Due date Friday

HOMEWORK 5

**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 : $Q_A = 10 - P \rightarrow Q_A = 10 - P \rightarrow P = 10 - Q_A$

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

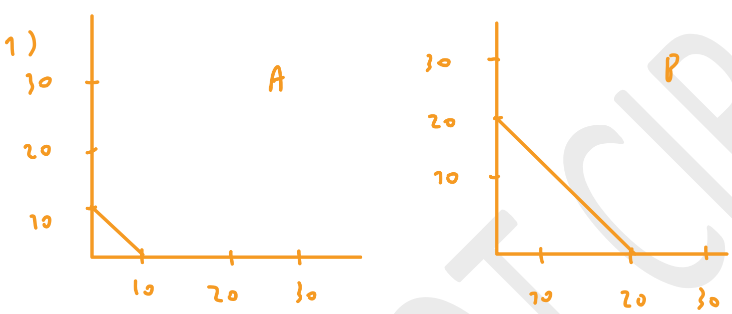
1 seller

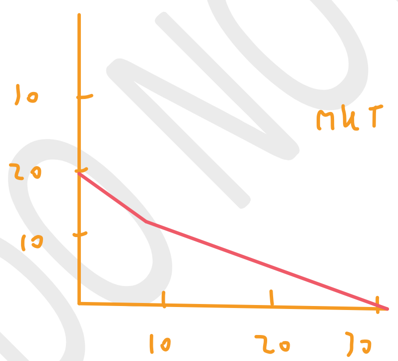
$Q = P$

1) draw diagram

2) find eqlm → how many seller, buyer

1)




when $P \geq 10$

only B buy

whe $P < 10$

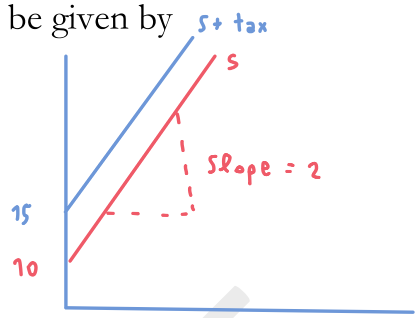
both A & B buy

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

**Example 3.I** Suppose that demand/supply equation can be given by

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

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




- Find the market equilibrium.

$$P^d = P^s$$

$$80 - 3Q^d = 10 + 2Q^s$$

$$70 = 5Q$$

$$Q^* = 14 \rightarrow P^* = 38$$

HOMEWORK 6

- Suppose that government imposes tax on producer equal to $5 per unit, determine market equilibrium under taxation.

new S : $P^s = 10 + 2Q + 5$

$P^s = 15 + 2Q$

$P^d = 80 - 3Q$

$$P^s = P^d$$

$$15 + 2Q = 80 - 3Q$$

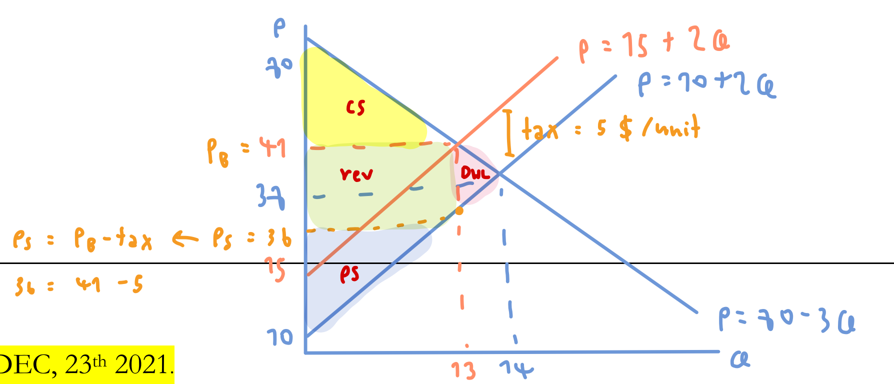
$$5Q = 65$$

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

$$= 41$$

$P^*_{tax} = 41$

$Q^*_{tax} = 13$



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

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

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

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

Before

$$p^d = p^s$$

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

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

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

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

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

After

$$p^d = p^s$$

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

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

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

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

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

- Derive the excess burden formula for buyers and sellers

consumers' burden

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

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

producers' burden

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

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

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

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

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

$$\frac{d\,\text{tax reveve}}{dt} = \frac{(a-c-t)'\cdot(d+b) - (d+b)'(a-c-t)}{(d+b)^2}$$

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

$$= \frac{-td - tb + a + c + b}{(d+b)^2} = 0$$

$$= -t(d+b-1) + a + c = (d+b)^2$$

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

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

**<u>Example 3.K</u>** ***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?

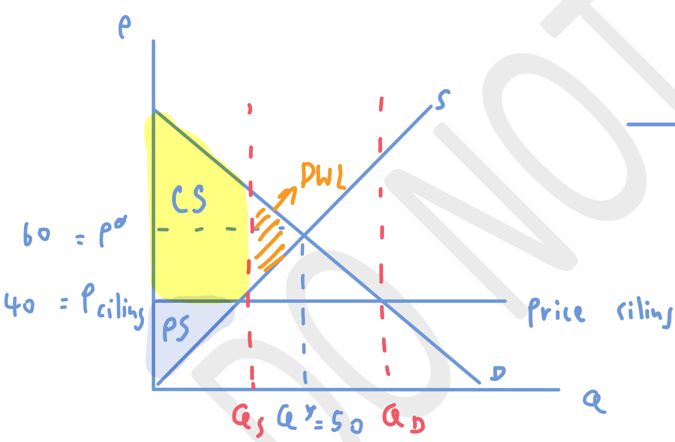
$-2q_d + 160 = q_s + 10$

$150 = 3q$

$q^* = 50$

$p^* = 50 + 10 = 60$

- 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?




| Before | After |
|---|---|
| $p^* = 60$<br>$Q = 50$ | Because of price ceiling the price is set to be lower than equilibrium ∴ there will be excess demand and lead to DWL |