

Completing the Square ($a \neq 1$)

Starter

1. **(Review of last lesson)** By completing the square, solve these equations:

(a) $x^2 + 4x + 1 = 0$

(b) $x^2 - 11x + 25 = 0$

Working: (a) $x^2 + 4x + 1 \equiv (x + 2)^2 - 2^2 + 1 \equiv (x + 2)^2 - 3$

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

$$(x + 2)^2 = 3$$

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

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

(b) $x^2 - 11x + 25 \equiv (x - 5.5)^2 - (-5.5)^2 + 25 \equiv (x - 5.5)^2 - 5.25$

$$(x - 5.5)^2 - 5.25 = 0$$

$$x - 5.5 = \pm \sqrt{5.25}$$

$$x = 5.5 \pm \sqrt{5.25}$$

E.g. 1 Complete the square for the expression $2x^2 - 8x + 3$.

Working: $2x^2 - 8x + 3 \equiv 2[x^2 - 4x] + 3$
 $\equiv 2[(x - 2)^2 - 2^2] + 3$
 $\equiv 2[(x - 2)^2 - 4] + 3$
 $\equiv 2(x - 2)^2 - 8 + 3$
 $\equiv 2(x - 2)^2 - 5$

Take coefficient of x^2 out as a factor

Complete square for square bracket

Expand the square brackets

Do the arithmetic

E.g. 2 Complete the square for: (a) $2x^2 - 12x + 5$ (b) $4x^2 + 8x - 11$

Working: (a) $2x^2 - 12x + 5 \equiv 2[x^2 - 6x] + 5$
 $\equiv 2[(x - 3)^2 - (-3)^2] + 5$
 $\equiv 2[(x - 3)^2 - 9] + 5$
 $\equiv 2(x - 3)^2 - 18 + 5$
 $\equiv 2(x - 3)^2 - 13$

(b) $4x^2 + 8x - 11 \equiv 4[x^2 + 2x] - 11$
 $\equiv 4[(x + 1)^2 - 1^2] - 11$
 $\equiv 4[(x + 1)^2 - 1] - 11$
 $\equiv 4(x + 1)^2 - 4 - 11$
 $\equiv 4(x + 1)^2 - 15$

Video: [Completing the square](#)

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

Exercise

9-1 class textbook: p398 E12.4 Qu 21-29

A*-G class textbook: p358 E12.2 Qu 21-29

9-1 homework book: p135 E12.4 Qu 6-10

A*-G homework book: p100 E12.2 Qu 6-10

Homework book answers (only available during a lockdown)