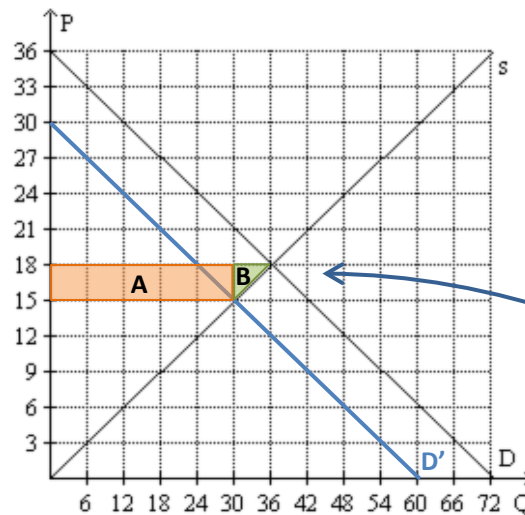# Week 7 Discussion Section – Solutions

Part 1

Figure 1: The market for good x

Consider the market depicted in **Figure 1**. Suppose the government imposes a price ceiling of $12 on this market.

1. Determine the price and quantity sold in the market under the price ceiling.

$$P_c = \$12$$
$$Q_c = 24$$

2. Is this price and quantity sold efficient? Explain why or why not.

Not efficient – when $Q_c = 24$, the market is not achieving the maximum amount of total surplus. 12 "mutually beneficial trades" are not occurring.

Consider the market depicted in **Figure 1** and suppose that demand shifts such that consumers wish to purchase 12 fewer units at every price.

3. How much will producer surplus change as a result of this decrease in demand?

$$PS_1 = \frac{1}{2} \times (18) \times (36) = 324$$

$$PS_2 = \frac{1}{2} \times (15) \times (30) = 225$$

Producer surplus falls by $99 (area $A + B$ in diagram)

4. How much of this change in producer surplus is from a change in the number of producers?

Six producers leave the market as a result of the change in demand and the subsequent decrease in equilibrium price. The lost producer surplus from this is $\frac{1}{2} \times (3) \times (6) = \$9 \rightarrow$ area B in the diagram.

Part 2

Figure 2: The supply of good x
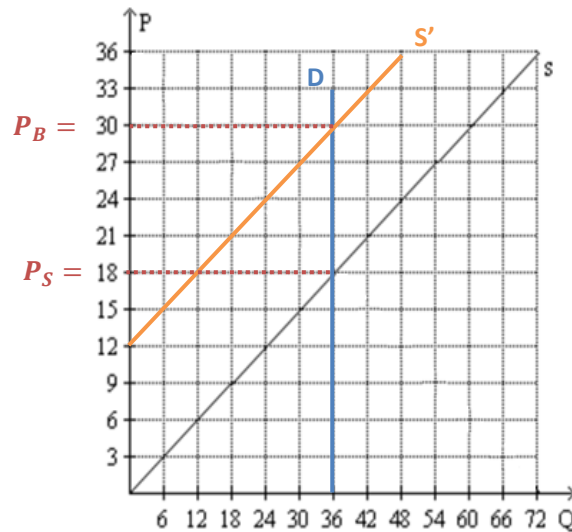
Consider the market depicted in **Figure 2** and suppose that buyers will purchase 36 units no matter what the price of the good is.

5. What kind of demand curve does the market have?

    Perfectly inelastic

6. Suppose a tax of $12 per unit was applied to sellers in the market for good x, will there be any deadweight loss from this tax? Explain.

    There will be no deadweight loss because the tax will not reduce the number of units sold (no reduction in "mutually beneficial trades"

    Sellers will still receive $18 per unit sold.

    Buyers will now pay $$30 per unit → all the tax burden falls on the buyers because they have perfectly inelastic demand.

Part 3

Suppose the market demand and market supply curves are given by the equations:

$$Q^D = 200 - P$$
$$Q^S = 3P$$

The equilibrium price in this market is $P = \$50$ and the equilibrium quantity is $Q = 150$ units.

Hint: I recommend sketching the demand, supply and other related functions as you solve the following questions.

7. Solve for the consumer and producer surplus at the market equilibrium.

$$CS = \frac{1}{2} \times (200 - 50) \times 150 = \$11{,}250$$

$$PS = \frac{1}{2} \times 50 \times 150 = \$3{,}750$$

Suppose the government decides to impose a per-unit tax of $40 on buyers in this market.

8. Update the demand curve to reflect this tax.

Demand should shift down by $40.

$$P = 200 - Q - 40 \rightarrow P = 160 - Q$$
$$Q^D_{Tax} = 160 - P$$

9. Solve for the equilibrium under the tax: P_B, P_S, and Q_T.

Step 1: $Q^D_{Tax} = Q^S$ gives $P_s \rightarrow 160 - P = 3P \rightarrow 4P = 160 \rightarrow \boldsymbol{P_S = \$40}$

Step 2: Plug P_S into Q^S to get Q_{Tax}

$$Q_{Tax} = 3 \times 40 \rightarrow \boldsymbol{Q_{Tax} = 120 \; units}$$

Step 3: $P_B = P_S + tax = 40 + 40 \rightarrow \boldsymbol{P_B = \$80}$

10. Determine the consumer surplus, producer surplus, tax revenue, and deadweight loss under the tax.

$$CS = \frac{1}{2} \times (200 - 80) \times (120) = \$7{,}200$$

$$PS = \frac{1}{2} \times (40 - 0) \times (120) = \$2{,}400$$

$$Tax \; Revenue = T \times Q_{Tax} = \$40 \times 120 = \$4{,}800$$

$$DWL = \frac{1}{2} \times (150 - 120) \times 40 = \$600$$

See next page for sketch.

P

200

160

$P_B = 80$

$P_E = 50$

$P_S = 40$

S

D_T

D

$Q_T = 120$

Q

$Q_E = 150$