

Section 1: Quadratic graphs and equations

Solutions to Exercise level 3

$$\begin{aligned}
 1. \quad (i) \quad A &= x(x+4) + \frac{1}{2}x(x+2) \\
 &= x^2 + 4x + \frac{1}{2}x^2 + x \\
 &= \frac{3}{2}x^2 + 5x
 \end{aligned}$$

$$\begin{aligned}
 (ii) \quad P &= 2(x+4) + x + (x+2) + \sqrt{x^2 + (x+2)^2} \\
 &= 4x + 10 + \sqrt{x^2 + (x+2)^2}
 \end{aligned}$$

$$\begin{aligned}
 (iii) \quad A &= \frac{3}{2}x^2 + 5x = 200 \\
 \Rightarrow 3x^2 + 10x - 400 &= 0 \\
 \Rightarrow (x-10)(3x+40) &= 0 \\
 \Rightarrow x &= 10 \\
 \Rightarrow P &= 4x + 10 + \sqrt{x^2 + (x+2)^2} \\
 &= 40 + 10 + \sqrt{100 + 144} \\
 &= 65.6 \text{ m (3 s.f.)}
 \end{aligned}$$

2. If x is the number of seats in the original rows, then $x = \frac{300}{n}$

$$\text{and in the extension } \left(2 + \frac{n}{2}\right)(x-5) = 120$$

$$\begin{aligned}
 \Rightarrow (4+n)\left(\frac{300}{n} - 5\right) &= 240 \\
 \Rightarrow (4+n)(300-5n) &= 240n \\
 \Rightarrow 1200 + 300n - 20n - 5n^2 &= 240n \\
 \Rightarrow 5n^2 - 40n - 1200 &= 0 \\
 \Rightarrow (5n+60)(n-20) &= 0 \\
 \Rightarrow n &= 20
 \end{aligned}$$

So there are 20 rows of 15 seats in the first block, and 12 rows of 10 seats in the new extension.

Edexcel AS Maths Quadratics Section 1 Exercise

3. (i) If the width of the enclosure is x , then the length is given by

$$\text{length} = 100 - 2x$$

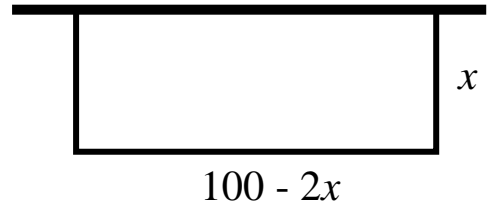
The area is given by

$$\begin{aligned} y &= x(100 - 2x) \\ &= -2(x^2 - 50x) \end{aligned}$$

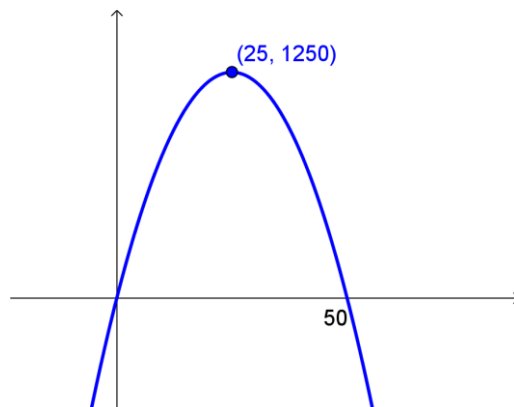
- (ii) So $y = -2(x^2 - 50x)$

$$= -2[(x - 25)^2 - 625]$$

and for the maximum area, $x = 25$ m, so the enclosure measures 25 metres wide by 50 metres long, and the area is 1250 m^2 .



- (iii)



At the intercepts on the x -axis, either $x = 0$ or $x = 50$, and in either case, the 'rectangle' has a zero area.