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)

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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)

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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

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

$\div 3$ $\div 3$

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

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

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

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

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

or

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

.....

(3)

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

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

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

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

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

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

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

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

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)

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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

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

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

$17 = (x+4)^2$

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

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

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

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

$5\sqrt{17}$

.....

(5)