

Self-assessment answers: 1 Quadratic functions

1. (a) $y = a(x+3)(x-1)$

$$y = -9 \text{ when } x = 0 \Rightarrow -9 = (3)(-1) \Rightarrow a = 3$$

$$\therefore y = 3(x+3)(x-1) \quad [3 \text{ marks}]$$

(b) $y = a(x+3)^2$

$$y = -18 \text{ when } x = 0 \Rightarrow -18 = a(3)^2 \Rightarrow a = -2$$

$$\therefore y = -2(x+3)^2 \quad [3 \text{ marks}]$$

2. (a) $2x^2 - 12x + 25 = 2[x^2 - 6x] + 25$

$$= 2[(x-3)^2 - 3^2] + 25$$

$$= 2(x-3)^2 + 7 \quad [4 \text{ marks}]$$

(b) (3, 7) [1 mark]

3. Ball 12 m above ground means it has travelled 48 m.

$$\therefore 2t + 4.9t^2 = 48$$

$$\Rightarrow 4.9t^2 + 2t - 48 = 0$$

$$\therefore t = \frac{-2 \pm \sqrt{2^2 - 4 \times 4.9 \times (-48)}}{2 \times 4.9}$$

$$= 2.93 \text{ (3SF)} \quad [4 \text{ marks}]$$

4. (a) The discriminant is zero: $(-3)^2 - 4(k)(6) = 0 \Rightarrow k = \frac{9}{24}$ [3 marks]

(b) $x = -\frac{b}{2a} = -\frac{-3}{2 \times \frac{9}{24}} = 4$ [2 marks]

5. (a) Perimeter of square = $4a$ and perimeter of rectangle = $2(w + 6)$.

$$\therefore 4a + 2(w + 6) = 30$$

$$\Rightarrow 2a + w - 9 = 0 \dots (*)$$

Areas equal: $a^2 = 6w$

Substituting into (*): $2a + \frac{a^2}{6} - 9 = 0 \Rightarrow a^2 + 12a - 54 = 0$ [7 marks]

(b) $a = \frac{-12 \pm \sqrt{12^2 - 4 \times 1 \times (-54)}}{2 \times 1} = 3\sqrt{10} - 6$

So, $w = \frac{a^2}{6} = 21 - 6\sqrt{10}$ [3 marks]