Economics 102
Summer 2015
Answers to Homework #2
Due Tuesday, June 30, 2015

Directions: The homework will be collected in a box **before** the lecture. Please place your name 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. Late homework will not be accepted so make plans ahead of time. **Please show your work.** Good luck!

Please realize that you are essentially creating "your brand" when you submit this homework. Do you want your homework to convey that you are competent, careful, and professional? Or, do you want to convey the image that you are careless, sloppy, and less than professional. For the rest of your life you will be creating your brand: please think about what you are saying about yourself when you do any work for someone else!

1. The following scenarios will allow you to practice your supply and demand analysis qualitatively.

a. Suppose the market for soap is initially in equilibrium. Then the price of labor used to manufacture soap decreases. Holding everything else constant, what happens to the equilibrium price and quantity in this market? Make sure in your answer you identify any shifts or movements that occur.

b. Suppose the market for envelopes is initially in equilibrium. Then the price of wood chips used in the manufacture of the paper for the envelopes increases. Holding everything else constant, what happens to the equilibrium price and quantity in this market? Make sure in your answer you identify any shifts or movements that occur.

c. Suppose that there is an infinite supply of sand at a price of $1. But, recent developments in fracking have led to an increase in the demand for sand. Holding everything else constant, what happens to the equilibrium price and quantity in this market? Make sure in your answer you identify any shifts or movements that occur.

d. Suppose the market for jigsaw puzzles is initially in equilibrium. Then the price of the glue used to mount the picture to the cardboard backing increases while simultaneously there is a decrease in the price of video games. For many consumers with time on their hands a turn at a jigsaw puzzle is as satisfying as time spent playing video games. Holding everything else constant, what happens to the equilibrium price and quantity in the market for jigsaw puzzles? Make sure in your answer you identify any shifts or movements that occur.

e. Suppose the market for motorcycles is initially in equilibrium. Then, suppose that the government decides to tax motorcycle manufacturers an excise tax that must be paid on every motorcycle that is produced. At the same time young people decide that it is exciting and fun to ride motorcycles. Holding everything else constant, what happens to the equilibrium price and equilibrium quantity of motorcycles? In your answer be sure to identify any shifts or movements that occur.

f. Suppose the market for insulin for insulin-dependent diabetics is initially in equilibrium. Furthermore, suppose that the population of insulin-dependent diabetics is fixed and will not increase or decrease over time; in addition, assume that the amount of insulin each of these diabetics needs per day is a fixed amount. Suppose that the machinery needed to produce insulin becomes more expensive. Holding everything else constant, what happens to the equilibrium price and equilibrium quantity of insulin? In you answer be sure to identify any shifts or movements that occur.

Answer:

a. When the price of labor decreases this will cause the supply curve for soap to shift to the right since producers at any given price will now be able to supply a greater quantity of soap due to this decrease in input costs. This shift in the supply curve will cause a movement along the demand curve. The equilibrium price of soap will decrease and the equilibrium quantity will increase relative to their initial levels.

b. When the price of wood chips used in the manufacture of paper for envelopes increases this causes the supply curve for envelopes to shift to the left since producers at any given price will not supply a smaller quantity of envelopes than they did initially due to this increase in input costs. This shift in the supply curve will cause a movement along the demand curve. The equilibrium price of envelopes will increase and the equilibrium quantity of envelopes will decrease relative to their initial levels.

c. The supply curve in this scenario is a horizontal line that intersects the vertical axis at a price of $1. The increase in fracking causes the demand for sand to shift to the right. This rightward shift in the demand curve will cause a movement along the supply curve. There will be no change in the equilibrium price of the good but the equilibrium quantity of sand will increase relative to its initial level.

d. In the market for jigsaw puzzles these events will cause two shifts: the supply curve for jigsaw puzzles will shift to the left when the price of the glue increases since this glue is an input in the production of the jigsaw puzzles; the demand curve will shift to the left when the price of a substitute good, the video games, decreases. These two shifts will result in a decrease in the equilibrium quantity of jigsaw puzzles relative to the initial equilibrium level. However, the effect on the equilibrium price is indeterminate: the equilibrium price may stay at its original level or it may increase or decrease.

e. The excise tax on motorcycle producers will increase the cost of producing motorcycles and result in a leftward shift in the supply curve. The change in young people's tastes and preferences in favor of riding motorcycles will shift the demand curve to the right. These two shifts will result in an increase in the equilibrium price of motorcycles relative to their initial price. However, the effect on the equilibrium quantity is indeterminate: the equilibrium quantity may stay at its original level or it may increase or decrease.
f. The demand curve for insulin from insulin-dependent diabetics is a vertical line. When the cost of the equipment used to manufacture insulin increases this causes the supply curve for insulin to shift to the left. This shift causes the equilibrium price of insulin to increase relative to its initial level while the equilibrium quantity does not change since the number of people needing insulin is constant.

2. Suppose you are told that the market for textbooks in Zipia, a small closed economy, can be described by the following equations where Q is that quantity of textbooks and P is the price per textbook:

Domestic Demand: $P = 150 - 3Q$
Domestic Supply: $P = 24 + 6Q$

a. Given the above information, find the equilibrium price and quantity of textbooks, the value of consumer surplus (CS), the value of producer surplus (PS), and the value of total surplus (TS). Draw a well labeled graph depicting these areas and this market.

b. Suppose that Zipia implements a policy that opens its market for textbooks to trade. When they open the market the world price of textbooks is $114. Describe what happens to the price of textbooks in Zipia, the quantity of textbooks demanded in Zipia, the level of imports or exports of textbooks from Zipia's perspective. In addition, calculate the value of consumer surplus when this market opens to trade (CS'), the value of producer surplus when this market opens to trade (PS'), and the value of total surplus when this market opens to trade (TS'). In Zipia, who is celebrating this change in policy? Explain your answer. Provide a well labeled graph to illustrate all of these answers.

c. Now, suppose that Zipia implements a policy that opens its market for textbooks to trade. When they open the market the world price of textbooks is $96. Describe what happens to the price of textbooks in Zipia, the quantity of textbooks demanded in Zipia, the level of imports or exports of textbooks from Zipia's perspective. In addition, calculate the value of consumer surplus when this market opens to trade (CS"), the value of producer surplus when this market opens to trade (PS"), and the value of total surplus when this market opens to trade (TS"). In Zipia, who is celebrating this change in policy? Explain your answer. Provide a well-labeled graph to illustrate all of these answers.

Answer:

a. To find the equilibrium price and quantity in this market set the demand and supply curves equal to one another:

150 – 3Q = 24 + 6Q

126 = 9Q

Q = 14 textbooks

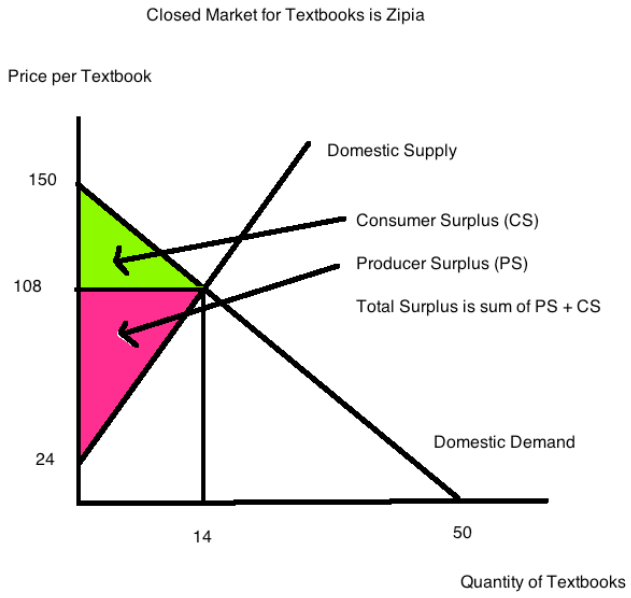
P = 150 – 3Q = 150 – 3(14) = $108 per textbook

Or, P = 24 + 6Q = 24 + 6(14) = $108 per textbook

CS = (1/2)($150 per textbook - $108 per textbook)(14 textbooks) = $294

PS = (1/2)($108 per textbook - $24 per textbook)(14 textbooks) = $588

TS = CS + PS = $294 + $588 = $882

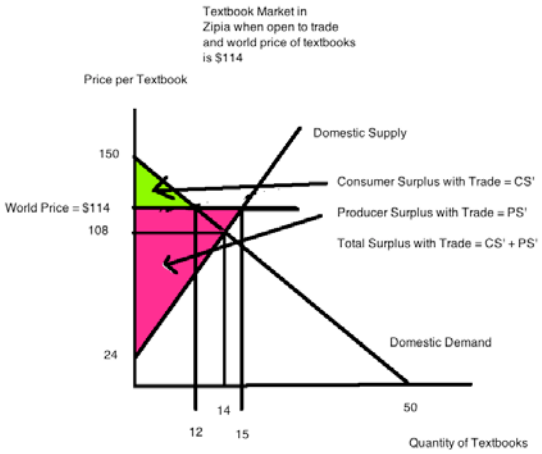


b. When the market for textbooks in Zipia is opened to trade we know that the price of textbooks will go to the world price of $108 per textbook. When the price is $108, the quantity demanded domestically will equal 12 textbooks while the quantity supplied domestically will equal 15 textbooks: this excess supply of 3 textbooks will be exported to the world. Thus, we know that the domestic producers of textbooks in Zipia will be celebrating since they are now selling more textbooks (15 rather than 14) and selling each one at a higher price ($114 versus $108).

CS' = (1/2)($150 per textbook - $114 per textbook)(12 textbooks) = $216

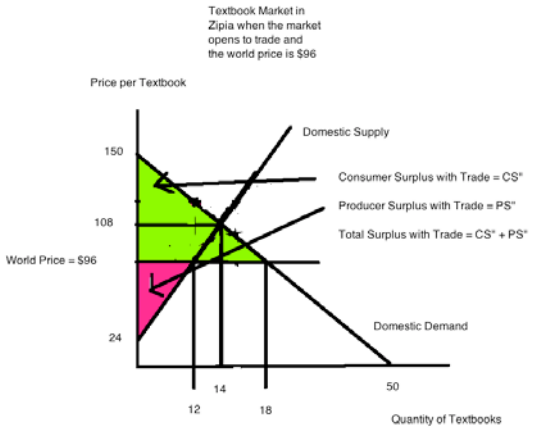
PS' = (1/2)($114 per textbook - $24 per textbook)(15 textbooks) = $675

TS' = CS' + PS' = $216 + $675 = $891



c. When the market for textbooks in Zipia is opened to trade we know that the price of textbooks will go to the world price of $96 per textbook. When the price is $96, the quantity demanded domestically will equal 18 textbooks while the quantity supplied domestically will equal 12 textbooks: this excess demand of 6 textbooks will be imported from the world producers of textbooks. Thus, we know that the domestic consumers of textbooks in Zipia will be celebrating since they are now buying more textbooks (18 rather than 14) and buying each one at a lower price ($96 versus $108).

CS" = (1/2)($150 per textbook - $96 per textbook)(18 textbooks) = $486
PS" = (1/2)($96 per textbook - $24 per textbook)(12 textbooks) = $432
TS" = CS" + PS" = $486 + $432 = $918



3. Suppose you are told that the market for textbooks in Zipia, a small closed economy, can be described by the following equations where Q is that quantity of textbooks and P is the price per textbook:

Domestic Demand: P = 150 – 3Q

Domestic Supply: P = 24 + 6Q

You are also told that the world price for textbooks is $96. Suppose that Zipia opens the market for textbooks to trade while simultaneously imposing an import quota of 3 textbooks. Given this information and assuming nothing else changes, determine the

values for the following (I am including a table so you can consolidate your answers, but in your homework show the work you did to get the values):

Price per textbook in Zipia once this market is opened to trade and the import quota is imposed	
Quantity of textbooks demanded domestically in Zipia once this market is opened to trade and the import quota is imposed	
Quantity of textbooks supplied domestically in Zipia once this market is opened to trade and the import quota is imposed	
CS in this market once this market is opened to trade and the import quota is imposed	
PS in this market once this market is opened to trade and the import quota is imposed	
License Holder Revenue from this import quota	
TS in this market once this market is opened to trade and the import quota is imposed	
Deadweight Loss in this market once this market is opened to trade and the import quota is imposed	
Maximum amount per textbook an importer would pay to be given the right to import a textbook into this market given this import quota	

In addition, provide a graph illustrating this problem and the various concepts listed in the table.

Answer:

The first thing we can note is that this problem uses the information we had in the previous problem. This will save us some time. Building on the last graph of the previous problem we know that the import quota can be modeled as shifting the supply curve to the right by the amount of the quota. The new supply curve will be parallel to the initial supply curve and therefore have the same slope. Thus, $P = 6Q + b$. To find the value of b we need to plug in one point that we know "sits" on the new supply curve: we know that (Q, P) = (12, 96) is on the initial supply curve, so that implies that (Q with quota, P) = (15, 96) is on the new supply curve. Using this point we have:

$96 = 6(15) + b$

$b = 6$

So the new supply curve with the quota is $P = 6Q + 6$. Using this equation and the demand equation we can solve for the equilibrium price and quantity with the import quota:

$150 – 3Q = 6Q + 6$

$144 = 9Q$

$Q = 16$ textbooks

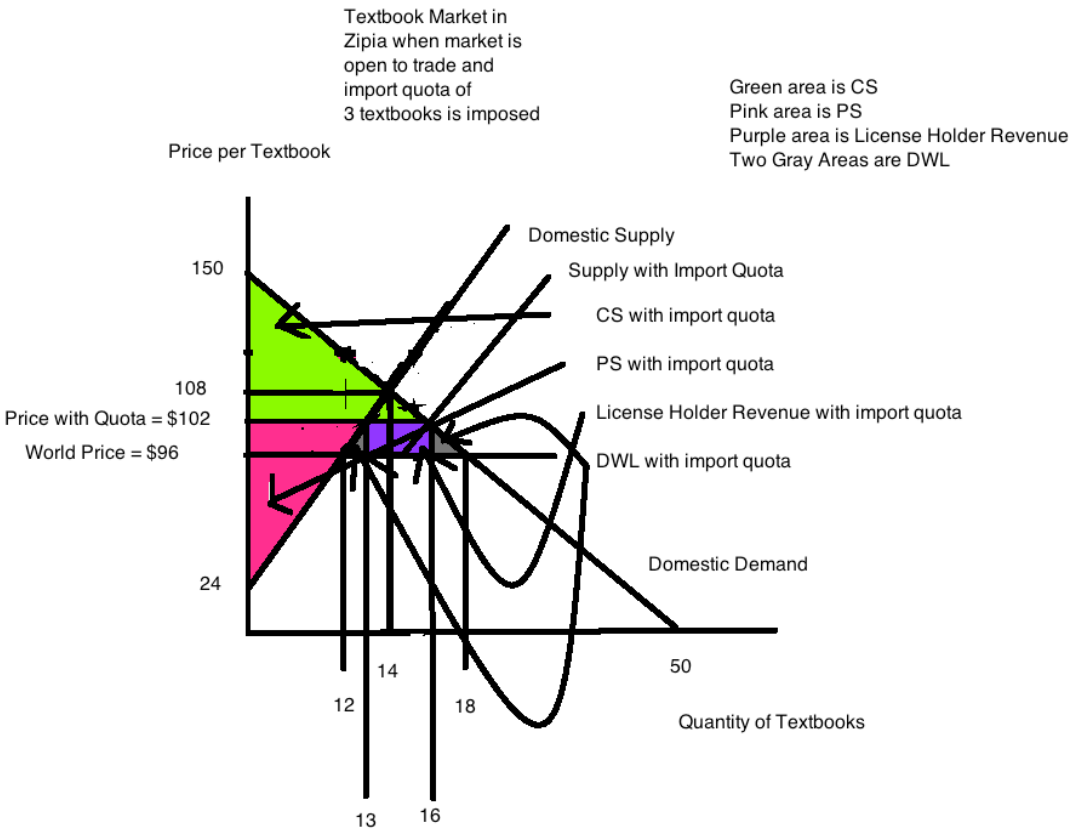
$P = 150 – 3Q = 150 – 3(16) = \$102$

Or, P = 6Q + 6 = 6(16) + 6 = $102

An alternative method of modeling this is to realize that the following is true:
(Quantity supplied domestically) + (import quota) = (quantity demanded domestically)
Using our domestic demand and supply equations we can rewrite this equation as:
(1/6)P – 4 + 3 = 50 – (1/3)P
(1/2)P = 51
P = $102
Quantity supplied domestically when P = $102 is equal to [(1/6)(102) – 4] or 13 textbooks.
Quantity demanded domestically when P = $102 is equal to [50 – (1/3)P] or 16 textbooks.

CS with quota = (1/2)($150 per textbook - $102 per textbook)(16 textbooks) = $384
PS with quota = (1/2)($102 per textbook - $24 per textbook)(13 textbooks) = $507
License Holder Revenue = ($102 per textbook - $96 per textbook)(3 textbooks) = $18
TS with quota = CS with quota + PS with quota + License Holder Revenue = $384 + $507 + $18 = $909
DWL with quota = (1/2)($102 per textbook - $96 per textbook)(13 textbooks – 12 textbooks) + (1/2)($102 per textbook - $96 per textbook)(18 textbooks – 16 textbooks) = $9

Price per textbook in Zipia once this market is opened to trade and the import quota is imposed	$102
Quantity of textbooks demanded domestically in Zipia once this market is opened to trade and the import quota is imposed	16 textbooks
Quantity of textbooks supplied domestically in Zipia once this market is opened to trade and the import quota is imposed	13 textbooks
CS in this market once this market is opened to trade and the import quota is imposed	$384
PS in this market once this market is opened to trade and the import quota is imposed	$507
License Holder Revenue from this import quota	$18
TS in this market once this market is opened to trade and the import quota is imposed	$909
Deadweight Loss in this market once this market is opened to trade and the import quota is imposed	$9
Maximum amount per textbook an importer would pay to be given the right to import a textbook into this market given this import quota	$6



4. Suppose you are told that the market for textbooks in Zipia, a small closed economy, can be described by the following equations where Q is that quantity of textbooks and P is the price per textbook:

Domestic Demand: $P = 150 – 6Q$

Domestic Supply: $P = 24 + 3Q$

You are also told that the world price for textbooks is $96. Suppose that Zipia opens the market for textbooks to trade.

a. Given the above information what is the quantity of textbooks demanded domestically when this market opens to trade? What is the quantity of textbooks produced domestically when this market opens to trade? Given the above information will Zipia import or export textbooks once this market is open to trade? Show your work.

Suppose that the world price of textbooks changes to a level where Zipia finds that it is now importing 9 textbooks. Nothing else has changed in the market for textbooks in Zipia.

b. Given this new information and the initial domestic demand and supply equations, calculate what the world price must be. Show your work.

c. Given this new information, calculate the value of consumer surplus (CS) and producer surplus (PS). Provide a graph to illustrate your analysis and make sure the graph is completely and carefully labeled. Show your work.

d. Given this new information, the government of Zipia decides that they want to implement a tariff in this market so that the quantity of imported textbooks falls to 6. Assuming that everything else stays constant, how big a tariff will need to be implemented to reach this goal? Show your work.

e. What is the deadweight loss in this market due to the imposition of the tariff described in (d)? Show your work.

Answer:

a. To find the quantity demanded domestically use the world price of $96 and the domestic demand equation: 96 = 150 – 6Q or Q = domestically demanded quantity = 9 textbooks. To find the quantity supplied domestically use the world price of $96 and the domestic supply equation: 96 = 24 + 3Q or Q = domestically supplied quantity = 24 textbooks. Since the quantity supplied domestically is greater than the quantity demanded domestically this country will export the difference: exports will equal 15 textbooks.

b. To find the world price we need to think about the relationship between the quantity demanded domestically, the quantity supplied domestically, and the level of imports. Since Zipia is now importing that tells us that the quantity supplied domestically is smaller than the quantity demanded domestically at this new world price. We can write that the (quantity supplied domestically) + (imports) = (quantity demanded domestically). Then, we can rewrite our domestic demand and domestic supply curves so that they are in X-intercept form and are therefore expressed with quantity on the left hand side of the equation. That is,

Domestic Demand: P = 150 – 6Q is the same as Q = 25 – (1/6)P

Domestic Supply: P = 24 + 3Q is the same as Q = (1/3)P – 8

Then, rewrite (quantity supplied domestically) + (imports) = (quantity demanded domestically) as ((1/3)P – 8) + (9) = (25 – (1/6)P) and solve for P, the new world price.

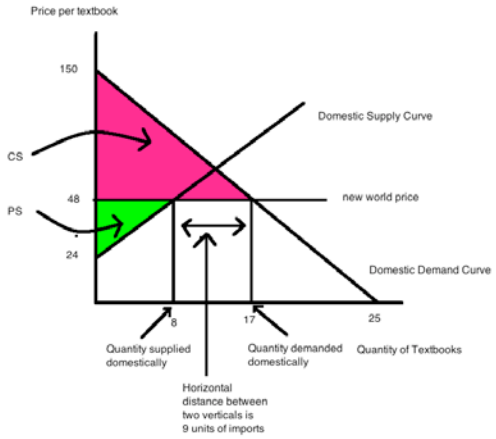
(1/3)P + 1 = 25 – (1/6)P

(1/3)P + (1/6)P = 24

(1/2)P = 24

P = $48 per textbook

c.



CS = (1/2)($150 per textbook - $48 per textbook)(17 textbooks) = $867
PS = (1/2)($48 per textbook - $24 per textbook)(8 textbooks) = $96

d. To find the needed tariff we can use the technique shown in (c) again. Recall that (quantity supplied domestically) + (imports) = (quantity demanded domestically). But this time imports are being set to 6 textbooks rather than the 9 textbooks that had been being imported. Thus, ((1/3)P – 8) + (6) = (25 – (1/6)P) and solve for P, the new price with the tariff.
(1/3)P - 2 = 25 – (1/6)P
(1/3)P + (1/6)P = 27
(1/2)P = 27
P = Price with the tariff = $54
The tariff therefore needs to be the difference between (price with the tariff) – (world price) = ($54) – ($48) = $6 per textbook.

e. The deadweight loss due to this tariff is:
DWL = (1/2)($54 per textbook - $48 per textbook)(10 textbooks – 8 textbooks) + (1/2)($54 per textbook - $48 per textbook)(17 textbooks – 16 textbooks) = $9

5. Suppose there are three countries in that produce and consume bananas. The domestic demand curves for the three countries are given as follows where Q is the quantity of units of bananas demanded by the particular country and P is the price per unit of bananas.

Domestic demand for bananas by Smallland: P = 10 – Q
Domestic demand for bananas by Micoland: P = 10 – (1/2)Q
Domestic demand for bananas by Topland: P = 5 – Q

You are also given the domestic supply curves for bananas for each of these three countries:

Domestic supply of bananas by Smallland: P = (9/23)Q
Domestic supply of bananas by Micoland: P = (9/23)Q
Domestic supply of bananas by Topland: P = (9/23)Q

a. Given this information, find the market demand curve for bananas if these three countries open their market for bananas to trade with one another. Assume that there are no other countries in the world. If necessary there may be more than one equation and, if so, you will need to identify either the relevant range or domain for each equation.

b. Given this information, find the market supply curve for bananas if these three countries open their market for bananas to trade with one another. Assume that there are no other countries in the world. If necessary there may be more than one equation and, if so, you will need to identify either the relevant range or domain for each equation.

c. Given the work you have done in (a) and (b), determine the world price for a unit of bananas if these three countries open their banana markets to trade. What will be the equilibrium quantity of banana units when this market is open to trade? Show your work.

d. Let's check to make sure this really works. Given your answers in (a), (b) and (c) you should now be able to calculate the level of imports and exports in each country. Then you can sum the imports and sum the exports to verify that imports = exports when the banana market is open to trade and is in equilibrium. If you find that imports do not equal exports then you have made an error and you need to go back and rework the problem! Here's a table where you can track your calculations. Hint: you will get "messy" numbers here-keep them as improper fractions rather than converting them to proper fractions or decimals!

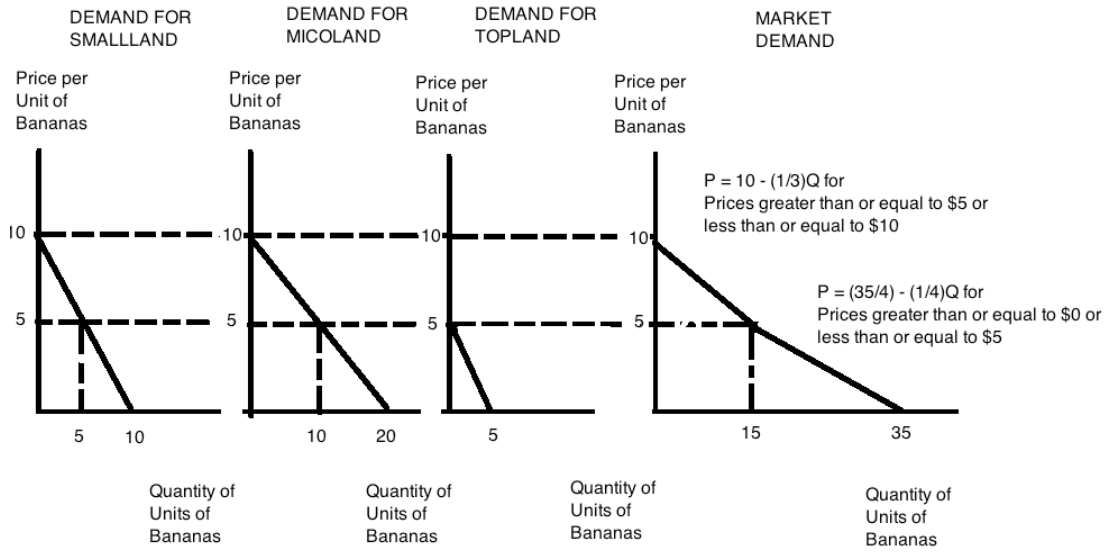
COUNTRY	NUMBER OF UNITS OF BANANAS IMPORTED	NUMBER OF UNITS OF BANANAS EXPORTED
SMALLLAND		
MICOLAND		
TOPLAND		
TOTALS		

e. Finally quickly identify which groups (domestic producers or domestic consumers) favor opening this market to trade. Make sure you identify the nationality of the group!

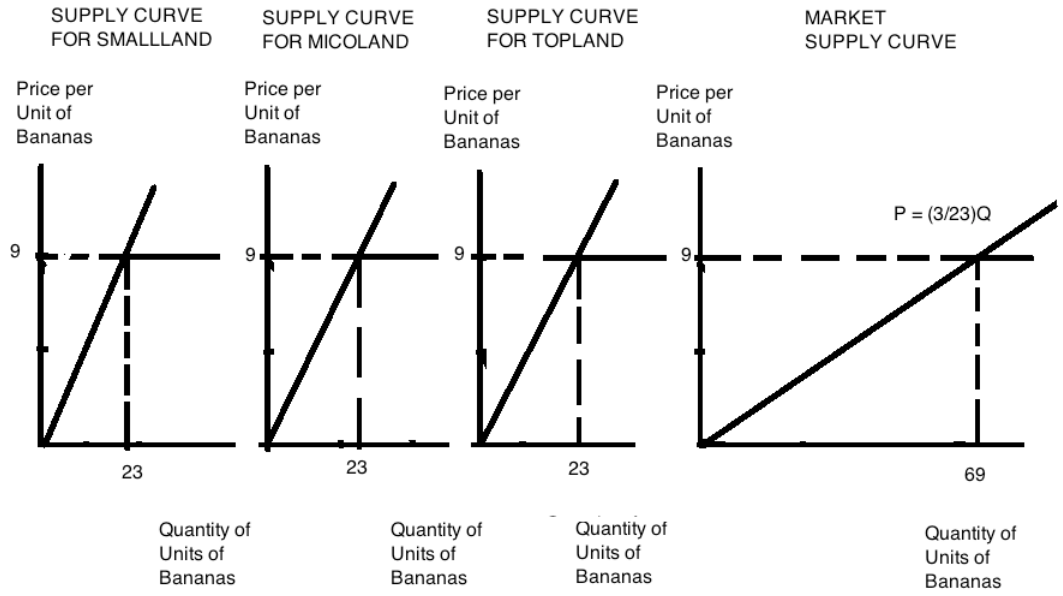
Answer:

a. To find the market demand curve for these three countries we need to sum together horizontally the individual country demand curves. This means that we hold price constant and then add up how many units of bananas will be demanded by the three countries at that price. A good starting point for this is to start with the y-intercepts for the individual demand curves, and a price of 0. So, if the price of the unit of bananas

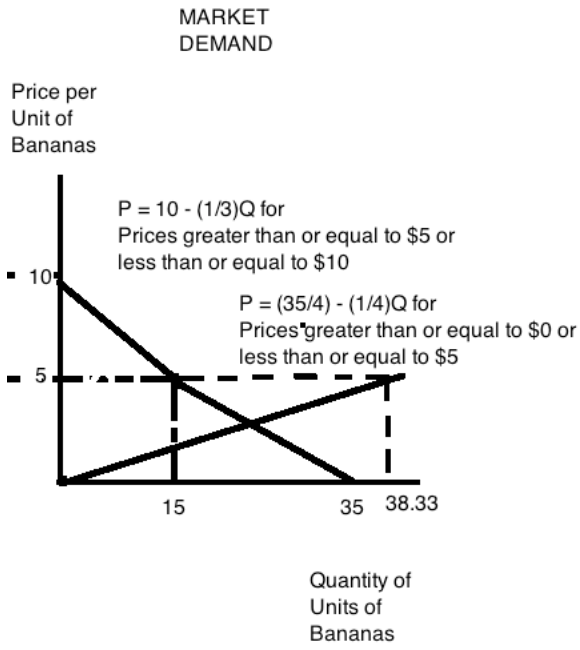
is $10, then none of the three countries will demand any bananas: the price is too high. So, (Q, P) = (0, 10) is one point on the market demand curve. If the price is $5, then Smallland and Micoland will each demand bananas, while Topland will not demand any bananas because the price is still too high for Topland. When the price is $5, Smallland will demand 5 units of bananas and Micoland will demand 10 units of bananas. So, the total market demand at $5 per unit of bananas will be 15 units of bananas: the point (Q, P) = (15, $5) is on the demand curve. We now have two points and can write the market demand curve for prices equal to or greater than $5 and equal to or less than $10. This market demand curve is P = 10 – (1/3)Q. This is the equation for the demand curve over the range of prices between $5 and $10 or over the domain of quantities between 0 and 15 units. If price falls below $5 then there will be demand from Topland: one easy point to find on this lower segment of the market demand curve is (Q, P) = (35, 0). Using the points (35, 0) and (15, 5) we can write the demand curve for quantities greater than or equal to 15 as P = (35/4) – (1/4)Q. The range for this equation is for prices less than or equal to $5. The following picture illustrates this work:



b. To find the market supply curve we will use a similar process to that used in part (a). We will start with a price of $0 per unit of bananas: this price is so low that none of the countries are willing to supply any bananas, so (Q, P) = (0, 0) is one point on the market supply curve. Then, consider a price of $9 per unit of bananas (this is an arbitrary price, but you want to pick a price that is easy to work with if you are doing this without a calculator): at this price Smallland is willing to supply 23 units of bananas as is Micoland and Topland. So, when the price is $9 per unit of bananas, the total market supply is 69 units of bananas. Thus, the two points (Q, P) = (0,0) and (69, 9) are both on the market supply curve. We can write the market supply curve then as follows: P = (9/69)Q or P = (3/23)Q. Here's a set of graphs depicting this outcome:



c. To find the equilibrium price and quantity in the banana market when these countries trade with one another we need to set the market demand curve equal to the market supply curve. This is a little bit challenging though because we have two segments in our market demand curve and we need to make sure we use the right segment to find our answer. We know that the point (Q, P) = (15, 5) is the "kink" point on the market demand curve. We can use this point and the market supply curve to determine whether then market supply curve intersects the market demand curve at this kink point, the upper segment of the demand curve, or the lower segment of the demand curve. When P = $5 per unit of bananas, the market supply curve tells us the market quantity supplied will be Q = 115/3 or 38.33 units of bananas. (To see this use P = (3/23)Q and substitute P = $5.) If we draw a sketch of this result in relation to the demand curve we get the following:



Clearly the new market equilibrium price must be lower than $5 since at a price of $5 the quantity demanded in the world market is 15 units of bananas while the quantity supplied in the world market is 38.33 units.

So, this exercise tells us that we need the market supply curve and the lower segment of the market demand curve to find the new equilibrium: thus,

Market Supply: P = (3/23)Q

Relevant Market Demand: P = (35/4) – (1/4)Q

Solving for the new equilibrium,

(3/23)Q = (35/4) – (1/4)Q

3Q = (35)(23)/(4) – (23/4)Q (note: I just multiplied through by 23)

(3)(4)Q = (35)(23) – (23)Q (note: I just multiplied through by 4)

12Q = 35(23) – (23)Q

35Q = 35(23) (note: I am waiting to do this big multiplication in hopes that I won't need to do it!)

Q = 23

And, if Q = 23 we can put that into either the market demand or the market supply equation to find the new world price:

P = world price = (3/23)(23) = $3 per unit of bananas using the market supply curve.

P = world price = (35/4) – (1/4)(23) = (12/4) = $3 per unit of bananas using the market demand curve.

This answer (Q, P) = (23, 3) seems reasonable given our earlier work: we know that the world price must be less than $5 per unit of bananas and that the new equilibrium quantity in the world market must be greater than 15 units of bananas and less than 35 units of bananas (that's the largest amount of bananas demanded in the world

market-it's the limit of how many units of bananas that could be sold in the world market).

d. To complete this table we need to go back to the individual country demand and supply curves and substitute in the world price of $3 per unit of bananas to see what the level of domestic demand and domestic supply is in each country. From this information we will be able to determine whether the country is importing (domestic demand is greater than domestic supply at the world price) or exporting (domestic demand is less than domestic supply at the world price).

So, for Smallland, when the price is $3 per unit of bananas:

Domestic Demand = 7 units of bananas

Domestic Supply = 23/3 units of bananas (this is more than 7 units of bananas and less than 8 units of bananas)

Since domestic supply is greater than domestic demand, Smallland will export the difference: Exports = 23/3 – 7 = 2/3 units of bananas. Enter this number into your table.

For Micoland, when the price is $3 per unit of bananas:

Domestic Demand = 14 units of bananas

Domestic Supply = 23/3 units of bananas (this is more than 7 units of bananas and less than 8 units of bananas)

Since domestic demand is greater than domestic supply, Micoland will import the difference: Imports = 14 – (23/3) = (19/3) units of bananas (more than 6 units of bananas and less than 7 units of bananas). Enter this number into your table.

For Topland, when the price is $3 per unit of bananas:

Domestic Demand = 2 units of bananas

Domestic Supply = 23/3 units of bananas (this is more than 7 units of bananas and less than 8 units of bananas)

Since domestic supply is greater than domestic demand, Topland will export the difference: Exports = 23/3 – 2 = (17/3) units of bananas (more than 5 units of bananas and less than 6 units of bananas). Enter this number into your table.

COUNTRY	NUMBER OF UNITS OF BANANAS IMPORTED	NUMBER OF UNITS OF BANANAS EXPORTED
SMALLLAND	0 units of bananas	2/3 units of bananas
MICOLAND	19/3 units of bananas	0 units of bananas
TOPLAND	0 units of bananas	17/3 units of bananas
TOTALS	19/3 units of bananas	19/3 units of bananas

e. Countries that import the good are going to find that their domestic consumers like opening the market to trade: so domestic consumers in Micoland favor opening the market to trade.

Countries that export the good are going to find that their domestic producers like opening the market to trade: so domestic producers in Smallland and Topland will favor opening the market to trade.