

SAMPLE PAPER 1: PAPER 1

QUESTION 8 (50 MARKS)

Question 8 (a)

$$x = 20\,000 - 100p$$

$$100p = 20\,000 - x$$

$$p = 200 - 0.01x \geq 0$$

$$\therefore 20\,000 \geq x$$

$$x \leq 20\,000$$

Question 8 (b) (ii)

It costs €40 to produce one more phone at any level of production.

Question 8 (c) (ii)

$$R = 200x - 0.01x^2 \geq 0$$

$$20\,000x - x^2 \geq 0$$

$$x(20\,000 - x) \geq 0$$

Solve the equality:

$$x(20\,000 - x) = 0$$

$$\therefore x = 0, 20\,000$$

$$\text{SOLUTION: } 0 \leq x \leq 20\,000$$

Question 8 (b) (i)

$$C = 120\,000 + 40x$$

$$\frac{dC}{dx} = 40 = \text{constant}$$

Question 8 (c) (i)

$$R = x \times p$$

$$p = 200 - 0.01x$$

$$\therefore R = x(200 - 0.01x) = 200x - 0.01x^2$$

Question 8 (d)

$$R = 200x - 0.01x^2$$

$$\frac{dR}{dx} = 200 - 0.02x$$

$$\frac{dR}{dx} = 0 \Rightarrow 200 - 0.02x = 0$$

$$200 = 0.02x$$

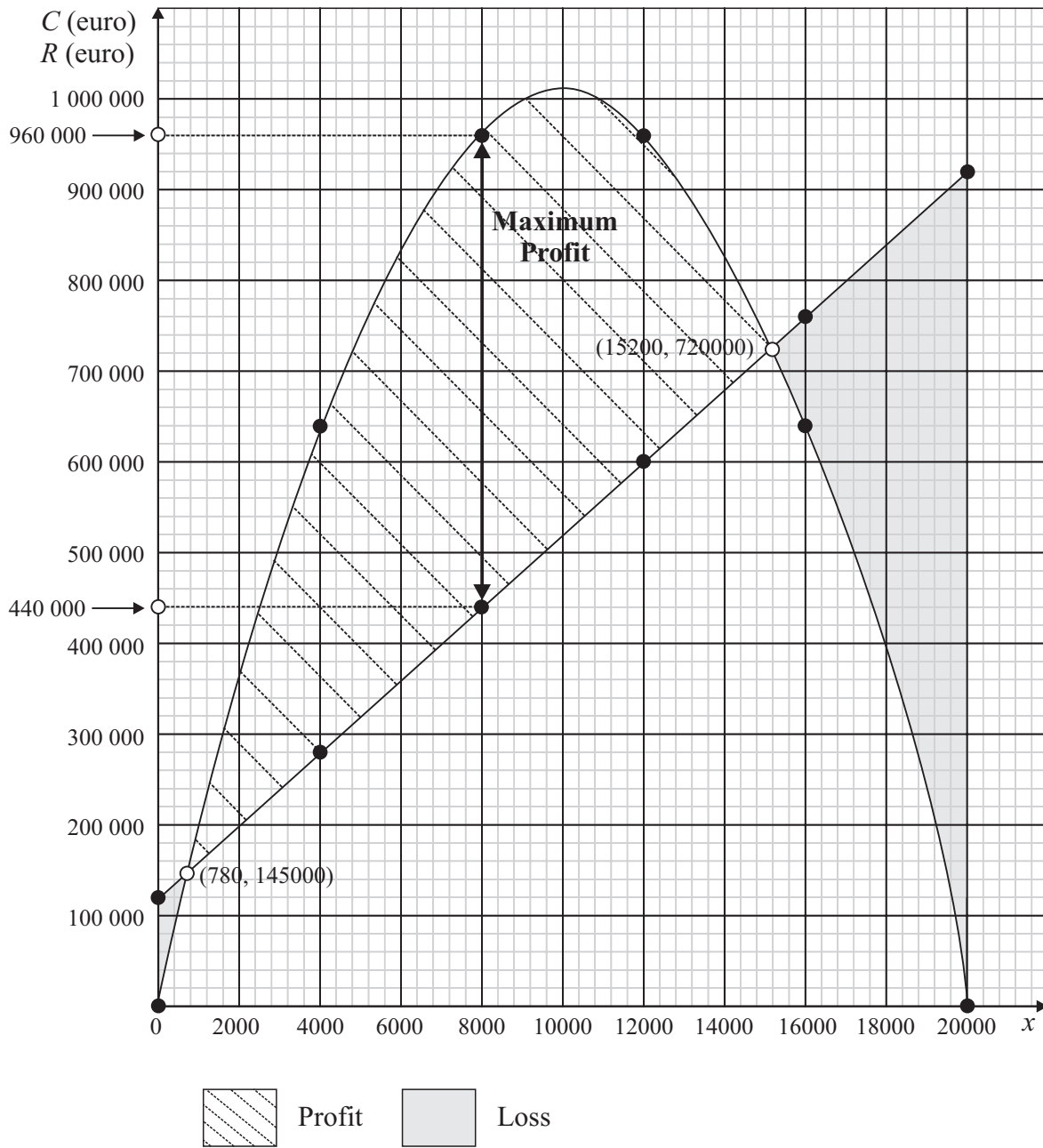
$$\therefore x = 10\,000$$

$$R_{\text{Max.}} = 200(10\,000) - 0.01(10\,000)^2 = \text{€}1\,000\,000$$

Question 8 (e) (i)

x	R (€)	C (€)
0	0	120 000
4000	640 000	280 000
8000	960 000	440 000
12 000	960 000	600 000
16 000	640 000	760 000
20 000	0	920 000

Question 8 (e) (ii)



Question 8 (f) (See graph above)

Question 8 (g)

$$R = C$$

$$200x - 0.01x^2 = 120\,000 + 40x$$

$$x^2 - 16\,000x + 12\,000\,000 = 0$$

$$x = \frac{-(-16\,000) \pm \sqrt{(-16\,000)^2 - 4(12\,000\,000)}}{2}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\therefore x = 789, 15\,211$$

Breakeven points from graph: (780, 145 000), (15 200, 720 000)

Question 8 (h) (i)

$$\begin{aligned}\text{CALCULUS: } P = R - C &= 200x - 0.01x^2 - 120\,000 - 40x \\ &= -0.01x^2 + 160x - 120\,000\end{aligned}$$

$$\frac{dP}{dx} = -0.02x + 160$$

$$\frac{dP}{dx} = 0 \Rightarrow -0.02x + 160 = 0$$

$$160 = 0.02x$$

$$\therefore x = 8000$$

$$P_{\text{Max.}} = -0.01(8000)^2 + 160(8000) - 120\,000 = \text{€}520\,000$$

GRAPH: The maximum profit is the greatest distance between the R and C graphs.

$$P_{\text{Max.}} = \text{€}960\,000 - \text{€}440\,000 = \text{€}520\,000$$

Question 8 (h) (ii)

$$x = 8000$$

$$p = 200 - 0.01x$$

$$\therefore p = 200 - 0.01(8000) = \text{€}120$$
