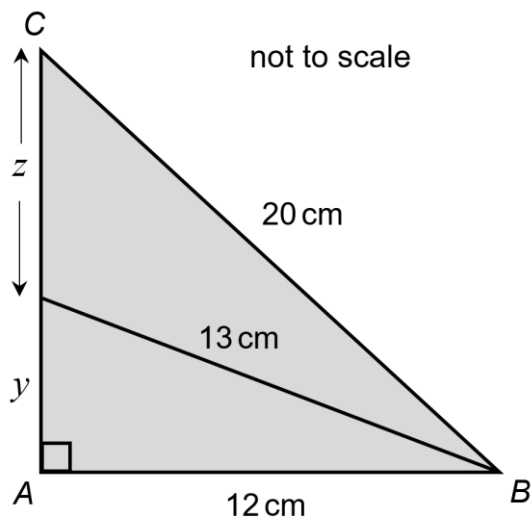


not to scale

Calculate the **shaded area** of the blade.

[4]

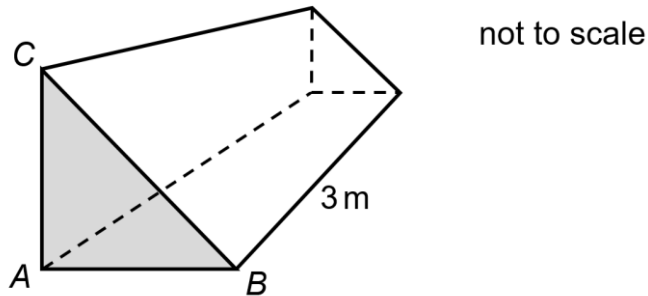
3. (a) Calculate the lengths marked y and z in the triangle ABC below.



[6]

- (b) The triangle ABC , above, forms the perpendicular cross-section of a prism, 3 metres long, made from lead.

Calculate the **volume** of the prism in cubic centimetres.



[4]

- (c) 1 cubic metre of lead has a mass of 11 342 kilograms.

Calculate the **mass** of the prism.

[3]

4. (a) The n^{th} term of a sequence $t_n = 5n + 3$

Calculate the 12th and 24th terms, t_{12} and t_{24}

[4]

- (b) Calculate the 50th term, t_{50} , of each of the following sequences.

(i) 5 , 12 , 19 , 26 , ... (ii) 2 , 5 , 10 , 17 , 26 , ...

[6]

- (c) A sequence starts 9 , 13 , 17 , 21 , ...

Which term in the sequence will be 145 ?

[4]

5. Solve the equation $\frac{x + 1}{3} = 3 - \frac{x - 1}{4}$

[5]

6. When 2 adults and 3 children go to the zoo it costs £48.
However, it costs £76 for 5 adults and 2 children go to the zoo.
Work out the price of an **adult's ticket** and the price of a **child's ticket**.

[6]

7. (a) Factorise fully

$$24xy + 15y^2 - 3y$$

(b) Simplify

$$\frac{2m^2 + 8m}{3m + 12}$$

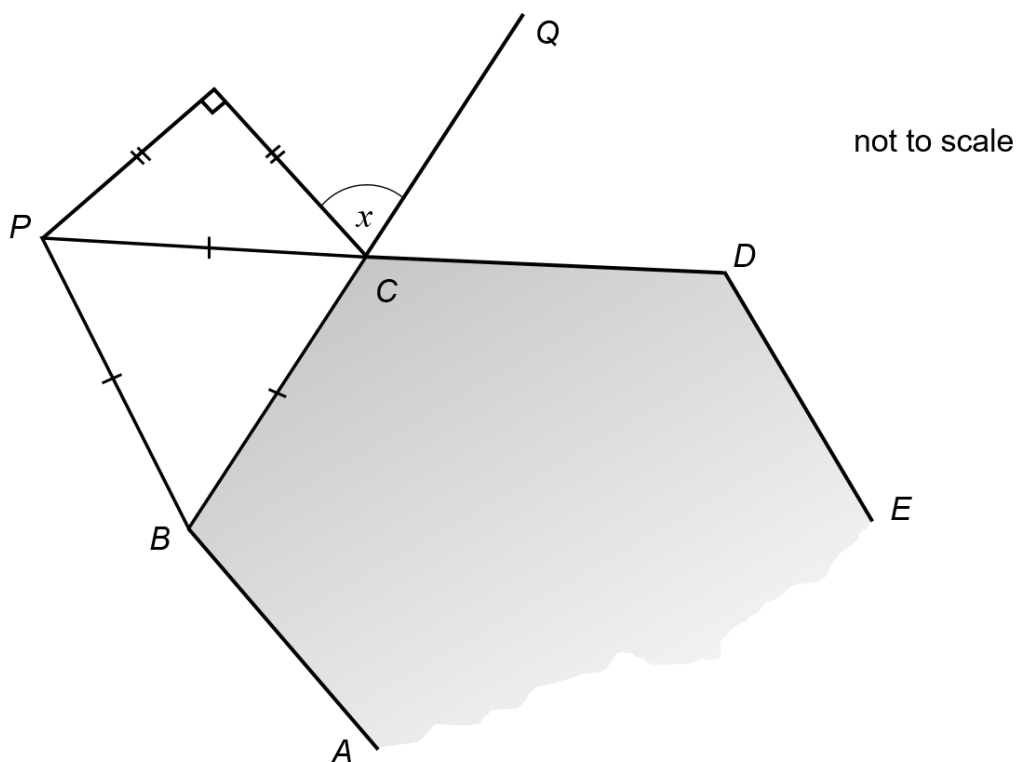
[5]

(c) Simplify this expression to show how it can easily be worked out **without** a calculator.

$$96.1 \times 4.068 + 3.9 \times 4.068$$

[3]

8. In the diagram, PCD and BCQ are straight lines.



- (a) Calculate the size of angle x

[4]

$ABCDE$ forms part of a regular polygon.

- (b) Calculate the number of sides of the complete polygon.

[2]

- (c) What can you say about PBA and why?

[3]

9. (a) The height of a volcano increases from the beginning to the end of each year by 5%.
At the start of 2017, it was 500 m high.

What will be its height by the end of 2026?



[4]

- (b) Including 15% sales tax, the total price of a house is £736 805

What is the price of the house before tax is added?



[4]

10. (a) Work out $8.2 \times 10^5 \times 7.625 \times 10^7$
giving your answers in standard form correct to 3 significant figures.

[3]

- (b) The distance from the Earth to the Sun is 1.48×10^8 kilometres.
Sheets of paper, each 0.97 mm, are stacked up in a pile on the Earth.
How many sheets of paper would be needed to reach the Sun?

[4]

11.



The diagram shows a step pyramid made up of 14 cubes, each with edges of 1 cm.
The outside surface of the pyramid, including the base, is painted gold.
Calculate the **area** painted gold.

[5]

12. (a) On the graph opposite, plot points to draw accurately the curve

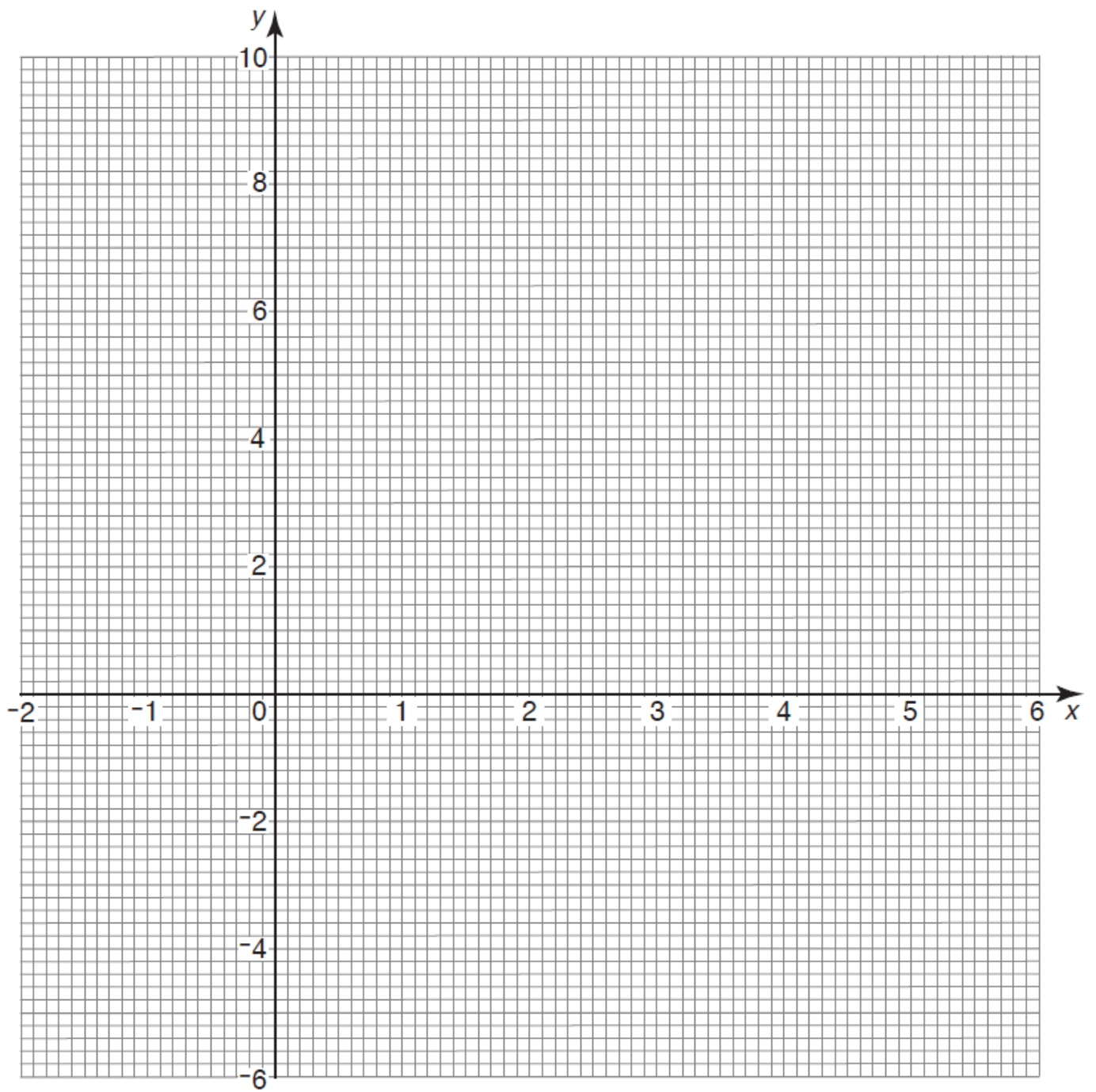
$$y = 10 - (x - 2)^2$$

[6]

- (b) Use the graph to find two values of x that satisfy the following equation correct to 1 decimal place:

$$\frac{x}{2} + 2 = 10 - (x - 2)^2$$

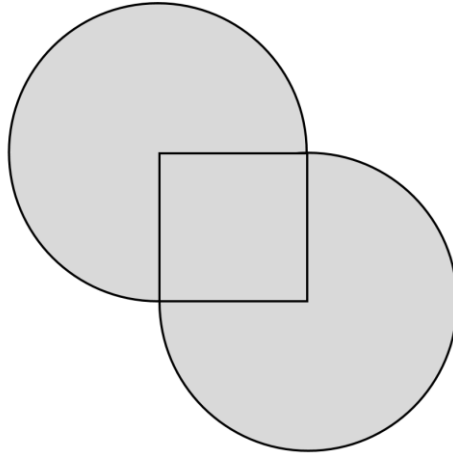
[5]



TURN OVER FOR QUESTION 13

13. Two circles intersect and a square is formed with vertices at the centre of each circle as shown.

The radius of each circle is r



Show that the area of the entire figure is $r^2\left(\frac{3\pi}{2} + 1\right)$

[5]

(Total marks: 100)