

**Economics 102**  
**Spring 2013**  
**Homework #2 (Answers)**  
**Due: 2/18/2013**

**Directions:** The homework will be collected in a box **before** the lecture. Please place your name, TA name and section number on top of the homework (legibly). Make sure you write your name as it appears on your ID so that you can receive the correct grade. Please remember the section number for the section **you are registered**, because you will need that number when you submit exams and homework. Late homework will not be accepted so make plans ahead of time. Please **show your work eligibly and neatly**; otherwise you will not receive full credit. Good luck!

**1. Comparative Advantage**

Two secret agents known only as A and B crash land on a (formerly) deserted island. While trapped on the island, they have a child whom they name C. In their quest for survival, the two goods they will need to produce are witty one-liners (jokes) and bandages. Food is unnecessary. A, B, and C are assumed to have the same amount of resources available to them and their individual production possibility frontiers are all linear.

A can produce 20 jokes and 0 bandages or 0 jokes and 5 bandages.

B can produce 10 jokes and 0 bandages or 0 jokes and 10 bandages.

C can produce 5 jokes and 0 bandages or 0 jokes and 1 bandage.

a) Assume A, B, and C all have constant opportunity cost. Draw their respective PPF's (with jokes on the y-axis and bandages on the x-axis), and write down an equation for each PPF.

A:  $J = 20 - 4B$ .

B:  $J = 10 - B$

C:  $J = 5 - 5B$

b) Find the opportunity cost for A, B, and C of bandages and jokes.

The opportunity costs for 1 bandage are:

A: 4 jokes.

B: 1 joke.

C: 5 jokes.

The opportunity costs for 1 joke are:

A: 1/4 bandage.

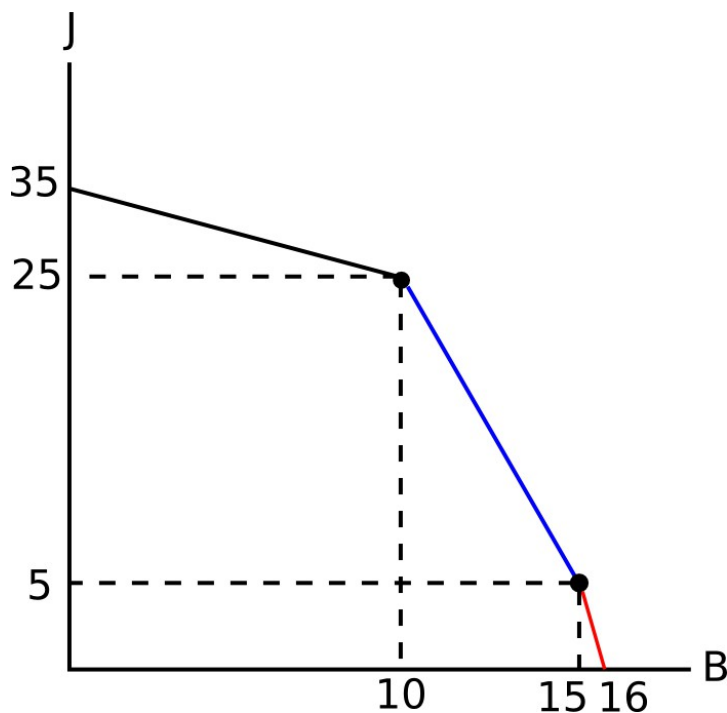
B: 1 bandage.

C: 1/5 bandage.

c) Who has a comparative advantage for jokes over both other people on the island?

C since C has the lowest opportunity cost for jokes.

d) Draw the joint PPF for A, B, and C if they are allowed to trade with each other.



The first line segment from the left (colored black) represents B's PPF as the economy moves from producing only jokes to bandages, the next represent's A's PPF (colored blue), and the last (colored red) represents the production by C. The movement along the curve shows the economy moving from employing more productive to less productive resources (in terms of bandages).

e) What happens if A and B have another child with constant opportunity cost? What if they have another and another and the population of the deserted island continues to grow? How will the shape of the joint PPF change? How will the intercepts of the PPF change?

The PPF begins to look more and more like the bowed out non-linear curve. For each new individual that is added, the intercepts and the feasible region of the PPF move outwards because we are able to produce more.

## **2. Supply and Demand**

In order to make a pencil: we need a rubber eraser, a graphite rod, and wood.

State whether the new equilibrium price and quantity is higher or lower in the market specified after the following changes (hint: you will find it helpful to draw a graph of the situation when analyzing each of these events). Assume that each market is initially in equilibrium and that you are analyzing the effect of the described change on the equilibrium price and equilibrium quantity in that market.

a. Consider the market for rubber. Suppose the workers involved in the production of rubber unionize and all firms producing rubber must now pay their workers a higher wage.

The supply curve for rubber shifts to the left since at all prices, the rubber firms are willing and able to supply less rubber. In the market for rubber the equilibrium price increases and the quantity exchanged decreases.

b. Consider the market for graphite. Suppose a graphite mine is destroyed.

The supply curve for graphite shifts to the left since at all prices, the graphite firms are willing and able to supply less graphite. In the market for graphite the equilibrium price increases and the quantity exchanged decreases.

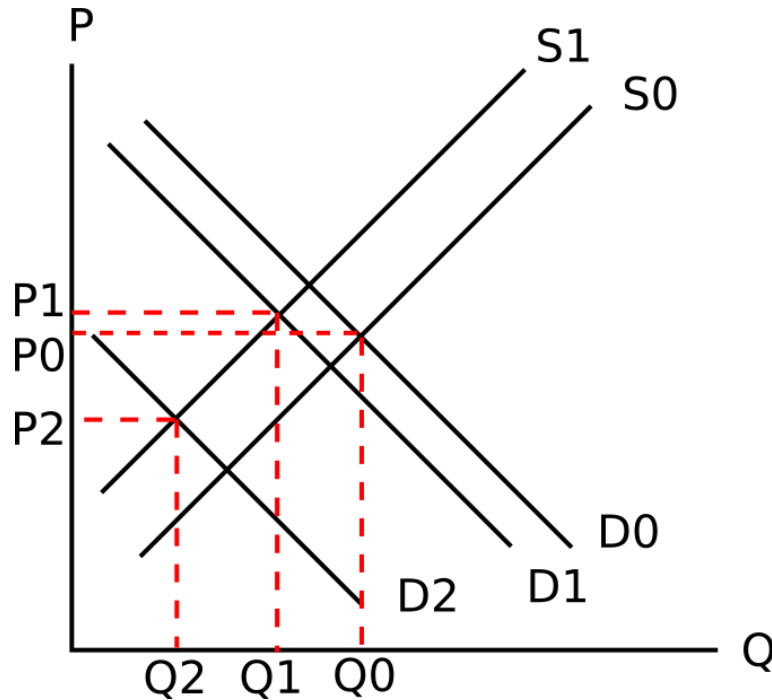
c. Consider the market for wood. Suppose the government decides to reduce the amount of deforestation by imposing a limit on how much wood may be produced (assume this limit is less than the current equilibrium quantity in the absence of restriction).

The government's restriction on wood harvesting is like a quota limit (think of the supply curve as being vertical at the quantity that is allowed). If effective (and it is assumed to be effective in this example) the quota limit will reduce the quantity exchanged and increase the price charged for wood.

d. Consider the market for paper. Suppose the government policy in (c) is implemented (wood is used to make paper).

The supply curve for paper shifts to the left since at all prices, the paper producers are willing and able to supply less paper. In the market for paper the equilibrium price increases and the quantity exchanged decreases.

e. Consider the **market for pencils**. Suppose that all of the events described in (a), (b), (c), and (d) occur simultaneously.



The original demand curve for pencils ( $D_0$ ) shifts to the left since paper is a complement for pencils and the price of paper has increased. The supply curve ( $S_0$ ) for pencils shifts to the left since the price of wood increases, the price of graphite increases, and the price of rubber increases this will cause a leftward shift in the supply curve for pencils. We know with certainty that the equilibrium quantity of pencils decreases relative to its initial level (see the equilibrium quantities corresponding to  $D_1$  and  $D_2$ :  $Q_1$  and  $Q_2$ ); however, we do not know if the equilibrium price of pencils increases, decreases, or remains the same relative to its initial level (as can be seen from the different equilibrium prices for  $D_1$  and  $D_2$ :  $P_1$  and  $P_2$ ). The price of pencils is indeterminate.

### **3. Investigation Question**

Let's see some economic theory in practice. Find a real world example in which a government (federal, state, municipality) implements a tax, subsidy, price ceiling, price floor or quota in a certain market. Describe in a couple of paragraphs the market that you are talking about and the type of government intervention or policy that is currently implemented. Then, try to analyze what would happen were the policy eliminated. (HINT: as a UW student there are some

examples that directly affect you that you could use.) Obviously your answer here should differ from everyone else's answer in the class since it is unlikely that you would pick precisely the same example as another student-make sure your answer is distinctly yours!

#### **4. International Trade**

The country of Badgerland is a small, closed country but is well known as a sport lovers' country. In particular, football is the most important sport for the people of Badgerland. The market for football t-shirts is large. The demand and the supply for football T-shirt are given by the following equations where Q is the quantity of t-shirts and P is the price per t-shirt:

Domestic Supply:  $Q = 20 + 2P$

Domestic Demand:  $Q = 200 - 0.5P$

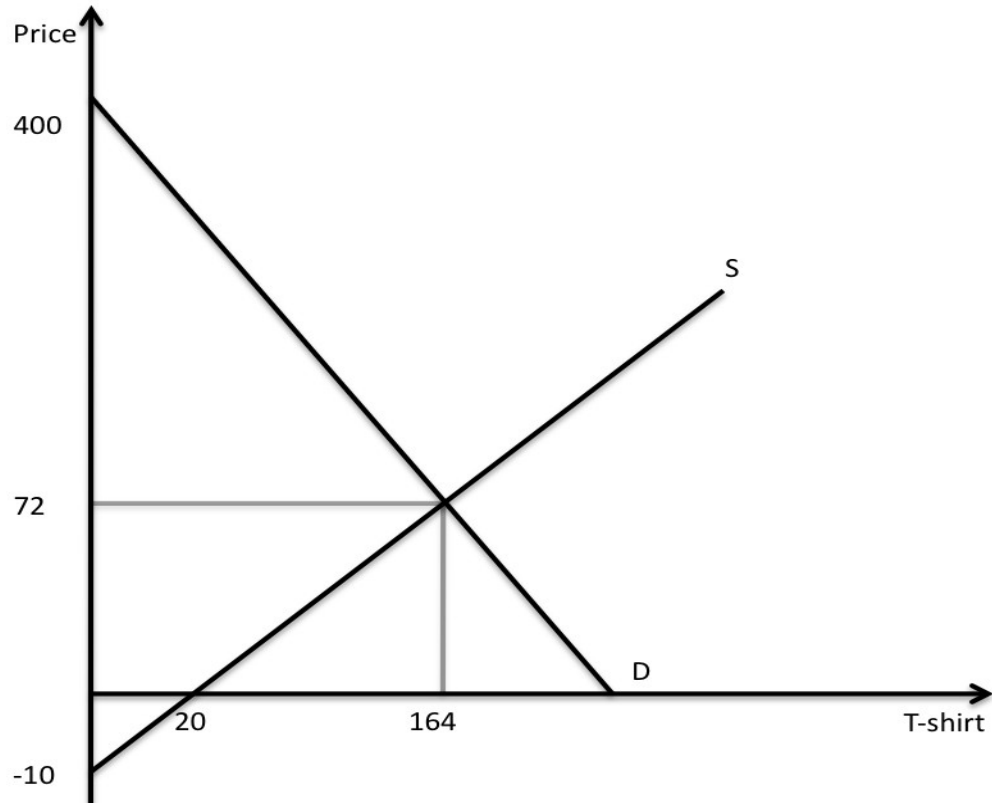
- a) Graph the demand and supply curves for t-shirts.

A first step, we rewrite the demand and supply equations in slope-intercept form:

$$\text{Domestic Supply: } P = 0.5Q - 10$$

$$\text{Domestic Demand: } P = 400 - 2Q$$

Then, we can plot the Demand and the Supply curves in a graph:



b) Calculate the equilibrium price and quantity

We equalize demand and supply equation to calculate the equilibrium price:

$$Q \text{ supplied} = Q \text{ demanded}$$

$$20 + 2P = 200 - 0.5P$$

$$2.5P = 180$$

$$P = \$72 \text{ per t-shirt}$$

Then we plug in the equilibrium price in either the demand or the supply equation:

$$Q \text{ supplied} = 20 + 2 * 72$$

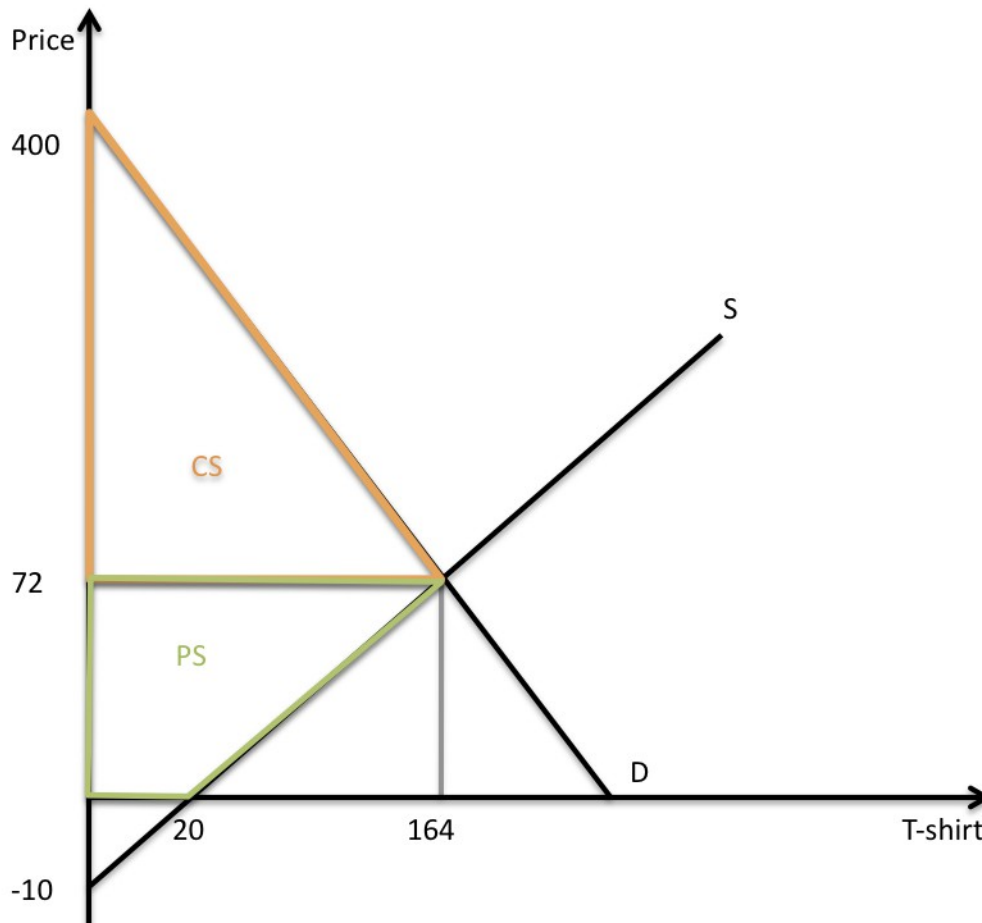
$$Q = 164 \text{ t-shirts}$$

c) Calculate consumer surplus (CS), produce surplus (PS) and total surplus (TS) in this market.

$$CS = (\$400 \text{ per t-shirt} - \$72 \text{ per t-shirt}) * 164 \text{ t-shirts} * (1/2) = \$26,896$$

$$PS = \$72 \text{ per t-shirt} * (164 \text{ t-shirts} - 20 \text{ t-shirts}) * (1/2) + \$72 \text{ per t-shirt} * 20 \text{ t-shirts} = \$6,624$$

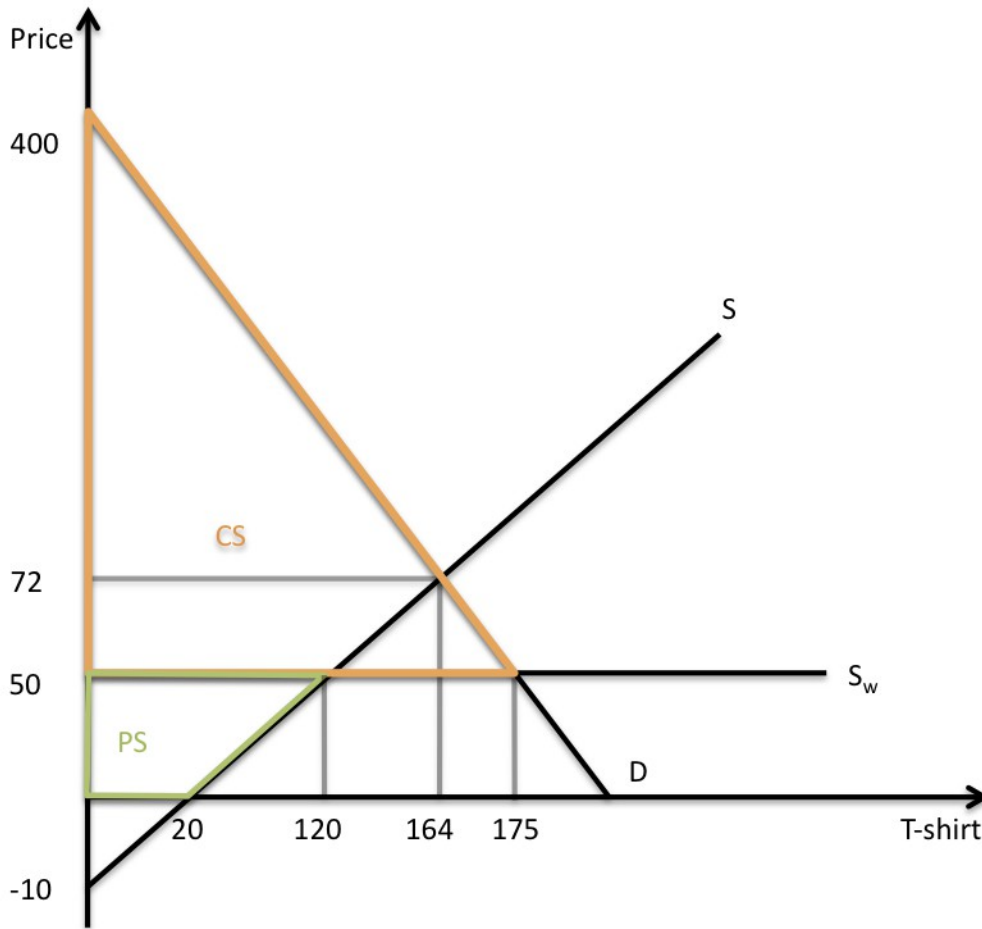
$$TS = PS + CS = \$6,624 + \$26,896 = \$33,520$$



The government of Badgerland decides to allow imported football t-shirts. The world price for football t-shirts is 50 dollars.

d) What price will t-shirts sell for in Badgerland if the market for t-shirts is opened? How many t-shirts will be sold in Badgerland once this market is open? How many t-shirts will be imported or exported when this market opens? Calculate the value of consumer surplus, CS, when this market is open to trade. Calculate the value of producer surplus, PS, when this market is open to trade. Does total surplus, TS, increase, decrease, or

remain the same when this market opens to trade? (Hint: you may find it helpful to draw a graph of this market to guide your calculations.)



First we calculate the quantity demanded domestically in Badgerland at the world price of \$50 per t-shirt:

$$\text{Quantity demanded domestically} = 200 - 0.5 * 50 = 175 \text{ t-shirts}$$

Then we calculate the domestic supply in Badgerland at the world price of \$50 per t-shirt:

$$\text{Quantity supplied domestically} = 20 + 2 * 50 = 120 \text{ t-shirts}$$



Finally the size of the imports:

$$\text{IMPORTS} = \text{Quantity Demanded Domestically} - \text{Quantity Supplied Domestically} = 175 - 120 = 55 \text{ imported t-shirts}$$

Now we calculate the various effects of free trade :

$$\text{CS with an open economy} = (\$400 \text{ per t-shirt} - \$50 \text{ per t-shirt}) * 175 * (1/2) = \$30,625$$

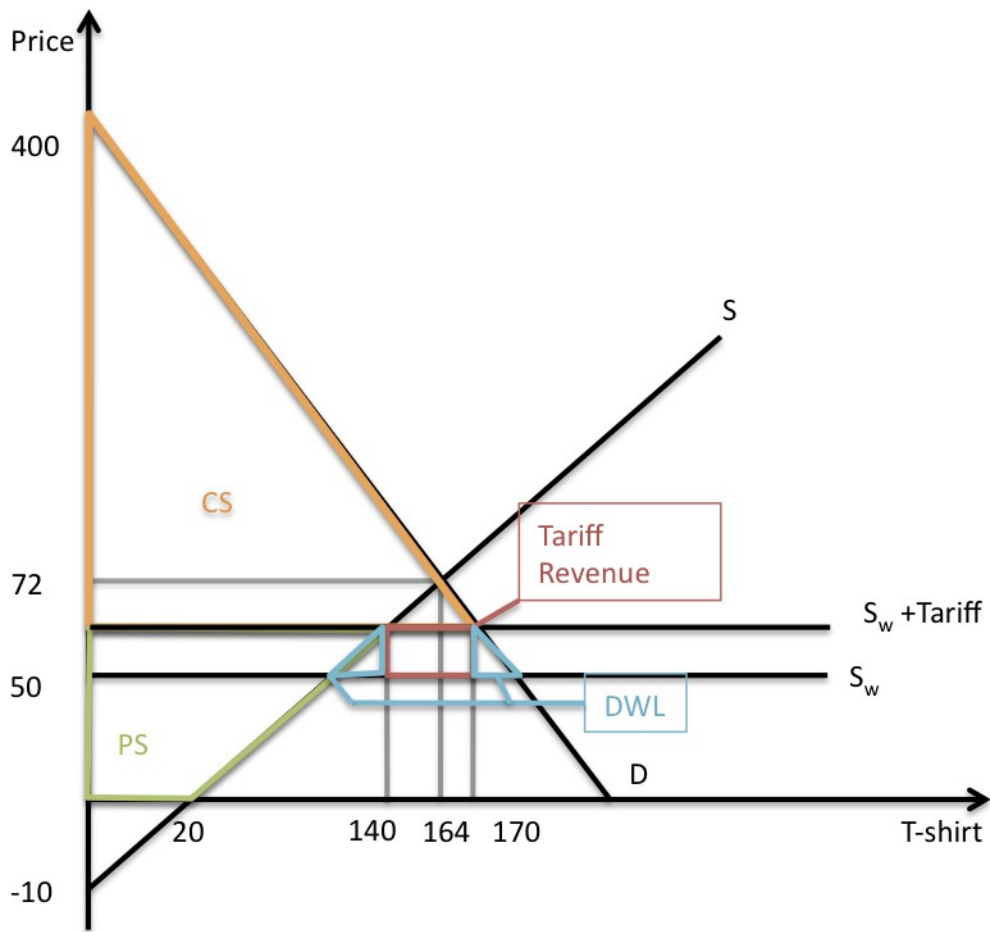
$$\text{PS with an open economy} = \$50 \text{ per t-shirt} * (120 \text{ t-shirts} - 20 \text{ t-shirts}) * (1/2) + \$50 \text{ per t-shirt} * 20 \text{ t-shirts} = \$3,500$$

$$\text{TS with an open economy} = \text{PS} + \text{CS} = \$30,625 + \$3,500 = \$34,125$$

There is an increase in Total Surplus. However, we can observe that the increase in total surplus is not shared equally between domestic consumers and domestic suppliers: trade in this example is beneficial to domestic consumers since they now get more of the product and at a lower price; trade is harmful to domestic producers since they now sell fewer units and at a lower price. We can see these distributional consequences by comparing consumer surplus and producer surplus in a closed market versus these areas when the market is open to trade.

After the decision to open the country to international trade, the government of Badgerland is highly criticized. In particular, domestic producers claim that the new international products are worse in quality and that these foreign suppliers are stealing Badgerland jobs. They propose two possible policies to limit imports: a quota and a tariff.

- e) The proposed tariff is 10 dollars on each imported t-shirt. Suppose the government implements this policy. How many t-shirts will be purchased in Badgerland? What price will these t-shirts sell for? How many t-shirts will be imported? How much revenue will the government get from the imposed tariff? Finally, what is the deadweight loss, DWL, due to the imposition of this tariff? (Hint: you will find it helpful to sketch a graph to guide your calculations.)



The analysis is equivalent to the one made at point (d). The only change is that instead of the world price of \$50, the price with the tariff will now be \$60 per t-shirt.

$$\text{Quantity Demanded Domestically} = 200 - 0.5 * 60 = 170 \text{ t-shirts}$$

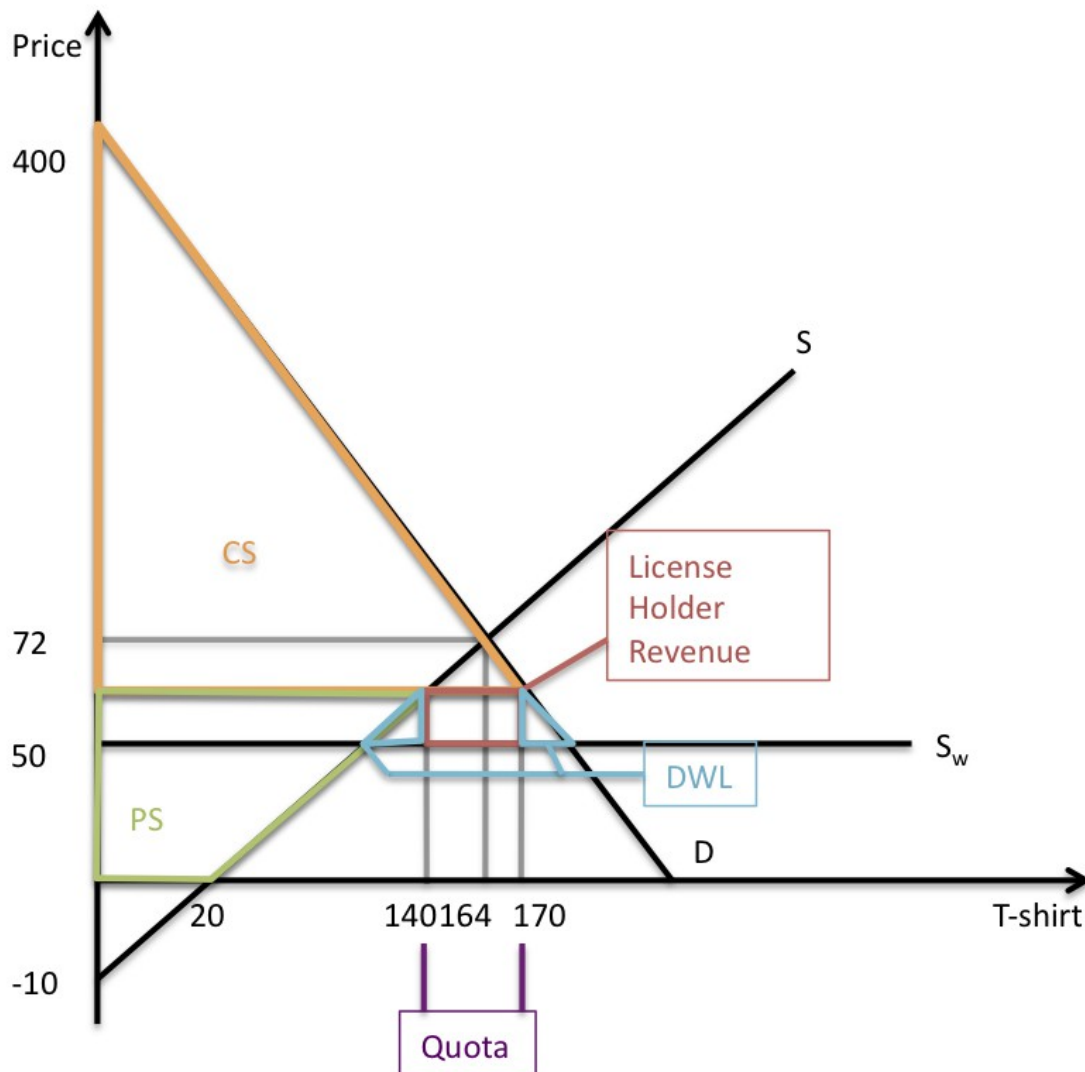
$$\text{Quantity Supplied Domestically} = 20 + 2 * 60 = 140 \text{ t-shirts}$$

$$\text{IMPORTS} = \text{Quantity Demanded Domestically} - \text{Quantity Supplied Domestically} = 170 - 140 = 30 \text{ t-shirts}$$

$$\text{GOVERNMENT REVENUE} = \text{IMPORTS} * \text{TARIFF PER UNIT OF THE GOOD} = 30 * 10 = \$300$$

$$\text{DWL} = (1/2)(\$60 \text{ per t-shirt} - \$50 \text{ per t-shirt})(140 \text{ t-shirts} - 120 \text{ t-shirts}) + (1/2)(\$60 \text{ per t-shirt} - \$50 \text{ per t-shirt})(175 \text{ t-shirts} - 170 \text{ t-shirts}) = 100 + 25 = \$125$$

- f) Suppose that instead of the tariff described in (e), the government decides to implement an import quota in this market. The proposed quota is a quota of 30 imported t-shirts. Find the new quantity of t-shirts that will be purchased and the price per t-shirt given this quota. Also, calculate the license holder revenue that will be generated by this import quota. Finally, what is the deadweight loss due to the imposition of this quota? (Hint: You may find it helpful to draw a graph of this quota to guide your calculations.)



In this case we need to solve for the price of equilibrium given a quota of 30 T-shirts:

$$\text{IMPORTS} = \text{Quantity Demanded Domestically} - \text{Quantity Supplied Domestically} = 30 \text{ t-shirts}$$

$$200 - 0.5P - 20 - 2P = 30$$

$$2.5P = 150$$

$$P = \$60 \text{ per t-shirt}$$

Now we can back out the demand and the internal supply:

$$\text{Quantity Demanded Domestically} = 200 - 0.5 * 60 = 170 \text{ t-shirts}$$

$$\text{Quantity Supplied Domestically} = 20 + 2 * 60 = 140 \text{ t-shirts}$$

$$\text{License Holder Revenue} = (\$60 \text{ per t-shirt} - \$50 \text{ per t-shirt})(30 \text{ t-shirts}) = \$300$$

$$\text{DWL} = (1/2)(\$60 \text{ per t-shirt} - \$50 \text{ per t-shirt})(140 \text{ t-shirts} - 120 \text{ t-shirts}) + (1/2)(\$60 \text{ per t-shirt} - \$50 \text{ per t-shirt})(175 \text{ t-shirts} - 170 \text{ t-shirts}) = 100 + 25 = \$125$$

- g) Compare the effect on CS, PS, TS, and DWL of the four possible policies considered in this problem: closed economy (autarchy), open economy, open economy with tariff of \$10 per t-shirt, and open economy with an import quota of 30 t-shirts. Organize your results in a table like the following:

	CS	PS	Government Revenue or License Holder Revenue	TS	DWL
Closed Economy (autarchy)					
Open Economy					
Tariff of \$10 per t-shirt					
Import Quota of 30 t-shirts					

We can calculate the CS and PS for the case of either the quota or tariff in this example since these two programs are equivalent except for the distinction between license holder revenue and tariff revenue. Notice that in both cases the quantity supplied, quantity demanded and the price of the t-shirts are the same: therefore,

$$\text{CS with a quota 30 t-shirts (or tariff of \$10)} = (\$400 \text{ per t-shirt} - \$60 \text{ per t-shirt}) * 170 * (1/2) = \$28,900$$

$$\text{PS with a quota 30 t-shirts (or tariff of \$10)} = \$60 \text{ per t-shirt} * (140 \text{ t-shirts} - 20 \text{ t-shirts}) * (1/2) + \$60 \text{ per t-shirt} * 20 \text{ t-shirts} = \$4,800$$

We can use the table to summarize our results:

	CS	PS	Government Revenue or License Holder Revenue	TS	DWL
Closed Economy (autarchy)	\$26,896	\$6,624	\$0	\$33,520	\$605
Open Economy	\$30,625	\$2400	\$0	\$34,125	\$0
Tariff of \$10 per t-shirt	\$28,900	\$4800	\$300	=CS + PS + Rev. = \$34,000	\$125
Import Quota of 30 t-shirts	\$28,900	\$4800	\$300	=CS + PS + Rev. = \$34,000	\$125