

Completing the square *stretch*

Use it when you need the turning point, the smallest value, or to solve by completing the square.

- 1 Complete the square**
Halve, the bracket, take away the square.

$$(x + p)^2 + q$$

$x^2 - bx$? then p is negative

- 2 Turning point**
Change the sign of p . Keep q as it is.

$$(-p, q)$$

$(x - p)^2$? then the x coordinate is $+p$

- 3 Smallest value**
The smallest value is q . It happens when the bracket is 0.

$$\text{smallest value} = q, \text{ when } x = -p$$

a square is never negative

- 4 Solve: = 0**
Set it = 0. Move the q to the other side.

$$(x + p)^2 = -q$$

q positive? then there are no solutions

- 5 Square root**
Square root both sides. Write $\pm$.

$$x + p = \pm\sqrt{-q}$$

no $\pm$ and you lose one answer

- 6 Answer**
Take away p from both sides.

$$x = -p \pm \sqrt{-q}$$

*surd form? leave the $\sqrt{}$ in
simplify the root if you can*

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