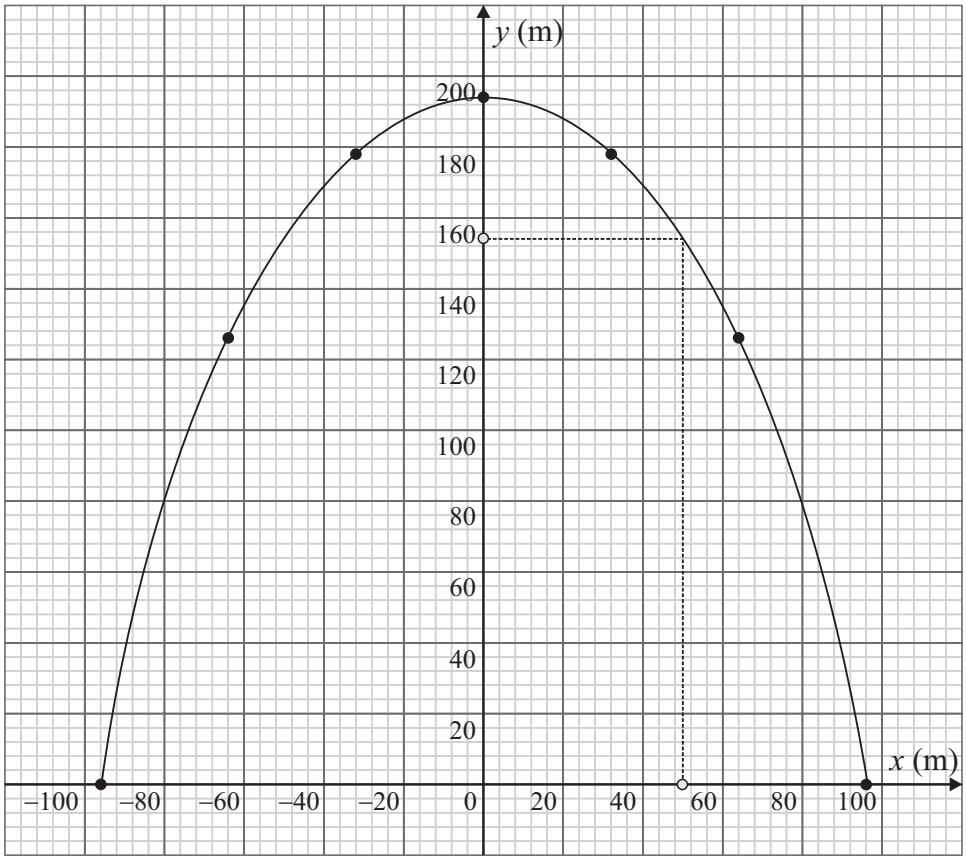
Sample Paper 6: Paper 1

Question 8 (50 marks)

Question 8 (a) (i)

x (m)	–96	–64	–32	0	32	64	96
y (m)	0	126	178	192	178	126	0

Question 8 (a) (ii)



Question 8 (b) (i)

Maximum height = 192 m
$x = 50$ m, $y = 154$ m

Question 8 (b) (ii)

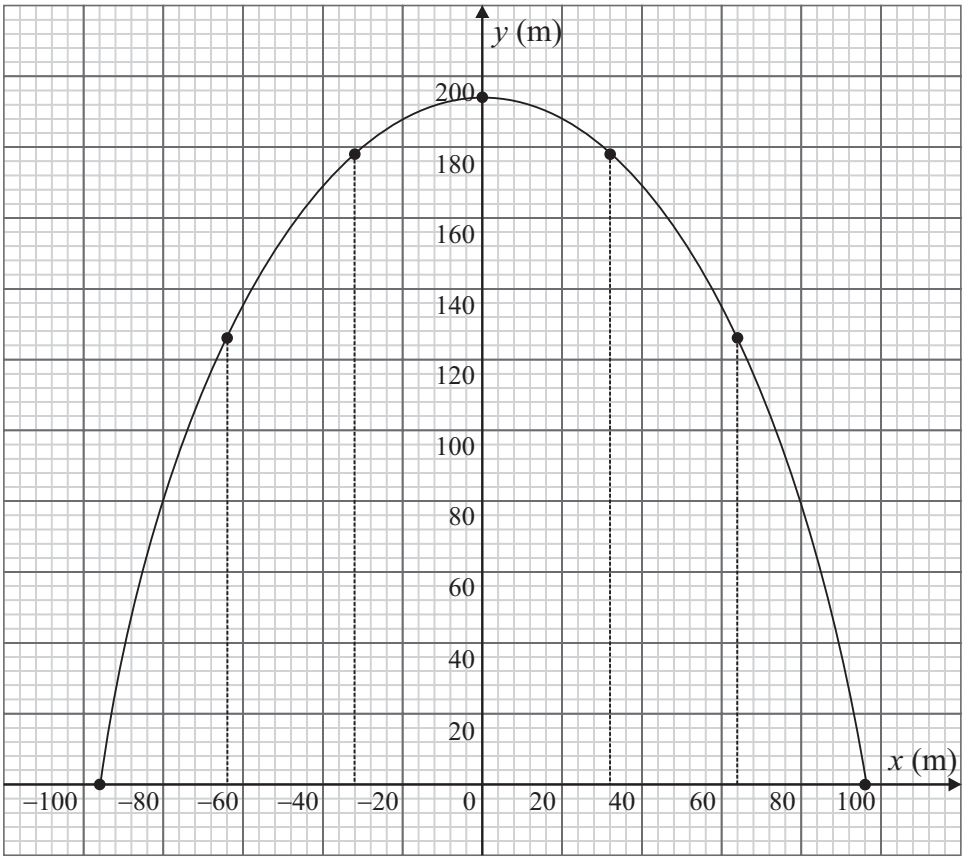
$$1 \text{ ft} = 0.3048 \text{ m}$$

$$\frac{1}{0.3048} \text{ ft} = 1 \text{ m}$$

$$\frac{1}{0.3048} \times 192 \text{ ft} = 192 \text{ m} \Rightarrow 192 \text{ m} = 629.92126 \text{ ft}$$

$$\% \text{ error} = \left(\frac{630 - 629.92126}{630}\right) \times 100\% = 0.0125\%$$

Question 8 (c)



h =32 m, y_1 = 0 m, y_2 = 126 m, y_3 = 178 m, y_4 = 192 m, y_5 = 178 m, y_6 = 126 m, y_7 = 0 m

$$A = \frac{h}{2}[y_1 + y_n + 2(y_2 + y_3 + y_4 + \ldots\ldots\ldots\ldots\ldots + y_{n-1})]$$
$$= \frac{32}{2}[0 + 0 + 2(126 + 178 + 192 + 178 + 126)]$$
$$= 25\,600 \text{ m}^2$$

Question 8 (d) (i)

$$e^x = 1 + x + \frac{x^2}{2}$$
$$e^{-x} = 1 + (-x) + \frac{(-x)^2}{2} = 1 - x + \frac{x^2}{2}$$
$$\therefore e^x + e^{-x} = 2 + x^2$$

Question 8 (d) (ii)

$$e^x + e^{-x} = 2 + x^2$$
$$\therefore e^{\frac{1}{39}x} + e^{-\frac{1}{39}x} = 2 + (\tfrac{1}{39}x)^2 = 2 + \frac{x^2}{1521}$$
$$y = 231 - 19.57\{e^{\frac{1}{39}x} + e^{-\frac{1}{39}x}\}$$
$$= 231 - 19.57\left\{2 + \frac{x^2}{1521}\right\}$$
$$= 231 - 39.14 - 0.013x^2$$
$$= 191.86 - 0.013x^2$$

Question 8 (e)

$y = 191 \cdot 86 - 0 \cdot 013x^2$

$y = 0 \Rightarrow 191 \cdot 86 - 0 \cdot 013x^2 = 0$

$191 \cdot 86 = 0 \cdot 013x^2$

$x = \sqrt{\dfrac{191 \cdot 86}{0 \cdot 013}} = 121 \cdot 5 \text{ m}$

$\therefore \text{Width} = 2x \approx 243 \text{ m}$

Question 8 (f)

$y = 191.86 - ax^2$

$y = 0 : x = \sqrt{\dfrac{191.86}{a}} = 96$

$\dfrac{191.86}{a} = 9216$

$\therefore a = \dfrac{191.86}{9216} = 0.0208$