# HW 7

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## Problem 1 :

Cost shoes 1 = $\frac{500\ \$}{Shoe}$

Cost shoes 2 = $\frac{500\ \$}{Shoe}$

shoe1 demand : $d_1 = 50000 - 25P_1$

shoe 2 demand : $d_2 = 80000 - 50P_2$

goal : maximize profit

As we know:

if demand = A - BP and cost = C/unit $\Rightarrow$ optimum price for max profit:

$$P = \left(A/(2 \times B)\right) + \frac{C}{2}$$

$\Rightarrow$ optimum price 1 : $P_1 = \left(\frac{50000}{2 \times 25}\right) + \frac{500}{2} =$

$$P_1 = 1250$$

optimum price 2 : $P_2 = \left(\frac{80000}{2 \times 50}\right) + \frac{500}{2} =$

$$P_2 = 1050$$

now demand for each segment:

$d_1 = 50000 - 25P_1 = 18750$

$d_2 = 80000 - 50P_2 = 27500$

The profit for each section:

$Profit\ 1 = (P_1 - 500) \times d_1 = (1250 - 500) \times 18750 =$
$= 14,062,500\ \$$

$Profit\ 2 = (P_2 - 500) \times d_2 = (1050 - 500) \times 27500 =$
$= 15,125,000\ \$$

$Total\ Profit = Profit\ 1 + Profit\ 2 = \underline{29,187,500\ \$}$

b) if we choose single price $P$:

$Profit = (P-500)(50000-25P) + (P-500)(80000-50P) =$
$Profit = (P-500)[130000 - 75P]$

$\frac{dProfit}{dP} = (1)(130000 - 75P) - 75(P-500) = 0$
$130000 - 75P - 75P + 37500 = 0$

$\Rightarrow 150P - 167500 = 0$

$\Rightarrow P = 1116.\overline{6} = \underline{1116.7 = P}$

$d_1 = 50000 - 25P = 22,083$

$d_2 = 80,000 - 50P = 24,165$

Total profit $= (1116.7 - 500) \times (22,083 + 24,165)$

$= (616.7) \times (46248)$

$= \underline{28,521,141.6}$

difference $= 29,187,500 - 28,521,141.6 =$

$= \underline{666,358.4\ \$}$

# Problem 2

Cost shoe 1 = $\frac{700\$}{Shoe}$

Cost shoe 2 = $\frac{500\$}{Shoe}$

shoe 1 demand: $d_1 = 50000 - 25P_1$

shoe 2 demand: $d_2 = 80000 - 50P_2$

goal to maximize profit:

optimum price 1: $P_1 = \left(\frac{50000}{2 \times 25}\right) + \frac{700}{2} = 1350$

" price 2: $P_2 = \left(\frac{80000}{2 \times 50}\right) + \frac{500}{2} = 1050$

now demand for each segment:

$d_1 = 50000 - 25 \times 1350 = \underline{16250}$

$d_2 = 80000 - 50 \times 1050 = \underline{27500}$

Profit 1 = $(1350 - 700) \times 16250 = 10,562,500\$$

Profit 2 = $(1050 - 500) \times 27500 = 15,125,000\$$

Total Profit = profit 1 + profit 2 = $\boxed{25687,500\$}$

b) if we chose single price:

$$Profit = (P-700)(50000-25P)+(P-500)(80000-50P)$$

$$Profit = 50{,}000P - 25P^2 - 35{,}000{,}000 + 17500P$$
$$+ 80000P - 50P^2 - 40{,}000{,}000 + 25000P$$

$$\frac{dProfit}{dP} = 50000 - 50P + 17500 + 80000 - 100P$$
$$+ 25000 = 172500 - 150P = 0$$

$$\Rightarrow P = 1150$$

$$\Rightarrow d_1 = 50000 - \underbrace{25 \times 1150}_{28750} = 21250$$

$$d_2 = 80000 - \underbrace{50 \times 1150}_{57500} = 22500$$

$$Total\ Profit = (1150 - \underbrace{700}_{450}) \times 21250 +$$
$$+ (1150 - \underbrace{500}_{650}) \times 22500$$
$$= 9{,}0562{,}500 + 14{,}625{,}000$$
$$= 24{,}187{,}500\ \$$$

difference = 25,687,500 - 24,187,500 $

= 1,500,000 $