

Quadratics and Completing the Square

e.g. Sketch the parabola $y = x^2 + 8x + 12$

$$y = x^2 + 8x + 12$$

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

\therefore vertex is $(-4, -4)$

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

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

$$x + 4 = \pm 2$$

$$x = -4 \pm 2$$

$$x = -6 \text{ or } x = -2$$

\therefore x intercepts are

$(-6, 0)$ and $(-2, 0)$

(ii) Write down the quadratic with roots 2 and 8 and vertex (5, 3)

$$y = k \left\{ (x - 5)^2 \right\} + 3$$

$$9k = -3$$

$$y = -\frac{1}{3} \left\{ (x - 5)^2 \right\} + 3$$

$$(2, 0): 0 = k \left\{ (2 - 5)^2 \right\} + 3$$

$$k = -\frac{1}{3}$$

$$\underline{y = -\frac{1}{3}(x^2 - 10x + 16)}$$

Quadratics and the Discriminant

$$\Delta = b^2 - 4ac$$

$$\text{vertex} = \left(\frac{-b}{2a}, \frac{-\Delta}{4a} \right)$$

$$\text{zeroes} = \frac{-b \pm \sqrt{\Delta}}{2a}$$

Note: if $\Delta < 0$, no x intercepts

$\Delta = 0$, one x intercept

$\Delta > 0$, two x intercepts

e.g. Sketch the parabola $y = x^2 + 8x + 12$

$$\Delta = 8^2 - 4(1)(12)$$

$$= 16$$

$$\therefore \text{vertex} = \left(-\frac{8}{2}, -\frac{16}{4} \right)$$

$$= \underline{(-4, -4)}$$

**Exercise 8B; 1cfi, 2bd, 3c, 4b, 6bei, 10b,
11d, 16, 17, 20***

**Exercise 8C; 1adg, 2adg, 3ad, 5ac, 8ac,
10, 13***