Geometric shapes with algebra

Q1. The diagram shows a cuboid.
A cuboid has a square base of side x cm.
The height of the cuboid is $(x + 4)$ cm.
The volume of the cuboid is 150 cm3.

(a) Show that $x^3 + 4x^2 = 150$

The equation $x^3 + 4x^2 = 150$ has a solution between 4 and 5

(b) Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place. You must show ALL your working.

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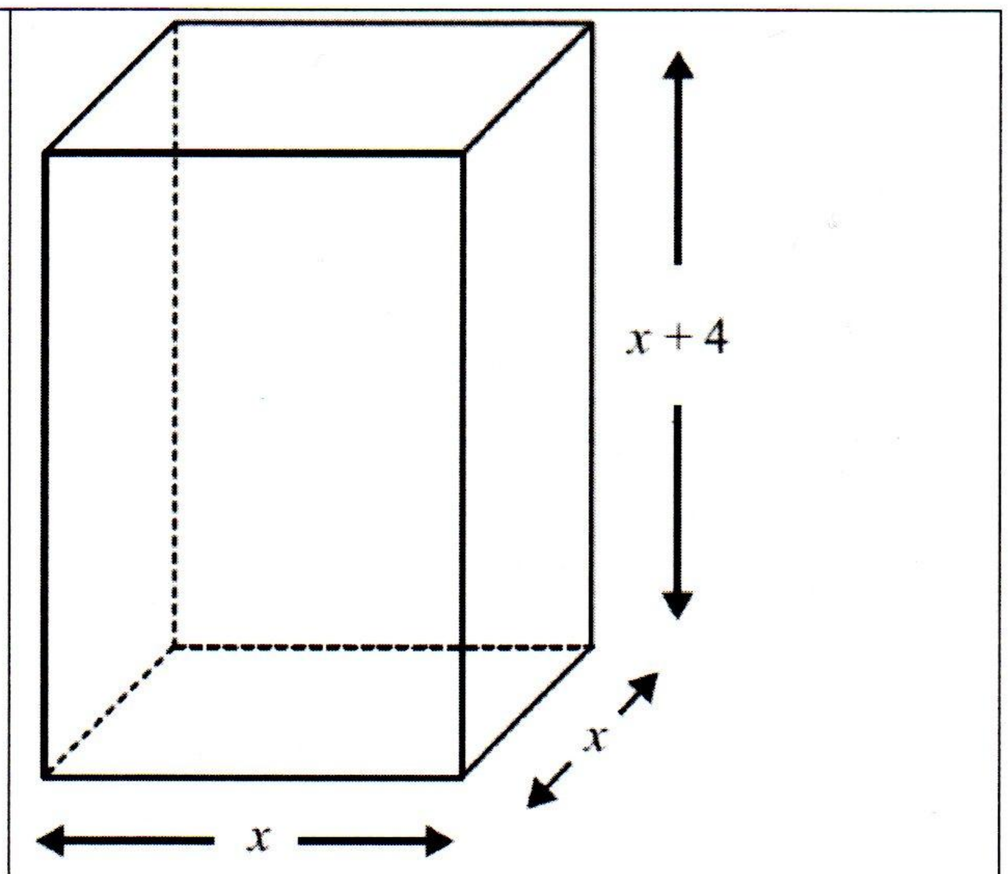
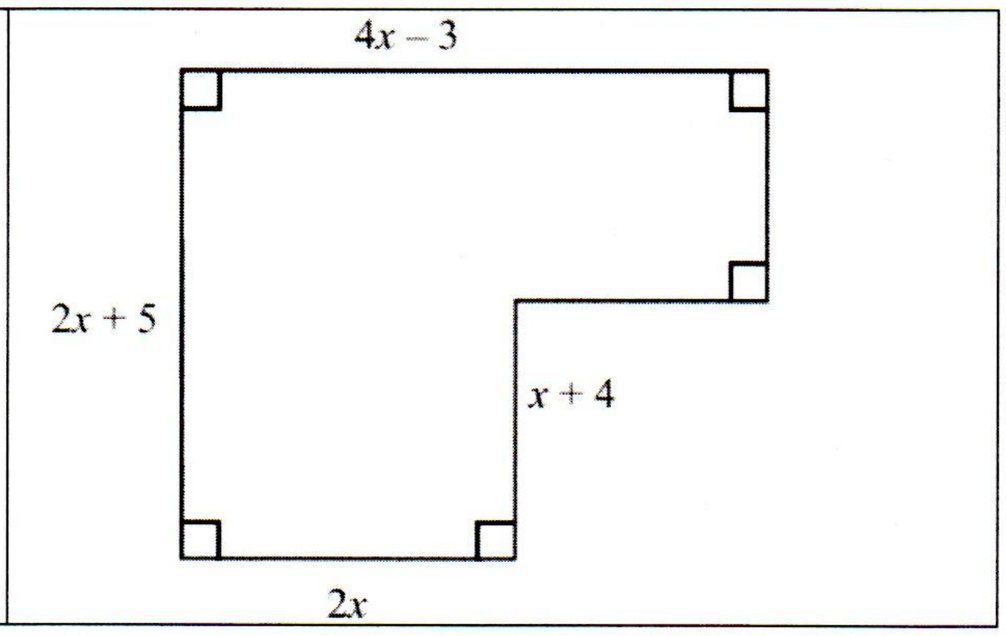
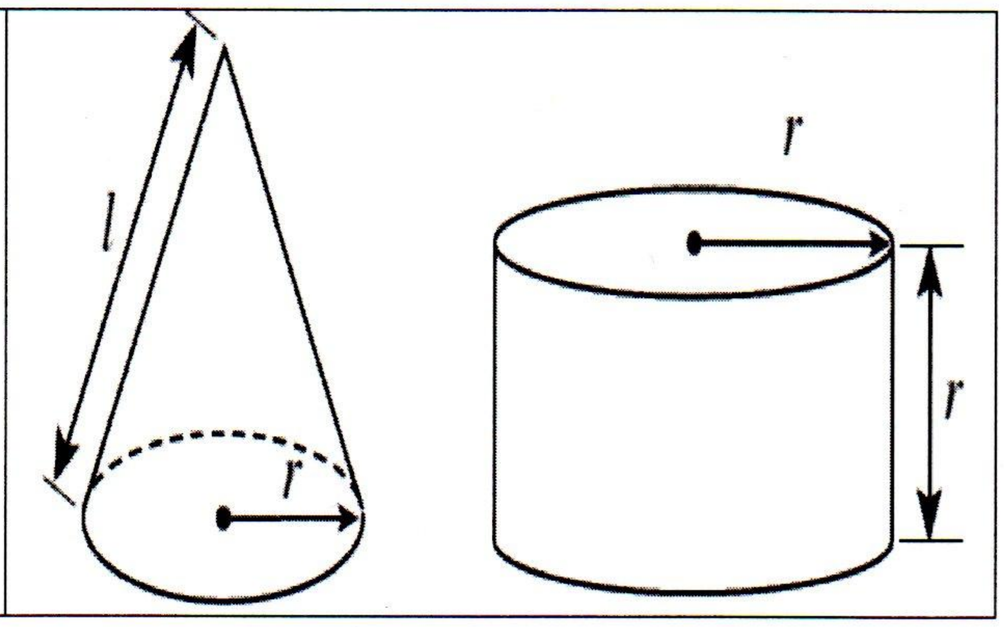


Q2. The diagram below shows a hexagon.

All the measurements are in centimetres.
The area of this shape is 102 cm^2.
Work out the length of the longest side of the shape. _____

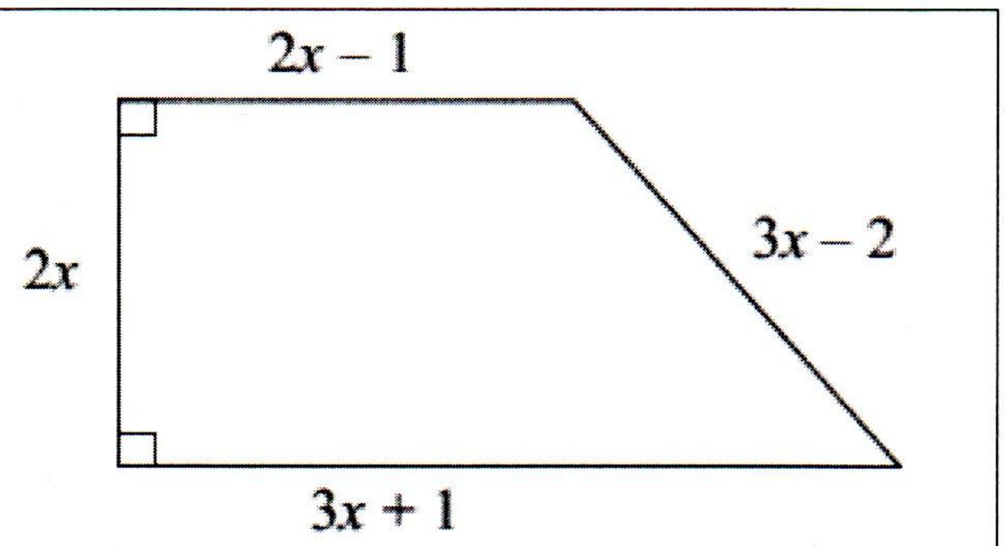


Q3. A cone has radius r and slant height l.
A cylinder has radius r and height r.
The **total** surface area of the cone is equal to the **total** surface area of the cylinder.
Find an expression for l in terms of r.



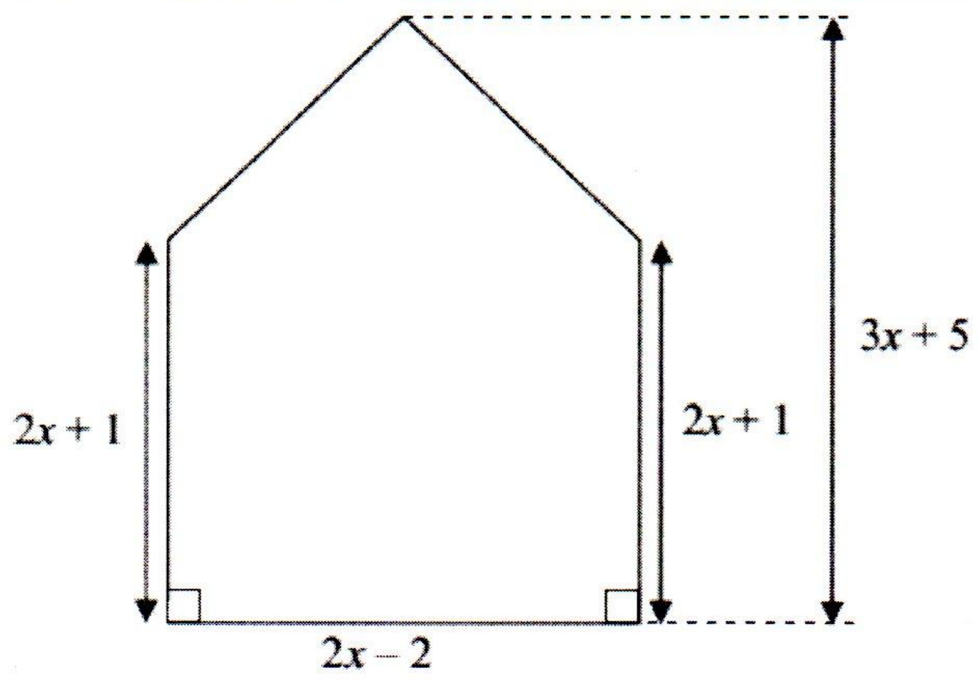
Q4The diagram shows a trapezium.

In the diagram, all measurements are in centimetres.
The perimeter of the trapezium is 38 cm.
Work out the area of the trapezium.

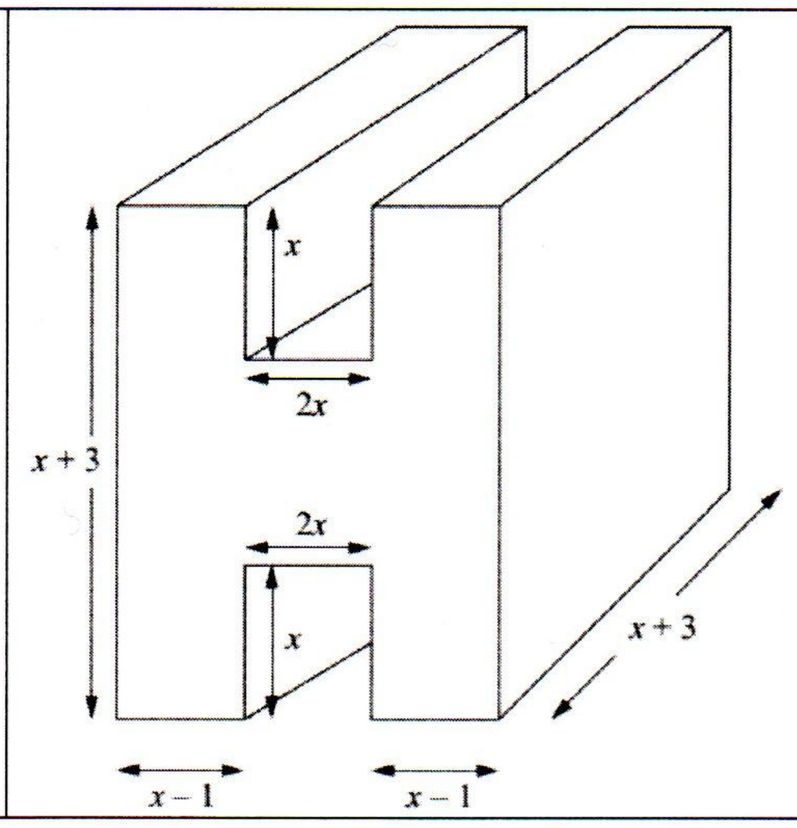


Q5. The diagram shows a pentagon.

All measurements are in centimetres.
Show that the area of this pentagon can be written as $5x^2 + x - 6$



Q6. The diagram shows a prism.
All measurements are in cm.
All corners are right angles.
The volume of the prism is V cm^3.
Find a formula for V.

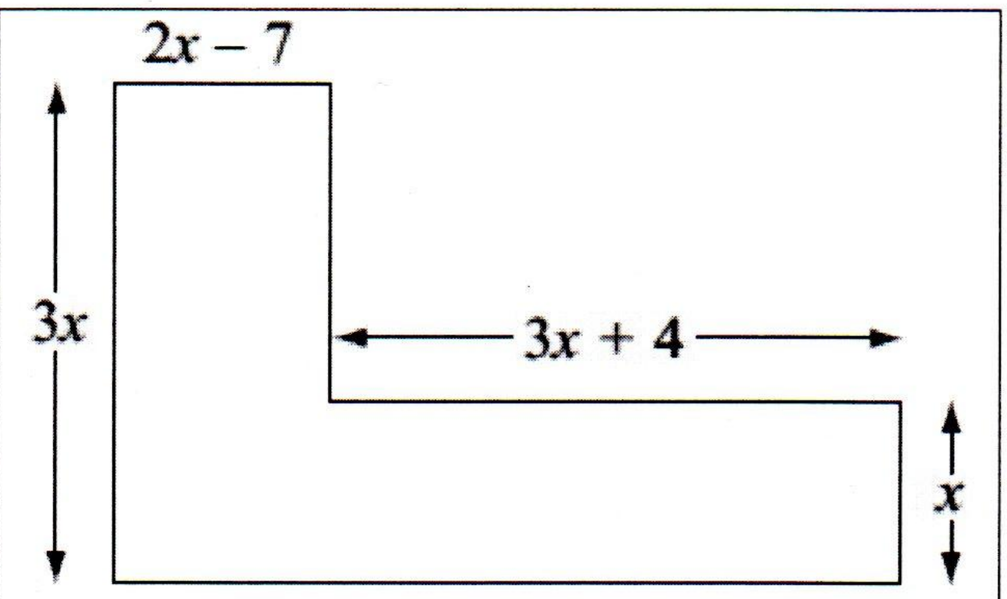


Q7. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

a) Find the area of the shape in algebraic expression and simplify into simplest form.

b) The area of the shape is 85 cm^2.
Make equation and solve the equation.
Give your solutions correct to 3 significant figures.

x = ... or x = ...



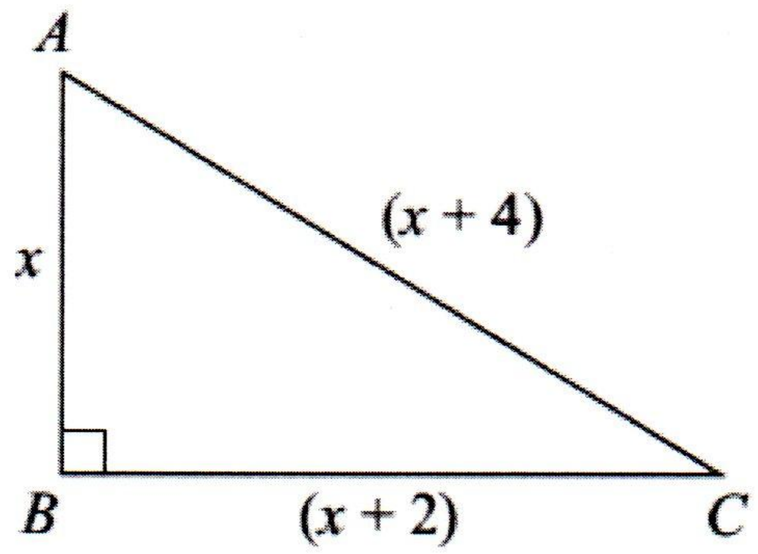
Q8. ABC is a right-angled triangle.
All the measurements are in centimetres.
$AB = x$, $BC = (x + 2)$, $AC = (x + 4)$

Show that $x^2 – 4x – 12 = 0$

(b) (i) Solve $x^2 – 4x – 12 = 0$
.....

(ii) Hence, write down the length of *AC.*

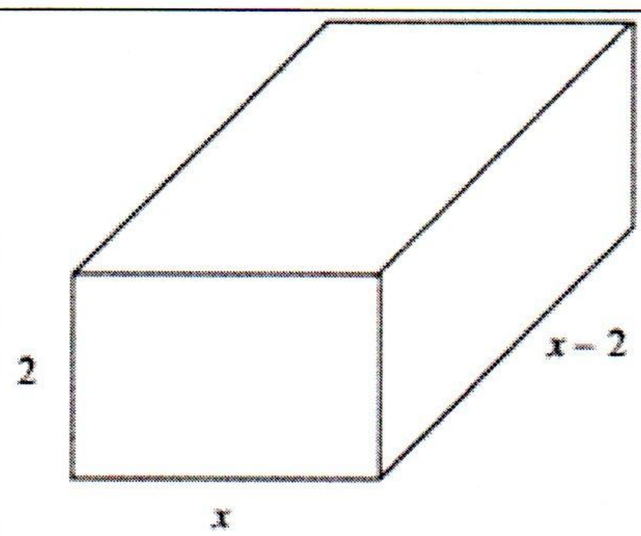
AC = ...cm



Q9. The diagram shows a cuboid.
All the measurements are in cm.
The volume of the cuboid is 51 cm^3.

(a) Show that $2x^2 – 4x – 51 = 0$ for $x > 2$

(b) Solve the quadratic equation
$2x^2 – 4x – 51 = 0$
Give your solutions correct to 3 significant figures.
You must show your working.



Q10. The sides of a right-angled triangle are x, $(x + 2)$ and $(2x – 2)$. The hypotenuse is length $(2x – 2)$. Find the actual dimensions of the triangle.

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Q11. The length of a rectangle is 5 m more than its width. Its area is 300 m^2. Find the actual dimensions of the rectangle.

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Q12. The average weight of a group of people is 45.2 kg. A newcomer to the group weighs 51 kg, which increases the average weight by 0.2 kg. How many people are now in the group?

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Q13. A tennis court has an area of 224 m^2. If the length were decreased by 1 m and the width increased by 1 m, the area would be increased by 1 m^2. Find the dimensions of the court.

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Q14. On a journey of 400 km, the driver of a train calculates that if he were to increase his average speed by 2 km/h, he would take 20 minutes less. Find his average speed.

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Q15. The difference of the squares of two positive numbers, whose difference is 2, is 184. Find these two numbers.

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Q16. The length of a carpet is 1 m more than its width. Its area is 9 m2. Find the dimensions of the carpet to 2 decimal places.

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Q17. The two shorter sides of a right-angled triangle differ by 2 cm. The area is 24 cm^2. Find the shortest side of the triangle.

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Q18. Helen worked out that she could save 30 minutes on a 45 km journey if she travelled at an average speed which was 15 km/h faster than that at which she had planned to travel. Find the speed at which Helen had originally planned to travel.

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Q19. Claire intended to spend £3.20 on balloons for her party. But each balloon cost her 2p more than she expected, so she had to buy 8 fewer balloons. Find the cost of each balloon.

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Q20. The sum of a number and its reciprocal is 2.05. What are the two numbers?
A woman buys goods for £60x and sells them for £$(600 – 6x)$ at a loss of x%.
Find x.

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