



Air maths tuition

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How to Solve a Quadratic Equation by Completing the Square

Solve the following quadratic equations giving your answers as exact values

1) $x^2 - 8x = 2$

$$\therefore x^2 - 8x - 2 = 0$$

$$\therefore (x - 4)^2 - 16 - 2 = 0$$

$$\therefore (x - 4)^2 = 18$$

$$\therefore x - 4 = \pm \sqrt{18}$$

$$\therefore x = 4 \pm \sqrt{18}$$

$$\therefore x = 4 \pm \sqrt{9} \sqrt{2}$$

$$\therefore x = 4 \pm 3\sqrt{2}$$

2) $3x^2 - 18x + 1 = 0$

$$\therefore 3(x^2 - 6x) + 1 = 0$$

$$\therefore 3[(x - 3)^2 - 9] + 1 = 0$$

$$\therefore 3(x - 3)^2 - 27 + 1 = 0$$

$$\therefore 3(x - 3)^2 = 26$$

$$\therefore (x - 3)^2 = \frac{26}{3}$$

$$\therefore x - 3 = \pm \sqrt{\frac{26}{3}}$$

$$\therefore x = 3 \pm \sqrt{\frac{26}{3}}$$

3) $2x^2 - 10x - 3 = 0$

$$\therefore 2(x^2 - 5x) - 3 = 0$$

$$\therefore 2\left[\left(x - \frac{5}{2}\right)^2 - \frac{25}{4}\right] - 3 = 0$$

$$\therefore 2\left(x - \frac{5}{2}\right)^2 - \frac{25}{2} - 3 = 0$$

$$\therefore 2\left(x - \frac{5}{2}\right)^2 = \frac{31}{2}$$

$$\therefore \left(x - \frac{5}{2}\right)^2 = \frac{31}{4}$$

$$\therefore x - \frac{5}{2} = \pm \sqrt{\frac{31}{4}}$$

$$\therefore x = \frac{5}{2} \pm \frac{\sqrt{31}}{2}$$

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