

Solving Quadratics by Completing the Square (H)

Starter

1. **(Review of last lesson)** Complete the square for these quadratic expressions:

(a) $x^2 + 2x - 9$

(b) $x^2 - 8x + 3$

Working: (a) $x^2 + 2x - 9 \equiv (x + 1)^2 - 1^2 - 9$
 $\equiv (x + 1)^2 - 1 - 9$
 $\equiv (x + 1)^2 - 10$

(b) $x^2 - 8x + 3 \equiv (x - 4)^2 - (-4)^2 + 3$
 $\equiv (x - 4)^2 - 16 + 3$
 $\equiv (x - 4)^2 - 13$

2. Using your answer to 1, solve the equations, giving your answers exactly:

(a) $x^2 + 2x - 9 = 0$

(b) $x^2 - 8x + 3 = 0$

Working: (a) $(x + 1)^2 - 10 = 0$
 $(x + 1)^2 = 10$
 $x + 1 = \pm \sqrt{10}$
 $x = -1 \pm \sqrt{10}$

(b) $(x - 4)^2 - 13 = 0;$
 $(x - 4)^2 = 13$
 $x - 4 = \pm \sqrt{13}$
 $x = 4 \pm \sqrt{13}$

E.g. 1 Solve the equation $x^2 + 12x + 19 = 0$ by completing the square (and using BIDMAS).

Working: $x^2 + 12x + 19 = 0$
 $(x + 6)^2 - 6^2 + 19 = 0$
 $(x + 6)^2 - 17 = 0$
 $(x + 6)^2 = 17$
 $x + 6 = \pm \sqrt{17}$
 $x = -6 \pm \sqrt{17}$
 $x = -1.877$ or $x = -10.1$ (3 s.f.)

Complete the square
Now we can rearrange
Addition/Subtraction before Indices
Remember \pm
This is the answer exact form

E.g. 2 By completing the square, solve these equations. Give your answers as exact values (i.e. in surd form).

(a) $x^2 + 6x - 4 = 0$

(b) $x^2 + 8x + 5 = 0$

(c) $x^2 - 7x + 9 = 0$

Working: (a) $x^2 + 6x - 4 \equiv (x + 3)^2 - 3^2 - 4 \equiv (x + 3)^2 - 13$
 $(x + 3)^2 - 13 = 0$
 $(x + 3)^2 = 13$
 $x + 3 = \pm \sqrt{13}$
 $x = -3 \pm \sqrt{13}$

$$(b) \quad x^2 + 8x + 5 \equiv (x + 4)^2 - 4^2 + 5 \equiv (x + 4)^2 - 11$$

$$(x + 4)^2 - 11 = 0$$

$$(x + 4)^2 = 11$$

$$x + 4 = \pm \sqrt{11}$$

$$x = -4 \pm \sqrt{11}$$

$$(c) \quad x^2 - 7x + 9 \equiv (x - 3.5)^2 - 3.5^2 + 9 \equiv (x - 3.5)^2 - 3.25$$

$$(x - 3.5)^2 - 3.25 = 0$$

$$x - 3.5 = \pm \sqrt{3.25}$$

$$x = 3.5 \pm \sqrt{3.25}$$

Video: [Completing the square \(2nd video\)](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:

p398 E12.4 Qu 10-20

A*-G class textbook:

p358 E12.2 Qu 10-20

9-1 homework book:

p398 E12.4 Qu 4-5

A*-G homework book:

p100 E12.2 Qu 4-5

[Homework book answers \(only available during a lockdown\)](#)