Example 3.G: Solve for the market equilibrium using the information in **Example 3.E** and **Example 3.F.** Justify your answer!

2 consumers

$A: Q_A = 10 - P$; $P = 10 - Q_A$

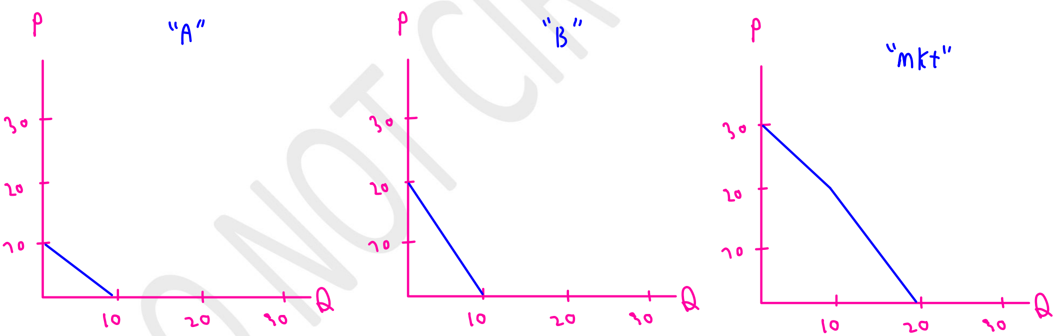
$B: Q_B = 10 - \frac{1}{2}P$; $P = 20 - 2Q_B$

1 seller

$Q = P$

1) Draw diagrams ; individual demand , market demand

2) Find equilibrium ; how many buyers buy



$$Q^D_{mkt} = \begin{cases} 30 - P & \text{for } P \geq 10 \\ 20 - 2P & \text{for } P < 10 \end{cases}$$

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$$P^d = 80 - 3Q^d$$

tax/unit = 5

$$P^s = 10 + 2Q^s$$

new S : $p^d = 80 - 3Q$ $\quad$ $p^s = 10 + 2Q + 5$

$= 15 + 2Q$

$p^d = p^s$

$80 - 3Q = 15 + 2Q$

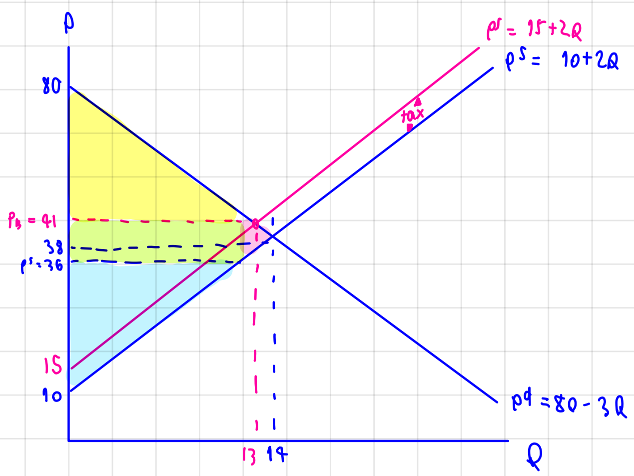
$65 = 5Q$

$Q^*_{tax} = 13$

$P^*_{tax} = 15 + 2(13)$

$= 15 + 26$

$= 41$



Example 3.J: Excess burden *formula under linear model & Tax-Revenue-maxizing tax rate*

Demand: $p^d = a - bQ^d \quad ; \; a \geq 0, \quad b \leq 0.$

Supply : $p^s = c + dQ^s \quad ; \; d \geq 0.$

- Solve for quantity and prices equilibrium when the unit tax is imposed. Analyze the result solve for P^*, Q^* / before tax

$P^* = f(a,b,c,d)$

$Q^* = f(a,b,c,d)$

→ After tax : Assume tax/unit = t

new S : $p = c + dQ + t$

$P^*_{tax} = f(a,b,c,d,t)$

$Q^*_{tax} = f(a,b,c,d,t)$

Before :

$p^d = p^s$

$a - bQ = c + dQ$

$a - c = Q(b+d)$

$\frac{a-c}{b+d} = Q$

$Q^* = \frac{a-c}{b+d}$

$P^* = a - b\left(\frac{a-c}{b+d}\right)$

After :

$p^d = p^s$

$a - bQ^d = c + dQ^d + t$

$a - c - t = Q(b+d)$

$Q^*_{tax} = \frac{a-c-t}{b+d}$

$P^*_{tax} = a - b\left(\frac{a-c-t}{b+d}\right)$

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- Derive the excess burden formula for buyers and sellers

consumers' burden

$$= (P_B - P^*) \times Q_{tax}$$

$$= \left[\left(a - b\left(\frac{a-c-t}{d-b}\right) \right) - \left(a - b\left(\frac{a-c}{b+d}\right) \right) \right] \frac{a-c-t}{b+d}$$

producers' burden

$$= (P^* - P_S) \times Q_{tax}$$

$$= \left[\left(a - b\left(\frac{a-c}{b+d}\right) \right) - \left(a - b\left(\frac{a-c-t}{d-b}\right) - t \right) \right] \frac{a-c-t}{b+d}$$

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- Calculate the tax rate that maximizes the tax revenue of government.

$$\text{tax revenue} = t \times Q_{tax}$$

$$= t \times \frac{a-c-t}{b+d}$$

$$\frac{d\,\text{tax revenue}}{dt} = 0 \rightarrow t^*$$

$$\frac{(b+d)'(a-c-t) - (a-c-t)'(b+d)}{(b+d)^2} = 0$$

$$\frac{(a-c-t) + bt + dt}{(b+d)^2} =$$

$$\frac{t(b+d-1) + a - c}{b+d^2} =$$

$$t^* = \frac{(b+d)^2 - a + c}{(b+d-1)}$$

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Example 3.K ***Price control and Welfare***

Consider the market for apartment rentals in Chicago. The price of rent is determined by the following system of equations.

Demand: $p = -2q_d + 160$

Supply: $p = q_s + 10$

- What is the equilibrium price and quantity in the market for apartment rentals?

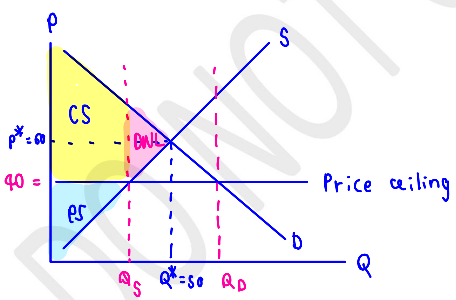
$$-2q + 160 = q + 10$$

$$150 = 3q$$

$$q^* = 50$$

$$p^* = 50 + 10 = 60$$

- Suppose the government tries to control the rent prices through a price ceiling of \$40. Discuss the implication of this policy. Is there any deadweight loss?



Yes, there is deadweight loss since price ceiling leads to discourage in production and decrease supply of goods below what consumer demand.

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