

Name:

Level 2 Further Maths



Solving Quadratics using
Completing the Square

Corbettmaths

Ensure you have: Pencil or pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Revision for this topic

www.corbettmaths.com/more/further-maths/



1. (a) Write $x^2 + 4x - 3$ in the form $(x + a)^2 + b$, where a and b are constants

$$(x + 2)^2 - 4 - 3$$

$$(x + 2)^2 - 7$$

.....
(2)

- (b) Hence solve $x^2 + 4x - 3 = 0$

$$(x + 2)^2 - 7 = 0$$

$$(x + 2)^2 = 7$$

$$x + 2 = \pm \sqrt{7}$$

$$x = -2 + \sqrt{7}$$

or

$$x = -2 - \sqrt{7}$$

.....
(2)

2. Solve $x^2 - 2x - 5 = 0$ using completing the square

$$(x - 1)^2 - 1 - 5 = 0$$

$$(x - 1)^2 = 6$$

$$x - 1 = \pm \sqrt{6}$$

$$x = 1 \pm \sqrt{6}$$

$$x = 1 + \sqrt{6}$$

or

$$x = 1 - \sqrt{6}$$

.....
(3)

3. Solve $x^2 - 3x + 1 = 0$ using completing the square

$$\left(x - \frac{3}{2}\right)^2 - \frac{9}{4} + 1 = 0$$

$$\left(x - \frac{3}{2}\right)^2 - \frac{5}{4} = 0$$

$$\left(x - \frac{3}{2}\right)^2 = \frac{5}{4}$$

$$x - \frac{3}{2} = \pm \frac{\sqrt{5}}{2}$$

$$x = \frac{3}{2} \pm \frac{\sqrt{5}}{2}$$

$$x = \frac{3}{2} + \frac{\sqrt{5}}{2}$$

or

$$x = \frac{3}{2} - \frac{\sqrt{5}}{2}$$

.....
(3)

4. Solve $x^2 + 13x + 1 = 0$ using completing the square

$$\left(x + \frac{13}{2}\right)^2 - \frac{169}{4} + 1 = 0$$

$$\left(x + \frac{13}{2}\right)^2 - \frac{165}{4} = 0$$

$$\left(x + \frac{13}{2}\right)^2 = \frac{165}{4}$$

$$x + \frac{13}{2} = \pm \frac{\sqrt{165}}{2}$$

$$x = -\frac{13}{2} \pm \frac{\sqrt{165}}{2}$$

$$x = -\frac{13}{2} + \frac{\sqrt{165}}{2}$$

or

$$x = -\frac{13}{2} - \frac{\sqrt{165}}{2}$$

.....
(3)

5. Solve $3x^2 + 12x - 2 = 0$ using completing the square

$$3 \left[x^2 + 4x - \frac{2}{3} \right] = 0$$

$$\div 3 \qquad \qquad \qquad \div 3$$

$$x^2 + 4x - \frac{2}{3} = 0$$

$$(x+2)^2 - 4 - \frac{2}{3} = 0$$

$$(x+2)^2 = \frac{14}{3}$$

$$x+2 = \pm \sqrt{\frac{14}{3}}$$

$$x = -2 + \sqrt{\frac{14}{3}}$$

or

$$x = -2 - \sqrt{\frac{14}{3}}$$

.....
(3)

6. Solve $5x^2 + 2x - 8 = 0$ using completing the square

$$5 \left[x^2 + \frac{2}{5}x - \frac{8}{5} \right] = 0$$

$$x^2 + \frac{2}{5}x - \frac{8}{5} = 0$$

$$\left(x + \frac{1}{5} \right)^2 - \frac{1}{25} - \frac{8}{5} = 0$$

$$\left(x + \frac{1}{5} \right)^2 = \frac{41}{25}$$

$$\left(x + \frac{1}{5} \right) = \pm \frac{\sqrt{41}}{5}$$

$$x = -\frac{1}{5} + \frac{\sqrt{41}}{5}$$

$$x = -\frac{1}{5} + \frac{\sqrt{41}}{5}$$

or

$$x = -\frac{1}{5} - \frac{\sqrt{41}}{5}$$

.....
(3)

7. A curve has equation $y = x^2 + 10x + 3$

Find the coordinates of the points where the curve meets the x-axis.

$$0 = x^2 + 10x + 3$$

$$0 = (x+5)^2 - 25 + 3$$

$$0 = (x+5)^2 - 22$$

$$22 = (x+5)^2$$

$$\pm\sqrt{22} = x+5$$

$$x = -5 \pm \sqrt{22}$$

$$(-5 + \sqrt{22}, 0)$$

$$(-5 - \sqrt{22}, 0)$$

.....
(4)

8. A curve with equation $y = x^2 + 8x - 1$ meets the x-axis at the points A and B
The point C has coordinates (2, 5).

Find the area of triangle ABC

$$0 = (x+4)^2 - 16 - 1$$

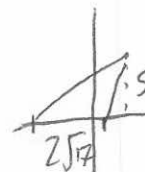
$$0 = (x+4)^2 - 17$$

$$17 = (x+4)^2$$

$$\pm\sqrt{17} = x+4$$

$$x = -4 \pm \sqrt{17}$$

$$A(-4 - \sqrt{17}, 0) \quad B(-4 + \sqrt{17}, 0)$$



$$\frac{1}{2} \times (2\sqrt{17}) \times 5$$

$$5\sqrt{17}$$

.....
(5)