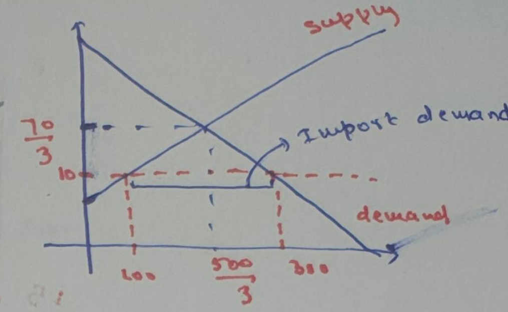
1. a. $S = D \Rightarrow 50+5P = 400-10P \Rightarrow P^* = \frac{70}{3}$; $Q^d = \frac{500}{3}$.

At $P = 10$; $Q_d = 400 - 100 = 300$

$Q_s = 100$

$Q_{Import} = 300 - 100 = 200$

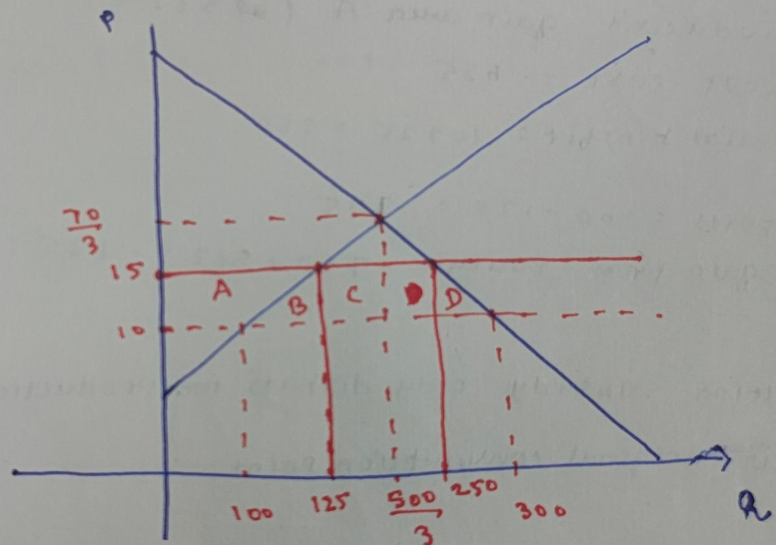


Now with a 5 dollar tariff per unit of import

$S = 50+5(15) = 125 = Q_s^t$

$D = 400-10(15) = 250 = Q_d^t$

$Q^t_{import} = 250 - 125 = 125.$



loss in CS : A+B+C+D (I)

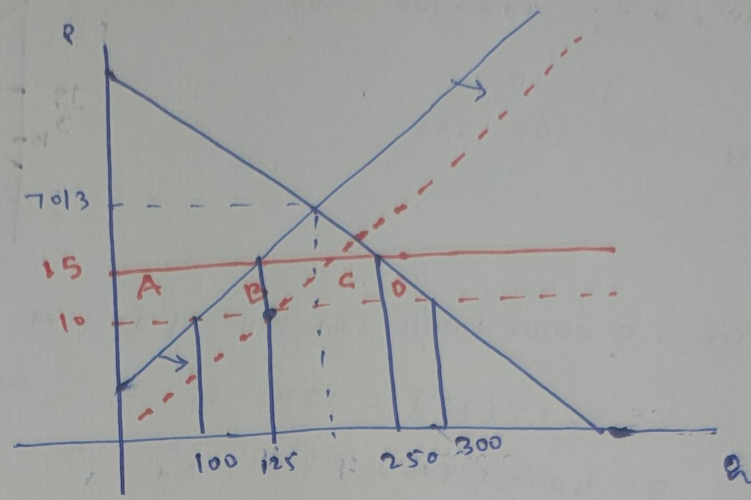
gain in PS : A (II)

govt revenue : C (III)

marginal social benefit : $10 \times (125-100) = 250$ (IV)

Net welfare : (IV) + (III) + (II) − (I)

b



consumer's surplus remains the same.

Producer's gain area A (562.5)

Govt cost = 625

social benefit = 10×25 = 250

Imports = 300 − 125 = 175

Net gain from policy = 250 + 562.5 − 625 = 187.5

c. Production subsidy only distorts the production side, consumers remain at their original consumption point.

d

welfare = CS + PS + GVT + SB

Δwelfare = $\Delta CS + \Delta PS + \Delta GVT + \Delta SB + \Delta CS$; $\Delta CS = 0$

$S = 50 + 5P$

$S = 50 + 5(10 + \text{subsidy}) = 100 + 5s$

$\Delta PS = (100 \times s) + \left(\dfrac{s \times (100 + 5 \times s - 100)}{2}\right) = 100s + \frac{5}{2}s^2$

$\Delta GVT = s(100 + 5s) = 100s + 5s^2$

$\Delta SB = 10(100 + 5s - 100) = 50s$

$$\text{Max } \Delta \text{welfare} = 100 \times s + \frac{5}{2} s^2 - (100 s + 5 s^2) + (50 \times s)$$

$$\Delta W = -\frac{5}{2} s^2 + 50 s$$

$$\frac{\partial \Delta W}{\partial s} = -5s + 50 = 0$$

$$s = 50/5 = 10$$

strict concave f^n → unique maximum

2
a. $1600 - 125P = 440 + 165P$

$1160 = 290P$

$P = 4$; $Q = 1100$.

b. (i) At $P = 4.50$

$Q_d = 1600 - 125(4.5) = 1037.5$

$Q_s = 440 + 165(4.5) = 440 + 742.5 = 1182.5$

Surplus : $1182.5 - 1037.5 = 145$ mn

(ii) Govt must buy the surplus of 145 mn bushels to maintain the price floor.

Total cost : $145 \times 4.5 = 652.5$ mn

(iii) more prod^n : $1182.5 - 1100 = 82.5$ mn

less cons^m $= 1100 - 1037.5 = 62.5$ mn.

c. New supply $Q_s' = (440 + 145) + 165P = 585 + 165P$

$Q^d = Q_s'$

$1600 - 125P = 585 + 165P$

$P = 3.5$

$Q^{d'} = 1600 - 437.5 = 1162.5$

$Q_s' = 585 + 165(3.5) = 585 + 577.5 = 1162.5$

Price falls from 4 to 3.5

Quantity increases from 1100 to 1162.5.

At $P = 4.50$

$Q_d' = 1600 - 125(4.5) = 1037.5$

$Q_s' = 585 + 165(4.5) = 1327.5$

$Q_s' - Q_d' = 290 \rightarrow$ Govt's purchase.

cost $= 290 \times 4.5 = 1305$

d. $Q_s = 440 + 165(p + 0.50)$

$Q_d = 1600 - 125p$

$Q_d = Q_s \Rightarrow p' = 3.7155$

$Q = 1135.56$

	Price support	Subsidy	No intervention
consumer's purchase :	1037.5	1136	1100
farmer's produce :	1182.5	1136	1000
govt purchase :	145		0
cost to govt :	652.5	568 mn	0

3. a

Alice's demand (Q_A)

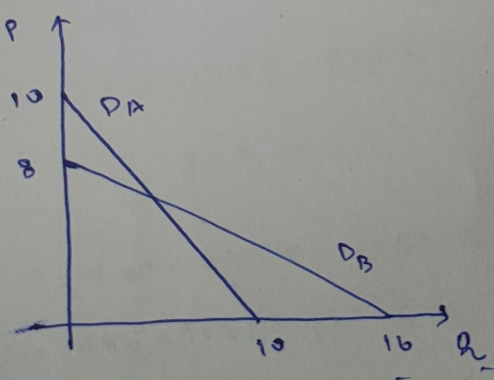
$$Q_A = \begin{cases} 10 - p & p < 10 \\ 0 & p \geq 10 \end{cases}$$

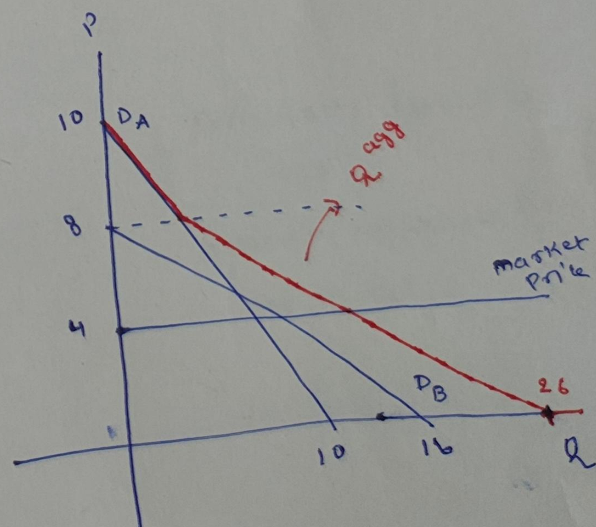
Barbara's demand

$$Q_B = \begin{cases} 16 - 2p & p < 8 \\ 0 & p \geq 8 \end{cases}$$

$\rightarrow$ Aggregate demand (Q^{agg}) :

$$\begin{cases} 26 - 3p & p < 8 \\ 10 - p & p \in [8, 10) \\ 0 & p \geq 10 \end{cases}$$





b. At $p = 4$

$Q_A = 10 - 4 = 6$

$Q_B = 16 - 8 = 8$

$Q = Q_A + Q_B = 14$

b. For $Q < 10$, both are willing to pay a positive amount, so we sum their marginal willingness to pay. For $Q \in [10, 16)$ only Barbara has a positive marginal willingness to pay. For $Q \geq 16$, neither are willing to pay anything. So, we get,

$$p^{agg} = \begin{cases} 18 - \frac{3Q}{2} & Q < 10 \\ 8 - \frac{Q}{2} & Q \in [10, 16) \\ 0 & Q \geq 16 \end{cases}$$