Unit II: Supply, Demand, and Consumer Choice  
Problem Set #2

1. EXPLAIN an experience or example that shows the “real world” application of each of the following. Define the terms in your own words and use examples that clearly demonstrate your understanding of each concept.
   a. The Law of Demand and the Law of Supply (____/5)
   b. The Law of Diminishing Marginal Utility (____/5)
   c. Normal Goods and Inferior Goods (____/5)
   d. Consumer’s Surplus and Producer’s Surplus (____/5)

2. Supply and Demand Worksheets
   a. Complete the study guide entitled “Study Guide: Demand and Supply” (____/5)
   b. Complete the worksheet entitled “Practice Sheet: Demand and Supply” (____/15)

3. Government Intervention:
   a. EXPLAIN the results of the following government policies; draw each on a separate graph: price floor, price ceiling, production subsidy, and production quota. (____/5)
   b. The government often uses excise taxes, called “sin taxes,” to manipulate consumption of cigarettes. Draw and label the shift from a tax. Identify the new price consumers pay, the price producers receive, the amount of tax revenue consumers pay, and the amount of tax revenue producers pay. Lastly, EXPLAIN why it is unlikely that this tax will significantly reduce cigarette consumption. (____/5)

4. Practice FRQs: Applying S&D Analysis
   a. Complete practice FRQ #1, #2 and #3. (____/20)
   b. Assume the following: The demand for all computers is price elastic. Laptop and desktop computers are substitutes. Laptops and DVD burners are complements. Use three separate S&D graphs (laptops, desktops, and DVD burners) to show the impact of a change in technology that improves only the production of laptop computers on the following: (____/10)
      i. Price of laptop computers
      ii. Output of laptop computers
      iii. Total revenue of laptop computer producers
      iv. Price of desktop computers
      v. Output of desktop computers
      vi. Price of DVD burners
      vii. Output of DVD burners

5. Elasticity
   a. Give three reasons why the demand for some goods is elastic and for others is inelastic. In your response, define elasticity and inelasticity and give examples of each. (____/5)
   b. EXPLAIN how the total revenue test can be used to determine if a demand curve is elastic or inelastic. Use two graphs with numerical examples in your response. (____/5)
6. Article Analysis (separate file on my webpage)
   a. “Smoking and Smuggling,” read/annotate/highlight and answer questions (___/5)
   b. “Slave Redemption in Sudan,” read/annotate/highlight and answer questions (___/5)

7. Utility Maximization
   You just won a $100 shopping spree at a store that sells only DVDs and CDs. You are trying to determine what combination of these two goods would maximize your utility. The price of CDs is $10 and DVDs are $20. Below is the total utility you receive from consuming these goods.

<table>
<thead>
<tr>
<th>CDs</th>
<th>Total Utility</th>
<th>DVDs</th>
<th>Total Utility</th>
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<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>1</td>
<td>160</td>
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<tr>
<td>2</td>
<td>110</td>
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<td>180</td>
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<td>5</td>
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<td>5</td>
<td>600</td>
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<tr>
<td>6</td>
<td>210</td>
<td>6</td>
<td>660</td>
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a. Calculate the marginal utility and marginal utility per dollar for each unit of each good. ( ___/4)

b. If you only had $100, EXPLAIN how you determine the utility maximizing combination of CDs and DVDs? ( ___/3)

c. If your reward increased and your income constraint became $130, EXPLAIN how you determine the utility maximizing combination of CDs and DVDs? ( ___/3)
**STUDY GUIDE: DEMAND AND SUPPLY**

<table>
<thead>
<tr>
<th>DEMAND</th>
<th>SUPPLY</th>
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<tbody>
<tr>
<td><strong>Demand Schedule</strong></td>
<td><strong>Supply Schedule</strong></td>
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<tr>
<td>Demand Schedule</td>
<td>Supply Schedule</td>
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<tr>
<td>Price</td>
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<td>Demand Curve</td>
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<td><img src="image" alt="Demand Curve" /></td>
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<td>Demand is</td>
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<td>The Law of Demand:</td>
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What causes a “change in quantity demanded”? (△QD)

What causes a “change in quantity supplied”? (△QS)

What causes a “change in demand”? (△D)

What causes a “change in supply”? (△S)

...
### Demand Supply

<table>
<thead>
<tr>
<th>Elastic Demand</th>
<th>Elastic Supply</th>
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<tr>
<td><img src="img" alt="Movie Tickets" /></td>
<td><img src="img" alt="Tomatoes" /></td>
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<tr>
<th>Inelastic Demand</th>
<th>Inelastic Supply</th>
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<tr>
<td><img src="img" alt="Cigarettes" /></td>
<td><img src="img" alt="Electricity" /></td>
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#### Equilibrium and Disequilibrium

- Excess Quantity Supplied = ________________
- Equilibrium Price = ______________________
- Excess Quantity Demanded = ________________

#### Consumer’s Surplus

- Definition: ____________
- ______________________
- ______________________
- ______________________

#### Producer’s Surplus

- Definition: ____________
- ______________________
- ______________________
- ______________________

### Economic Analysis - Easy as 1, 2, 3

**DVDs**

1. Before Change
2. Change
   - Did it affect supply or demand first?
   - Which determinant caused the change?
   - Will it increase or decrease?
3. After Change
   - Price? Quantity?

Scenario: Price of DVD players falls dramatically.

### Double Shifts (Moving Two Curves)

**Rule:**

- ________________
- ______________________
- ______________________
- ______________________

**Example:**

*Population ↑ ⇒
Demand ↑
*New technology⇒
costs↓ ⇒ Supply ↑
## PRACTICE SHEET: SUPPLY – DEMAND

Use Economic Analysis to determine what happens to the price and quantity of computer games in each scenario.

<table>
<thead>
<tr>
<th>#</th>
<th>Scenario</th>
<th>Graph</th>
<th>Economic Analysis</th>
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</table>
| 1 | It becomes known that an electronics store is going to have a sale on their computer games 3 months from now. | ![Graph] | 1. Equilibrium Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. Equilibrium After –  
Price - Quantity - |
| 2 | The workers who produce the computer games go on strike for over two months | ![Graph] | 1. Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. After –  
Price - Quantity - |
| 3 | When the average price of movie tickets rises, it has an effect on the purchase of computer games. (Analyze computer games.) | ![Graph] | 1. Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. After –  
Price - Quantity - |
| 4 | The workers who produce the computer games negotiate a $20 per hour wage increase. | ![Graph] | 1. Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. After –  
Price - Quantity - |
| 5 | The price of business software, a product also supplied by computer game software producers, rises. (Analyze computer games.) | ![Graph] | 1. Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. After –  
Price - Quantity - |
| 6 | A reputable private research institute announces that children who play computer games also improve their grades in school. | ![Graph] | 1. Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. After –  
Price - Quantity - |
| 7 | Because of the use of mass production techniques, workers in the computer game industry become more productive | ![Graph] | 1. Equilibrium Before –  
2. Change –  
Supply or Demand first?  
Shifter?  
Increase or decrease?  
3. Equilibrium After –  
Price - Quantity - |
<p>| | | |</p>
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<tr>
<td><strong>8.</strong></td>
<td>The price of home computers decreases significantly. (Analyze computer games.)</td>
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<td><strong>9.</strong></td>
<td>The Federal government imposes a $5 per game tax on the manufacturers of the games.</td>
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<tr>
<td><strong>10</strong></td>
<td>The manufacturer of the computer games raises the price on the games.</td>
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<td><strong>11</strong></td>
<td>In order to promote American production, Congress provides a subsidy to game producers. (Analyze only American firms)</td>
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<td><strong>12</strong></td>
<td>A large firm enters the game business with a new line of games. (Analyze the whole game industry)</td>
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<tr>
<td><strong>13</strong></td>
<td>In order make computer games available to low-income families, Congress sets a price ceiling for the games.</td>
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<tr>
<td><strong>14</strong></td>
<td>The popularity of the computer games increases in the world markets. At the same time new technology lower production costs. (Double Shift)</td>
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</table>
Discussion questions for “Smoking and Smuggling”

1. What are some politically driven motives for increasing the tax on cigarettes? Any health concerns? How were tax revenues distributed to States spent?

2. When tax hikes were imposed on cigarettes, who carried the burden of the extra cost? Do cigarettes follow the model of the Demand Curve? Are cigarettes more likely to be elastic or inelastic? WHY? (How) Would this affect Total Revenue?

3. Why are cigarettes a prime candidate for smuggling? Why does raising taxes encourage the formation of Black Markets?

4. How did tariffs affect British Tea during the American Revolution? Why?

5. Various state and federal laws specify that a pack of cigarettes must contain twenty cigarettes and that these cigarettes are limited in the total amount of tobacco they may contain. If such limits were not in place, when taxes per pack were raised, what would you expect to see happen to the number of cigarettes in a pack and the amount of tobacco in a cigarette?
There is little doubt that despite the addictive attributes of nicotine, higher cigarette prices make inroads on smoking—after all, the demand curve for cigarettes, like the demand curve for any other good, is downward-sloping. For each 10 percent that taxes push up the retail price, the number of packs sold drops by 4 to 8 percent. Interestingly, however, although smokers respond to higher taxes by smoking fewer cigarettes, they also tend to smoke cigarettes that are longer and have higher nicotine and tar content. This effect is so pronounced among people between the ages of eighteen and twenty-four that the average daily tar intake among the young people who continue to smoke is actually higher when the tax rate is higher. Because tar is believed to be the principal carcinogenic substance in cigarettes, higher taxes probably lead to more adverse health consequences among young smokers.

Smoking tends to be concentrated among lower-income individuals, which means that the burden of cigarette taxes also tends to be concentrated in this segment of the population. For example, one survey several years ago revealed that only 19 percent of people earning more than $50,000 per year smoked, whereas 32 percent of those earning less than $10,000 smoked. As a result, cigarette taxes increased 0.4 percent of the income of smokers in the high-income group but 5.1 percent of the income of the low-income smokers. Indeed, it is estimated that more than half of the latest increases in federal cigarette taxes will be borne by people earning less than $25,000 per year.

Perhaps the most interesting consequence of changes in cigarette taxes, however, is the change in distribution channels that results. Cigarettes are both light and compact relative to their market value, and this becomes increasingly important when the taxes on them are raised. This makes cigarettes prime candidates for smuggling—and taxes are a prime stimulus to such smuggling. Worldwide, of the 1 trillion cigarettes exported from producing nations, it is estimated that roughly 300 billion were sold by smugglers, up from 100 billion in 1990. The chief reason for this smuggling is that cigarette taxes vary enormously around the world, creating price differences across nations of several dollars per pack.

For example, in Britain, where cigarettes cost about $9.00 per pack, it is estimated that half of all British smokers consume at least some smuggled cigarettes each year. About 25 percent of the cigarettes consumed in Spain are illegal, 20 percent of Italian cigarettes are black-market, and perhaps 40 percent of all cigarettes consumed in Hong Kong are contraband. In low-tax Luxembourg, it is estimated that only 15 percent of tobacco purchased is consumed in the country, with the rest being moved covertly to higher-tax locales elsewhere in Europe.

In 1991, the Canadian federal government raised cigarette taxes by 146 percent, yielding a price per pack of $3.50, compared to an average U.S. price of $1.00 at the time. Provincial governments soon followed suit with higher cigarette taxes of their own. By 1994, black-market cigarette consumption in Canada had jumped to 25 percent of total consumption, up from about 2 percent. How did this happen? When Canadian cigarettes are exported, they are exempt from Canadian cigarette taxes. Soon after the higher federal and provincial taxes went into effect, there was a huge rise in (tax-exempt) exports to the United States, where the cigarettes were promptly—and illegally—exported back to Canada. The federal and provincial governments were ultimately forced to slash their taxes down to about what they had been before the smuggling outbreak.

How big are the potential cigarette smuggling stakes in the United States? With an average $1.00-per-pack hike in combined state and federal taxes, the potential net revenue to smugglers would be on the order of $3 billion to $6 billion per year, even if only a quarter of all smokers turned to the black market. And where would these smuggled cigarettes come from? Almost anywhere. Mexico, a transshipment point for much of America’s illegal drug imports, is one place. In the early 1990s, U.S. exports of cigarettes to Mexico went from 5 million packs a year to 150 million. Some of this was due to increased Mexican consumption, but a significant amount is believed to be due to reexports to California, which had tripled its cigarette taxes in 1989. In 2004, the federal government broke up a smuggling ring that had brought more than 100 million cigarettes into the United States from Mexico. Other likely sources of smuggled cigarettes are domestic U.S. military bases and Indian reservations, where cigarettes are generally tax-exempt. Both of these venues have been sources of bootleg cigarettes in the past, when combined federal and state taxes were far lower than they are now.

The potential problems facing states when they raise their cigarette taxes are magnified by the fact that other states represent potential sources of supply. Cigarette smuggling is sensitive to interstate tax
differentials of only a few cents per pack, so state governments must consider the taxing behavior of other states or suffer the consequences. For example, the late 1940s saw an outbreak of smuggling when a significant number of states first began using cigarettes as a source of tax revenue. Another outbreak of smuggling occurred in the 1970s as states raised taxes to make up for other revenue losses caused by the recession of the early 1970s.

Michigan's experience reveals that the latest round of state cigarette tax increases is producing yet another epidemic of interstate smuggling. In 1994, Michigan hiked its tax to 75 cents per pack from 25 cents. Within just over a year, 20 percent of the cigarettes consumed in Michigan were smuggled in as smokers traveled to Ohio and Indiana to save more than one-third on the cost of a carton. With the tax in Michigan now at $2.00 per pack, compared to Indiana's 55.5 cents, Michigan smokers can save $15 per carton through a quick trip over the state line. There has also been a sharp rise in organized, large-scale heists of cigarettes, and even a major law enforcement push against cigarette bootlegging seems unable to quell the onslaught of illegal imports.

None of these developments would be surprising to the British, who two centuries ago relied on import tariffs to fund much of their government spending and suffered the consequences. Between 1698 and 1758, the standard tariff rate went from 10 percent to 25 percent. After further increases in tariffs during the American Revolution, smuggled goods accounted for a full 20 percent of all imports to Britain. Tea was particularly popular and thus heavily taxed. Indeed, the tax rate reached 119 percent, and by 1784, it was estimated that two-thirds of all tea consumed in Britain was contraband. Given the situation with cigarette taxes, cigarette smuggling seems headed the same way.

Discussion questions for “Slave Redemption in Sudan”

1. What is slave redemption? How did humanitarian groups affect supply and demand for Sudanese slaves?

2. What does the sentence from the reading “We've made slave redemption more profitable than narcotics” mean?

3. Explain the Demand side and Supply side responses of slave redemption.

4. It appears that the actions of the slave redeemers have raised the equilibrium price of slaves. What does this imply about the number of slaves held by private owners in northern Sudan— as long as the demand curve for slaves is downward-sloping?

5. What do the higher profitability and volume of slave trading today imply about the number of slaves held in inventory in the south for trading purposes, compared to the number that used to be held there?
CHAPTER EIGHT

Slave Redemption in Sudan

Sudan is Africa’s largest nation. Located immediately south of Egypt, it encompasses nearly 1 million square miles and is home to 36 million people. It is also home to poverty, disease, civil war—and the emergence of modern-day slavery. The slave trade, in turn, has given rise to a humanitarian movement whose adherents seek to alleviate Sudan’s misery by buying freedom for its slaves. Well-intentioned though they are, these humanitarian efforts may be making things worse.

Slavery is a centuries-old practice in Sudan, one that colonial British rulers finally managed to halt during World War I. The Sudanese gained independence in 1956, but despite ensuing periods of civil war, the slave trade initially remained a piece of history. This changed in 1989, when the National Islamic Front (NIF) took control of the government. The NIF quickly began arming the Muslim Baggara tribe in the northern part of the country to fight against the rebellious Christian tribes of the south. The Baggara had previously made a regular practice of enlisting members of the southern Dinka tribe, and once armed by the NIF, the Baggara resumed the slave raids the British had suppressed. This activity was further aided by the government, which supplied horses to the Baggara and permitted slave markets to open in the cities controlled by the NIF. Perhaps as many as twenty thousand Dinkas, mostly women and children, were enslaved and taken north, selling for as little as $15 each. The slaves were branded with the names of their owners and put to work as cooks, maids, field hands, and concubines.

Within a few years, word of the revived slave trade began filtering out of Sudan. In response, a variety of humanitarian groups from other nations began buying slaves in large batches and setting them free.

The process is called “slave redemption,” and its purpose—ideally—is to reduce the number of people who are enslaved.

Raising money for slave redemption soon became big business, spreading rapidly among public schools and evangelical churches in the United States. A middle school in Oregon, for example, raised $2,500 to be used for slave redemption. Even more impressive was an elementary school class in Colorado: After the children’s efforts caught the media’s eye, the class raised more than $50,000 for slave redemption.

The largest of the humanitarian groups involved in slave redemption is Christian Solidarity International (CSI). This group says it has freed tens of thousands of slaves since 1995, most at prices of about $50 each. Other groups have purchased the freedom of several thousand additional slaves, sometimes at prices of up to $100 each.

Per capita income in Sudan is about $500 per year, which makes slave prices of $50 to $100 apiece quite attractive to the Baggara slave raiders. This is particularly true when the redeemers are buying in the south, where the targeted Dinkas live, and prices in the north, the traditional market for slaves, are as low as $15 apiece. In fact, says one individual who used to be active in slave redemption, “We’ve made slave redemption more profitable than narcotics.” What are the consequences of such profitability?

There have been two sets of responses. First, on the demand side, the higher prices for slaves make it more costly for owners in the north to hold slaves. So rather than own slaves, some of them have offered their slaves to the redeemers. This, of course, is exactly the effect the slave redemption movement has desired. But there is also a supply response: When the market value of slaves rises due to an increase in demand (the demand of the slave redeemers), we expect an increase in the quantity supplied. That is, we expect the raiders who produce slaves by capturing them to engage in more of that activity. This is exactly what has happened in Sudan.

Slave redemption began in earnest in the mid-1990s, and according to local authorities, the number of slave raids grew sharply in response. Moreover, the size of a typical raiding party rose from roughly four hundred attackers to more than twenty-five hundred. What accounts for the increase? Slaves used to be traded in relatively small batches, but the redeemers prefer to buy in large lots—hundreds or more at a time. Collecting and assembling the number of slaves required to satisfy the redemption buyers thus requires considerably more manpower. Hence
the slave trade has been transformed from a cottage industry into a large-scale business enterprise. Overall, it is estimated that the number of slaves captured in raids each year is greater now than at the inception of slave redemption.

Initially, it is likely that the impact of slave redemption was chiefly on the demand side; that is, the first slaves redeemed were almost surely “freed from slavery” in the sense that we would normally use that terminology. But once the stock of slave holdings in the north had adjusted downward in response to the newly elevated equilibrium price, there was only one place for the slave traders to get the slaves demanded by the redemption buyers. This was from the raiders who were now taking slaves for one purpose only—sale to the redeemers. Thus once the stock of slaves in the north had adjusted to its lower equilibrium level, all of the slaves subsequently “freed” by the redeemers were in fact individuals who never would have been enslaved had the redeemers not first made a market for them. In addition, because large numbers of new slaves now spend some time in captivity awaiting redemption, it is even possible that the total number of people in slavery at any point in time is actually higher because of the well-intentioned efforts of the slave redeemers.

As unpleasant as such reasoning is, it agrees with the opinions of people who observe the slave trade at first hand. As a local humanitarian worker says, “Giving money to the slave traders only encourages the trade. It is wrong and must stop. Where does the money go? It goes to the raiders to buy more guns, raid more villages... It is a vicious circle.” In a similar vein, the chief of one village that has been targeted by the slave raiders says, “Redemption is not the solution. It means you are encouraging the raiders.”

In addition to encouraging the capture of new slaves, redemption also reduces any incentive for owners to set free their less productive slaves. Before slave redemption, about 10 percent of all slaves, chiefly older women and young children, were allowed to escape or even told to go home because the costs of feeding, clothing, and housing them exceeded their value to their owners. Now slaves who would have been freed on their own are instead held in captivity until a trader can be found to haul them south for sale to the redeemers.

The final effect of redemption has been to create a trade in fictitious slaves—individuals who are paid to pose as slaves for the purposes of redemption and who are then given a cut of the redemption price after they are “freed.” Although redemption groups obviously try to avoid participating in such deals, observers familiar with the trade consider them a regular part of the redemption business.

Is there another way to combat slavery in Sudan? On the demand side, the U.S. government has long refused to negotiate with terrorists or pay ransom to kidnappers, because it believes that such tactics encourage terrorism and kidnapping. It recognizes that paying a ransom increases the profits of kidnapping, thus enticing more individuals into the trade.

On the supply side, the British were originally successful in ending the slave trade in Sudan and elsewhere in their empire by dispatching soldiers to kill or disarm slave raiders and by sending warships to close off maritime slave-trading routes. Sudan, of course, is an independent sovereign nation today; both the United Nations and the British electorate would likely oppose unilateral military action by the British government against Sudanese slave raiders. Yet even the people who used to be subject to British colonial rule have mixed feelings. When asked to compare the colonial British policies to the redeemers’ policies of today, a schoolmaster in the affected area remarked, “If the colonial government were standing for election, I would vote for them.” So too might the victims of the slave trade in Sudan.
**FRQ#1**: Draw and label a supply and demand graph for surfboards below. Identify equilibrium price and quantity.

a) In 2005, the world’s largest producer of surfboard foam stopped production. Demonstrate on the graph the effect of this change.

b) Now assume that surfing becomes widely popular. Demonstrate on the graph the effect of this change.

c) Compared to the original equilibrium, identify the effect that parts (a) and (b) together have on:
   i. Equilibrium price
   ii. Equilibrium quantity

**FRQ#2**: Early in the 20th century, the advent of the tractor revolutionized the production of wheat.

A. Use the supply and demand model to show the affect that this new production technique had on the price and quantity of wheat

B. To stable prices, the government established an effective price floor for wheat. On a new graph, show graphically the price floor and identify what happened to each of the following in relation to equilibrium:
   i. Quantity demanded
   ii. Quantity supplied
   iii. Consumers surplus

C. Years later, the government abolished the effective price floor causing the price of wheat to return to equilibrium.
   i. Identify if the price increased or decreased after the law was abolished.
   ii. Identify how abolishing the law affected quantity supplied and quantity demanded
FRQ#3

Assume that the market for home security systems is perfectly competitive and currently in equilibrium.

(a) Using a correctly labeled graph of supply and demand, show each of the following.

   (i) The equilibrium price and quantity, labeled as $P^*$ and $Q^*$, respectively

   (ii) The area representing consumer surplus, labeled as CS

   (iii) The area representing producer surplus, labeled as PS

(b) Suppose that the government imposes an effective (binding) price ceiling. Redraw your graph in part (a), and label the ceiling price as $P_2$. Completely shade the area representing the sum of the consumer surplus and the producer surplus after the imposition of the price ceiling.

(c) Suppose the demand for home security systems decreases and the price ceiling remains binding. Indicate what will happen to each of the following.

   (i) Consumer surplus

   (ii) Producer surplus