ECON3510 Tutorial 9 Answers

2019

Useful Formulas

$$Q_S = Q_D$$
$$CS = (C_{NG} \cdot Q_D)/2$$
$$PS = P \cdot S_{NS} + [(Q_S - S_{NS}) \cdot P]/2$$

where C_{NG} is the difference between P at $Q_D = 0$ and the actual P

where S_{NS} is just the quantity supplied at $P = 0$

Exercise 1

2.1 Question 1

$$Q_S = Q_D$$
$$100 + 40P = 400 - 10P$$
$$50P = 300$$
$$\therefore P = 6$$
$$\therefore Q = 400 - 10(6) = 340$$

2.2 Question 2

$$P = 4$$

$$\therefore Q_S = 100 + 40(4) = 260$$

$$\therefore Q_D = 400 - 10(4) = 360$$

The amount imported is:

$$I = Q_D - Q_S = 360 - 260 = 100$$

The consumer surplus is $CS = (C_{NG} \cdot Q_D)/$ where C_{NG} is the difference between P at $Q_D = 0$ and the actual P

$$Q_D = 0 = 400 - 10P$$

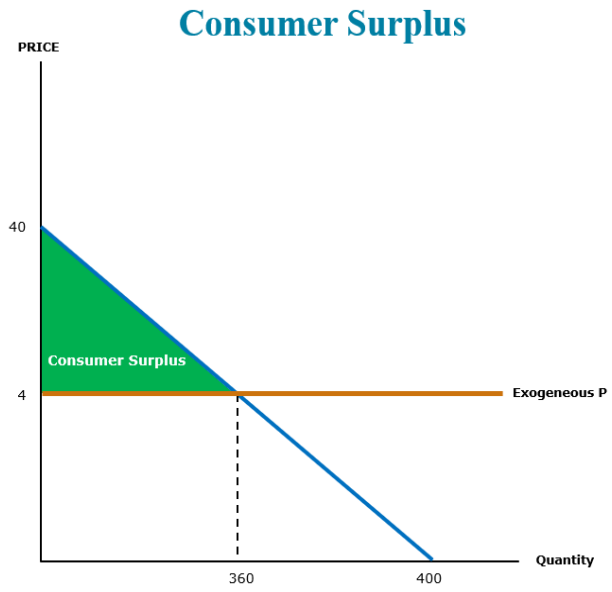
$$\therefore P_0 = 40$$

$$C_{NG} = P_0 - P = 40 - 4 = 36$$

Using the consumer surplus formula:

$$CS = (36 \cdot 360)/2 = 6480$$

The intuition for the consumer surplus formula comes from the following image



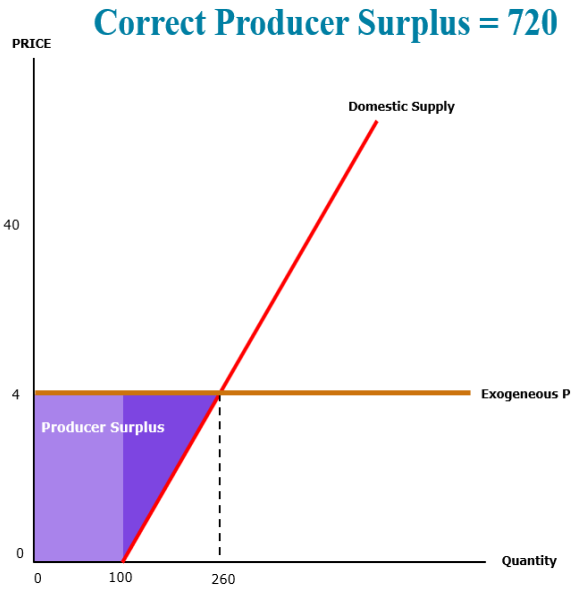
The producer surplus is $PS = P \cdot S_{NS} + [(Q_S - S_{NS}) \cdot P]/2$ where S_{NS} is the amount supplied at $P = 0$

$$S_{NS} = 100 + 40(0) = 100$$

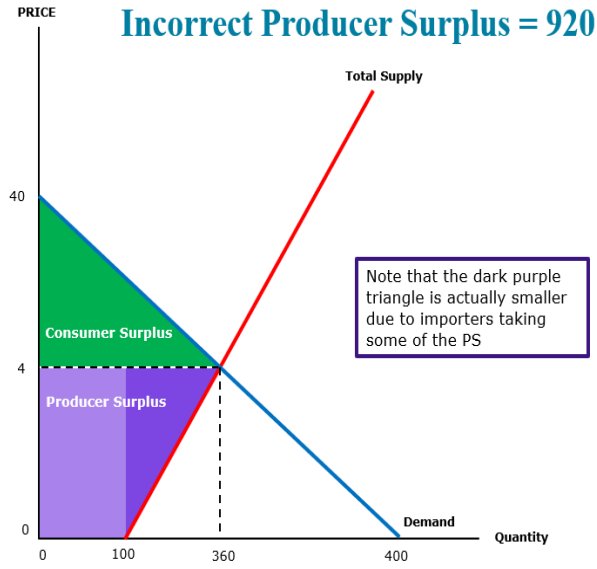
Therefore the producer surplus is:

$$PS = 4 \cdot 100 + [(260 - 100) \cdot 4]/2 = 720$$

The intuition for the producer surplus formula comes from the following image



Note that this is an unusual supply function since at $P = 0$ we still have $Q > 0$. Make sure that if calculating producer surplus graphically instead of using the formula that you calculate it using only the domestic supply and not the total supply, this will lead to the following incorrect results



2.3 Question 3

Similar to question 2, just repeat using $P = 5$ instead of $P = 4$ and compare the two outcomes.

$$P = 5$$

$$\therefore Q_S = 100 + 40(5) = 300$$

$$\therefore Q_D = 400 - 10(5) = 350$$

$$\therefore I = Q_D - Q_S = 350 - 300 = 50$$

$$C_{NG} = P_0 - P = 40 - 5 = 35$$

$$\therefore CS = (C_{NG} \cdot Q_D)/2 = (35 \cdot 350)/2 = 6125$$

So consumer surplus has fallen by 6480 - 6126 = 355

Note that S_{NS} has not changed and it is still 100 so producer surplus is:

$$PS = P \cdot S_{NS} + [(Q_S - S_{NS}) \cdot P]/2 = 5 \cdot 100 + [(300 - 100) \cdot 5]/2 = 1000$$

So producer surplus has actually increased by 1000-720 = 280

The revenue from tariff is $I \cdot tariff = 50 \cdot 1 = 50$.

Total welfare reducion is just the sum of gains^{-1} and losses^{-1} as a result of the tariff (i.e. comparing Q2 and Q3) and so we have

$$Welfare\ Reduction = \Delta CS - \Delta PS - \Delta Revenue = 355 - 280 - 50 = 25$$

Note that if we were to have a fall in producer surplus and a increase in consumer surplus then we would rewrite this as:

$$Welfare\ Reduction = \Delta PS - \Delta CS - \Delta Revenue$$

Exercise 2

3.1 Question 1

$$Q_{SE} = Q_{DI}$$
$$-120 + 40P_w = 120 - 20P_w$$
$$60P_w = 240$$
$$\therefore P_w = 4$$
$$\therefore Q_{DI} = 40$$

3.2 Question 2

We now have the importer facing $P = P_w + 1.5$ and so for the importers equation Q_{DI} we substitute in P:

$$Q_{SE} = Q_{DI}$$
$$-120 + 40P_w = 120 - 20(P_w + 1.5)$$
$$60P_w = 210$$
$$P_w = 3.5$$

Note that P_w is the world price but due to the tariff of 1.5 the US actually faces a price of $P = 5$. Therefore we have the quantity imported in the US being:

$$Q_{DI} = 120 - 20(5) = 20$$

Tariff revenue is $R = tariff \cdot Q_{DI} = 1.5 \cdot 20 = 30$