

**GCSE - Mathematics****Topic:** Solve quadratic equations (formula, and graphs)**Tier:** Higher**Grade:**

A\*/A

**Starter:**Evaluate these expressions where  $a = 3$ ,  $b = 6$  and  $c = -1$ 

- 1)  $4a + 2$
- 2)  $ab + c$
- 3)  $b^2 - 4c$
- 4)  $-a + \sqrt{6b}$

Rearrange these equations to make  $x$  the subject.

- 1)  $2x - 3 = x + 5$
- 2)  $2x + 6y = 30$
- 3)  $5xy + 2x = 4$

**Skills:**

1) Solve the quadratic equations by using the quadratic formula.

- a)  $x^2 + 6x + 3 = 0$
- b)  $x^2 + 7x - 3 = 0$
- c)  $2x^2 + 3x - 1 = 0$
- d)  $10x^2 - 9x - 6 = 0$
- e)  $x = 4 - x^2$
- f)  $x^2 = 8x + 18$

2) Complete the table and plot the graph of  $y = x^2 - 2x - 4$  to find the solutions of  $x^2 - 2x - 4 = 0$ 

x	-2	-1	0	1	2	3	4
y	4		-4	-5		-1	

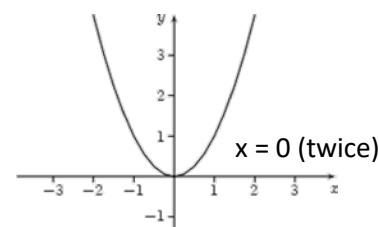
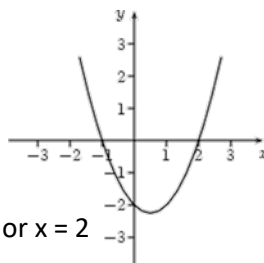
**Top Tips!**When it is not possible to solve a **quadratic equation** by **factorisation** you will need to solve it by using the **quadratic formula**.

- Make sure the equation is in the form  $ax^2 + bx + c = 0$
- Substitute a, b and c into the formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

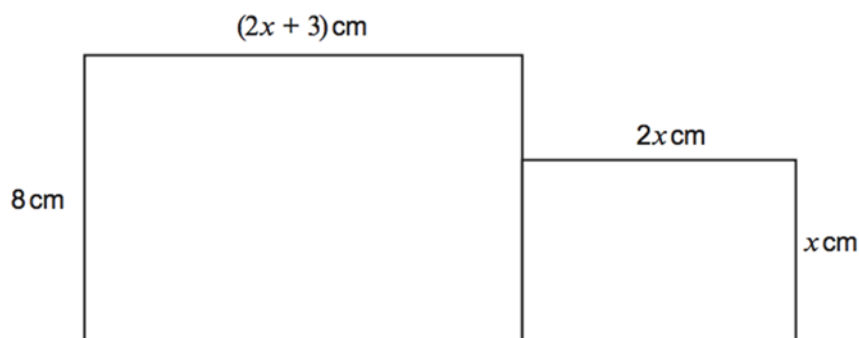
- Remember for a quadratic equation there are 2 solutions due to the  $\pm$  (or one repeated answer)

These solutions can also be found from the graph of the equation where the curve crosses the x axis.

**Examination Question:**

2014 November Linear P2 Higher Q13

The diagram shows two rectangles joined together.

*Diagram not drawn to scale*The total area of the two rectangles is  $212.5\text{cm}^2$ . By using an algebraic method, calculate the area of the smaller rectangle.**Assessment for Learning****Video / QR code**



**Starter:**

Evaluate these expressions where  $a = 3$ ,  $b = 6$  and  $c = -1$

1)  $4a + 2 = 14$

2)  $ab + c = 17$

3)  $b^2 - 4c = 40$

4)  $-a + \sqrt{6b} = 3$

Rearrange these equations to make  $x$  the subject.

1)  $2x - 3 = x + 5$        $x = 4$

2)  $2x + 6y = 30$     $x = 15 - 3y$

3)  $5xy + 2x = 4$     $x = \frac{4}{5y+2}$

**Skills:**

1) Solve the quadratic equations by using the quadratic formula.

a)  $x^2 + 6x + 3 = 0$

$x = -5.44$  or  $-0.55$  (2dp)

b)  $x^2 + 7x - 3 = 0$

$x = -7.41$  or  $0.41$  (2dp)

c)  $2x^2 + 3x - 1 = 0$

$x = -1.78$  or  $0.78$  (2dp)

d)  $10x^2 - 9x - 6 = 0$

$x = 1.35$  or  $-0.45$  (2dp)

e)  $x = 4 - x^2$

$x = -2.56$  or  $1.56$  (2dp)

f)  $x^2 = 8x + 18$

$x = 9.83$  or  $-1.83$  (2dp)

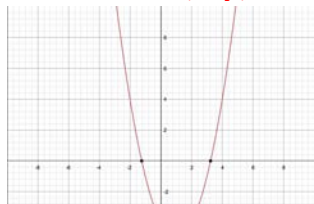
2) Complete the table and plot the graph of  $y = x^2 - 2x - 4$

to find the solutions of

$x^2 - 2x - 4 = 0$

x	-2	-1	0	1	2	3	4
y	4	-1	-4	-5	-4	-1	4

$x = -1.24$  (2dp) or  $x = 3.24$  (2dp)



**Top Tips!**

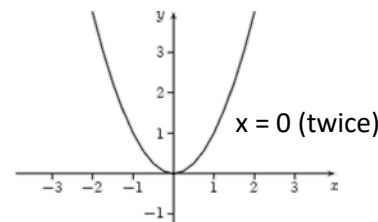
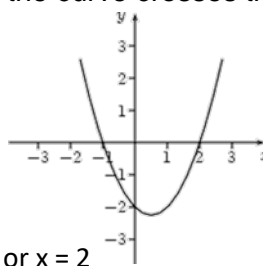
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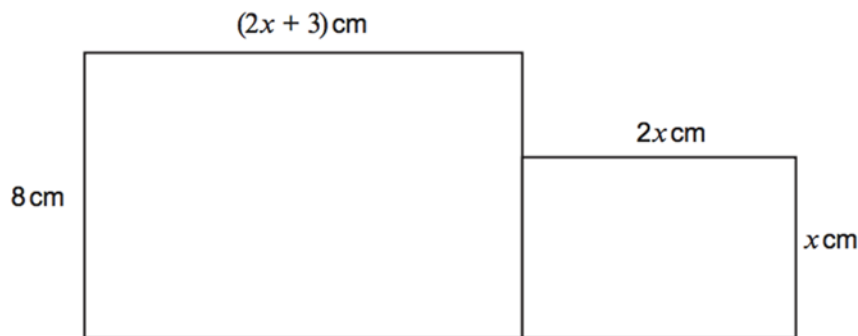


Diagram not drawn to scale

The total area of the two rectangles is  $212.5\text{cm}^2$ . By using an algebraic method, calculate the area of the smaller rectangle.

$8(2x + 3) + 2x^2 = 212.5 \Rightarrow 2x^2 + 16x + 24 = 212.5$

$\Rightarrow 2x^2 + 16x - 188.5 = 0$

$x = 6.5$  or  $x = -14.5$  must be

$x = 6.5\text{cm}$  as it's a length. Area =  $2(6.5) \times (6.5) = 84.5\text{cm}^2$

**Assessment for Learning**

**Video / QR code**