

*Quadratic Equations*Essential information

- There are three methods of solving quadratic equations:

- (i) ***quadratic factorisation***, where we can write

$$ax^2 + bx + c = a(x - p)(x - q) \text{ when } p \text{ and } q \text{ are rational numbers}$$

which has solution $x = p$ or $x = q$

- (ii) ***formula***
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- (iii) ***completing the square***, where we write

$$ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 - \frac{b^2}{4a} + c$$

- Note that if $(x - a)(x - b) = 0$, then either $x - a = 0$ or $x - b = 0$, giving $x = a$ or $x = b$.

- Quadratic equations have 2, 1 or 0 real roots according to the value of " $b^2 - 4ac$ ":

- (i) If $b^2 > 4ac$, there are 2 real distinct roots

- (ii) If $b^2 = 4ac$, there is 1 (repeated) real root

- (iii) If $b^2 < 4ac$, there are no real roots.