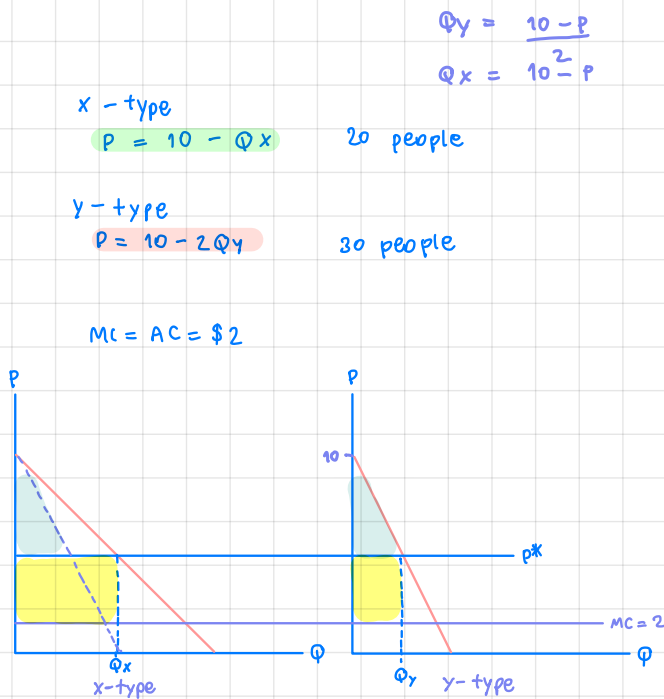


12.** Consider a bar whose owner plans to set profit-maximizing two-part tariff (entry fee and per-drink price) on two types of customers. The owner would like to welcome both types into his bar, meaning that he will not charge an entry fee that is too high.

There are 20 people of the X-type whose individual demand is given by $P = 10 - Q_x$. There are 30 people of the Y-type whose individual demand is given by $P = 10 - 2Q_y$. The $MC = AC = \$2$ per drink. Find the optimal entry fee and per-drink price. Also, calculate the profit the bar can make from these 50 customers.



Optimal entry fee

$$= (10 - 3.78) \left(\frac{10 - 3.78}{2} \right) \frac{1}{2}$$

$$= 9.67\$$$

$$\begin{aligned} \pi &= (50) 9.67\$ + 1.78 (3.11) (30) \\ &\quad + 1.78 (6.22) (20) \\ &= 483.95 + 166.074 + 221.432 \\ &= 871.256 \end{aligned}$$

$$\text{Total profit} = TR - TC$$

$$\text{Total Revenue} = 50 \left(\frac{1}{2} (10 - P) Q_y \right) + 20 Q_x P^* + 30 Q_y P^*$$

$$= 50 \left(25 - 5P + \frac{P^2}{4} \right) + 200P - 20P^2 + 150P - 15P^2$$

$$= 12.5P^2 - 250P + 1250 + 200P - 20P^2 + 150P - 15P^2$$

$$\text{Total Cost} = 20(2 \cdot Q_x) + 30(2 \cdot Q_y)$$

$$= 40 \cdot (10 - P) + 60 \cdot \left(\frac{10 - P}{2} \right)$$

$$= 400 - 40P + 300 - 30P$$

$$= 700 - 70P$$

$$\text{Total profit} = 12.5P^2 - 250P + 1250 + 200P - 20P^2 + 150P - 15P^2 - 700 + 70P$$

$$\frac{d\pi}{dP} = 25P - 250 + 200 - 40P + 150 - 30P + 70 + 30 = 0$$

$$P^* = 3.78 \quad \text{— per drink price}$$

อภิวัด

$$\text{Total } \pi = \pi_{\text{entry fee}} + \pi_{\text{drink sales}}$$

$$\pi_{\text{entry}} = \Delta \times 50$$

$$= 50 \times \frac{1}{2} (10 - p) (Q_y)$$

$$= 50 \times \frac{1}{2} (10 - p) \left(\frac{10 - p}{2} \right)$$

$$= \frac{50}{4} (10 - p)^2$$

$$\pi_{\text{drink sale}} = 20 \times \boxed{} + 30 \times \boxed{}$$

$$= (p - MC) Q_x (20) + (p - MV) Q_y (30)$$

$$= (p - MC) (20 Q_x + 30 Q_y)$$

$$= (p - 2) (20 (10 - p) + 30 \frac{(10 - p)}{2})$$

$$= 35 (p - 2) (10 - p)$$

$$\pi_{\text{total}} = \frac{50}{4} (10 - p)^2 + 35 (p - 2) (10 - p)$$

$$\text{Find } p \text{ that max } \pi \Rightarrow \frac{\partial \pi_{\text{total}}}{\partial p} = 0$$

$$\frac{\partial \pi}{\partial p} = 25(10 - p)(-1) + 35((p - 2)(-1) + (10 - p)(1))$$

$2 - p + 10 - p$

$$\frac{\partial \pi}{\partial p} = 0 \Rightarrow 25(10 - p) = 35(12 - 2p)$$

$$250 - 25p = 420 - 70p$$

$$45p = 170$$

$$p = 3.777 \text{ \$ - per drink price}$$

$$\text{entry fee per person} = \frac{1}{2} (10 - p) \left(\frac{10 - p}{2} \right)$$

$$= \frac{1}{2} (10 - 3.78) \left(\frac{10 - 3.78}{2} \right)$$

$$= 9.67 \text{ \$}$$