Chapter 12 extra problem

Assume the individual demand is

$P = 100 - Q$

and the total cost is $C(Q) = Q^2$

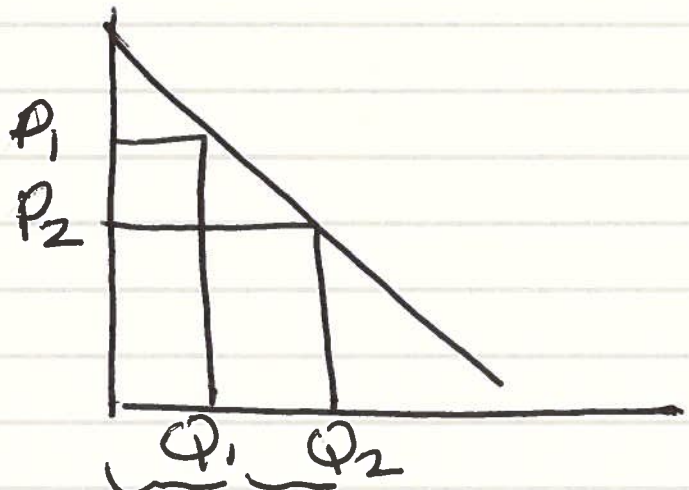
a) Calculate the optimal pricing strategy under block pricing (assuming two blocks)

b) Will there be any consumer surplus? If yes, explain why (no calculation needed)

c) Will there be a deadweight loss? If yes, explain why (no calculation needed)

Answer

Let $P_1 = 100 - Q_1$, $P_2 = 100 - Q_2$



total sales $= Q_1 + (Q_2 - Q_1)$

$= Q_2$

$$\max_{Q_1, Q_2} P_1 Q_1 + P_2 (Q_2 - Q_1) - C(Q_2)$$

$$\max_{Q_1, Q_2} (100 - Q_1) Q_1 + (100 - Q_2)(Q_2 - Q_1) - Q_2^2$$

$$\max_{Q_1 Q_2} 1000Q_1 - Q_1^2 + 1000Q_2 - 1000Q_1 - Q_2^2 + Q_1Q_2 - Q_2^2$$

$$\max_{Q_1 Q_2} -Q_1^2 + 1000Q_2 - 2Q_2^2 + Q_1Q_2$$

$$-2Q_1 + Q_2 = 0 \quad (1)$$

$$100 - 4Q_2 + Q_1 = 0 \quad (2)$$

Multiply equation (1) by 4, and add to equation (2)

$$\begin{array}{rrrr} & -8Q_1 & +4Q_2 & =0 \\ 100 & +Q_1 & -4Q_2 & =0 \\ \hline & 100 - 7Q_1 & = 0 & \end{array}$$

$$Q_1 = 100/7$$

$$Q_2 = 2Q_1 = 2\left(\frac{100}{7}\right) = \frac{200}{7}$$

$P_1 = 100 - Q_1$

$= 100 - \frac{100}{7}$

$P_1 = \frac{600}{7}$

Sales of $P_1 = Q_1$

$= \frac{100}{7}$

$P_2 = 100 - Q_2$

$= 100 - \frac{200}{7}$

$P_2 = \frac{500}{7}$

Sales of $P_2 = Q_2 - Q_1$

$= \frac{200}{7} - \frac{100}{7}$

$= \frac{100}{7}$

b) yes there will be consumer surplus since the firm can only charge two prices

c) yes there will be a deadweight. The firm will not want to sell extra units to get this extra surplus because it would require it to drop its price on the second block which would reduce profits