1. Early philosophers believe that everything has its internal value, and its price fluctuates around this value. But they have a hard time explaining why water is so much cheaper than diamond. After all we need water to survive, but we don't need diamond. Can you explain why the price of water is so much lower?
   The price of water is determined by the market supply and demand. A low price is a result of high supply (the price of water is higher in regions where water supply is lower.).

2. Discuss the forces that drive the market to Equilibrium (What happens when the price is higher than equilibrium price? What happens when the price is lower than equilibrium price?).
   When the price is higher than the equilibrium price, the quantity demanded is lower than the quantity supplied. The producers have incentive to lower the price and sell their excess supply, and at a lower price the consumers are willing to buy. So the trade continues until the price reaches the equilibrium price and the excess supply is gone.
   When the price is lower than equilibrium price, there is excess demand. Some consumers are willing to buy and cannot find the good in the market, so they are willing to increase the price. At a higher price the producers will produce more. So the trade continues and the price keeps going up until it reaches the equilibrium price.
   You can also explain it using the maximum willingness to pay. For example, when the price is higher than the equilibrium price, the quantity sold is smaller than the equilibrium quantity. For the unit of good next to the quantity sold, the consumers' maximum willingness to pay is higher than the cost of producing that unit, so the consumer is willing to buy it and the producer is willing to produce and sell it as long as the price is in between. So this unit will be traded. Similarly they will trade the next unit, then the next one, …, until the quantity traded is equal to the equilibrium quantity, where the consumer's maximum willingness to pay is equal to the marginal cost.

3. When there is excess demand and market is not working, waiting, as a mechanism, is often used to allocate the goods. If market mechanism is used, people who value the good most (with highest maximum willingness to pay) get the good; if waiting mechanism is used, people who wait long enough in line get the good. In reality, market is used when allocating goods like apples, but waiting is used to decide who should get the next kidney donated (A black market may exist though). Why don't we use market to allocate kidneys?
   A market for kidneys actually once existed on Ebay and then was closed. There are many reasons. One of them is that many people believe that kidneys (like many other medical services) should be allocated to those who need them most rather than to those who are rich enough (in a market the guy who is willing and able to pay the highest price will get the next kidney).

4. The price of beef has increased. Jack, a policy consultant, does some research and identifies two possible reasons: a) The cost is higher for some major beef producers, b) More people switch to beef after they know how chickens are raised. Assume one reason dominates, and the only data Jack has are the price and sales records of beef. Can you help Jack to figure out which one reason drives the price of beef higher?
   If a) dominates, supply will be lower, and the equilibrium quantity will be lower. If b) dominates, demand will be higher, and the equilibrium quantity will be higher. Since he has the price and sales records of beef, Jack can check whether the quantity traded goes up or down. If the quantity is higher, then demand must be higher, and thus b) dominates. If the quantity is lower, then supply is higher, and thus a) dominates.

5. Write down the key assumptions for a perfectly competitive market from your understandings. Then check the notes to see if you miss any assumption and why that assumption is important.
   - All firms sell identical product
   - There are numerous firms and everyone is a price taker.
   - Everyone has full information about the price and quality of the good.
   - Cost of trading are low.

   Among them the most important one is that everyone is a price taker.

6. (Problem 3 of Ch4.) Consider the market for minivans. For each of the events listed below, identify which of the determinants of demand or supply are affected. Also indicate whether demand or supply is increased or decreased. Then show the effect on the price and quantity of minivans.
   a. People decide to have more children.
   b. A strike by steelworkers raises steel prices.
   c. Engineers develop new automated machinery for the production of minivans.
   d. The price of SUVs rises.
   e. A stock market crash lowers people's wealth.

   a. If people decide to have more children (a change in tastes), they will want larger vehicles for hauling their kids around, so the demand for minivans will increase. Supply won't be

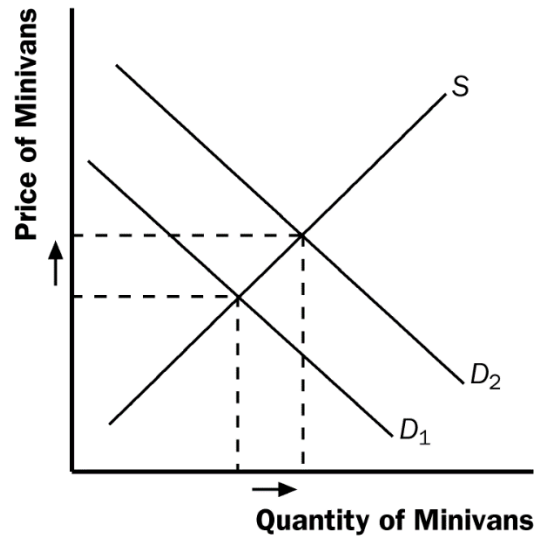affected. The result is a rise in both price and quantity, as Figure 12 shows.

Price of Minivans (vertical axis)

S

D₂

D₁

Quantity of Minivans

Figure 12

b.   If a strike by steelworkers raises steel prices, the cost of producing a minivan rises (a rise in input prices), so the supply of minivans decreases. Demand won't be affected. The result is a rise in the price of minivans and a decline in the quantity, as Figure 13 shows.
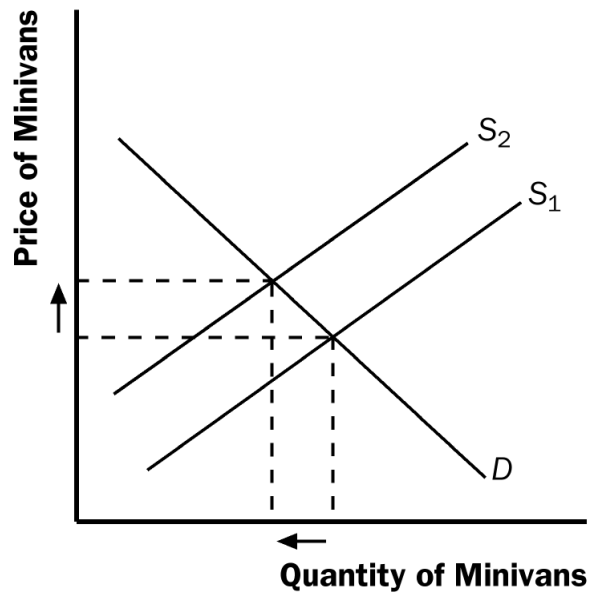
Price of Minivans (vertical axis)

S₂

S₁

D

Quantity of Minivans

Figure 13

c.   The development of new automated machinery for the production of minivans is an improvement in technology. The reduction in firms' costs results in an increase in supply. Demand isn't affected. The result is a decline in the price of minivans and an increase in the quantity, as Figure 14 shows.
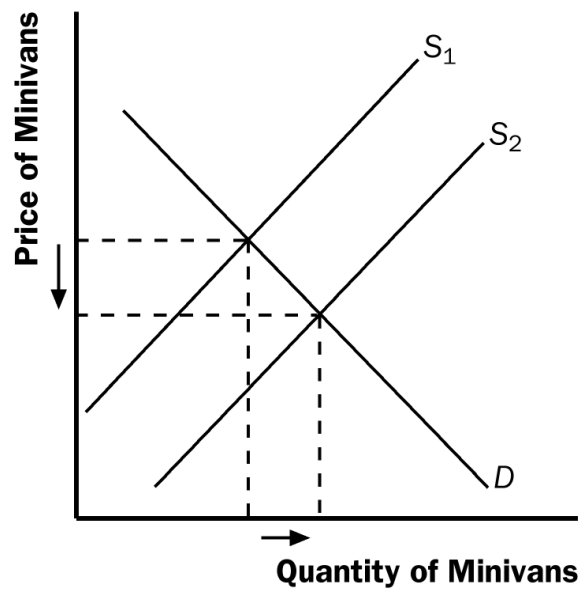
Figure 14

d.   The rise in the price of sport utility vehicles affects minivan demand because sport utility
vehicles are substitutes for minivans (that is, there is a rise in the price of a related
good). The result is an increase in demand for minivans. Supply is not affected. In
equilibrium, the price and quantity of minivans both rise, as Figure 12 shows.

e.   The reduction in peoples' wealth caused by a stock-market crash reduces their income,
leading to a reduction in the demand for minivans, since minivans are likely a normal
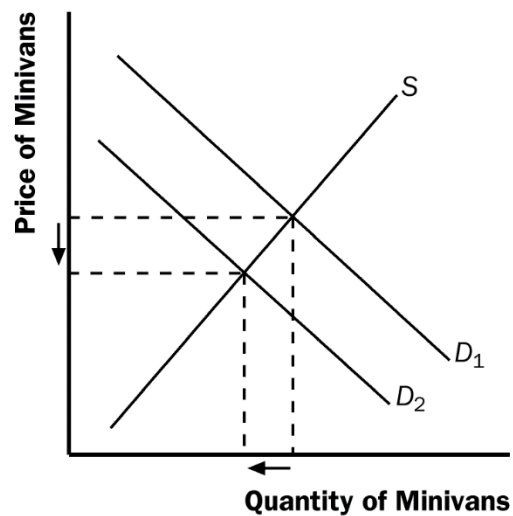good. Supply isn't affected. As a result, both price and quantity decline, as Figure 15
shows.

Figure 15

7. (Based on Problem 16 of Ch4.) At a price of $320 per ton, the supply of wheat in Canada is 25 million tons and the demand is 26 million tons. When the price increases to $340 per ton, the supply increases to 27 million tons and the demand decreases to 22 million tons. Assume that both the demand and supply curves are linear. (Use Q_d and Q_s to denote the quantity demanded and supplied respectively.)

   a. What is the equation for the demand curve for wheat? Draw the diagram and show the slope.

   b. What is the equation of the supply curve for wheat? Draw the diagram and show the slope.

   c. Using these equations, what is the equilibrium price and quantity of wheat?

   d. What is the price elasticity of demand at the point (Quantity=26 million tons, Price=$320)? At the point (Quantity=22 million tons, Price=$340)?

   e. What is the price elasticity of supply at the point (Quantity=25 million tons, Price=$320)? At the point (Quantity=27 million tons, Price=$340)?

   f. At which point (Q=? P=?) the price elasticity of demand is equal to 1?

   g. Suppose now the government imposes a sales tax of $10 per ton on the wheat producers. Calculate the new equilibrium (price and quantity). How much tax does the government collect? How much of the tax falls on the consumers, and on the producers? What if the tax is a consumption tax of $10 on the consumers?

   a. We know two points on the demand curve: A(Q=26, P=320) and B(Q=22, P=340). Define C as any other point on the demand curve: C(Q_d, P). Since it is assumed here that both the demand and supply curves are linear, they are straight lines. We can calculate the slope of the demand curve using any two points on the curve. If we use A and B: slope = $\frac{340-320}{22-26}$. If we use A and C: slope = $\frac{P-320}{Q_d-26}$. Because the demand curve is a straight line and thus has only one slope, we have slope = $\frac{340-320}{22-26} = \frac{P-320}{Q_d-26}$. This gives us the demand function. We can simplify it: $\frac{340-320}{22-26} = \frac{P-320}{Q_d-26} \Leftrightarrow -5 = \frac{P-320}{Q_d-26} \Leftrightarrow$ $P - 320 = -5(Q_d - 26) = -5Q_d + 130 \Leftrightarrow P = -5Q_d + 450$.

   b. We know two points on the supply curve: E(Q=25, P=320) and F(Q=27, P=340). Similarly we can use slope to get the supply function:
   Slope = $\frac{340-320}{27-25} = \frac{P-320}{Q_s-25} \Leftrightarrow \frac{P-320}{Q_s-25} = 10 \Leftrightarrow P = 10(Q_s - 25) + 320 \Leftrightarrow P = 10Q_s + 70$.

   c. In equilibrium $Q_d = Q_s \equiv Q$. So from the demand function in a) and supply function in b), we have $P = -5Q_d + 450 = 10Q_s + 70 \Leftrightarrow -5Q + 450 = 10Q + 70 \Leftrightarrow$ $380 = 15Q \Leftrightarrow Q = \frac{380}{15} \approx 25.3$. $P = 10Q + 70 \approx 253 + 70 = 323$. So in equilibrium (Q,P)=(25.3, 323). (See the figure in the last page.)

d. Price elasticity of demand $\epsilon_p = \frac{1}{|slope|}\frac{P}{Q}$. From the demand function in a) the slope =
-5. At the point (Q=26, P=320), $\epsilon_p = \frac{1}{|-5|}\frac{320}{26} \approx 2.46$. At the point (Q=22, P=340),
$\epsilon_p = \frac{1}{|-5|}\frac{340}{32} \approx 3.09$.

e. Price elasticity of supply $\eta_p = \frac{1}{|slope|}\frac{P}{Q}$. From the supply function in b) the slope = 10.
At the point (Q=25, P=320), $\eta_p = \frac{1}{|10|}\frac{320}{25} = 1.28$. At the point (Q=27, P=340), $\eta_p = \frac{1}{|10|}\frac{340}{27} \approx 1.26$.

f. Suppose at (Q, P) the price elasticity equals 1: $\epsilon_p = \frac{1}{|slope|}\frac{P}{Q} = \frac{1}{5}\frac{P}{Q} = 1 \Leftrightarrow P = 5Q$.
But from the demand function: $P = -5Q + 450$. So we have $5Q = -5Q + 450 \Leftrightarrow 10Q = 450 \Leftrightarrow Q = 45$. $P = 5Q = 5 * 45 = 225$. So at the point (Q=45, P=225), the price elasticity of demand is equal to 1.

g. Because the tax is on the producer, the demand curve doesn't change but the supply curve shift up by $10 (See the figure in the last page.). That is, at each quantity level, the after-tax price must be $10 higher than the original price. So the new supply function is $P = 10Q_s + 70 + 10 = 10Q_s + 80$. Then using the new supply function and the original demand function we can calculate the new equilibrium (point G_2). In equilibrium $Q_d = Q_s \equiv Q$. So $P = 10Q_s + 80 = -5Q_d + 450 \Leftrightarrow 10Q + 80 = -5Q + 450 \Leftrightarrow 15Q = 370 \Leftrightarrow Q = \frac{370}{15} \approx 24.7$. $P = 10Q + 80 = \frac{370}{15}10 + 80 \approx 327$.
Total tax collected = $10 * 24.7 = 247$.
Tax that falls on consumer = area of the rectangle a = $(327 - 323) * 24.7 = 98.8$.
Tax that falls on producer = area of the rectangle b=[10-(327-323)]*24.7=148.2.

8. (Problem 13 of Ch.5) A price change causes the quantity demanded of a good to decrease by 30 percent, while the total revenue of that good increases by 15 percent. Is the demand curve elastic or inelastic? Explain.
We actually don't need any calculation to answer this question. Obviously here the price change is a price increase. When the price increases, the quantity drops because the two have a negative relationship. Whether the revenue goes up or down depends on how much the quantity drops. If the quantity drops more than the increase in the price, in another word, if the demand is elastic, the revenue will be lower. If the demand is inelastic so that the quantity drops not as much as the increase in the price, then the revenue will increase. Here because the revenue increases, so the drop in quantity is less than the increase in the price, so the demand is inelastic.

9. (Problem 12 of Ch.5) Explain why the following might be true: A drought around the world raises the total revenue that farmers receive from the sale of grain, but a drought only in Alberta reduces the total revenue that Alberta farmers receive.

A drought around the world decreases the supply and thus increases the market price (equilibrium price). If the price elasticity of demand is inelastic, the drop in the quantity is lower than the increase in the price, and thus the total revenue increases.
Instead a drought only in Alberta does not change the price (Assume the market is global and the shortage in the supply of Alberta is filled by other producers.). For Alterta farmers, only the quantity supplied is lower, therefore their total revenue is lower.

10. (Problem 8 of Ch.5) Consider public policy aimed at smoking.

a. Studies indicate that the price elasticity of demand for cigarettes is about 0.4. If a pack of cigarettes currently costs $10 and the government wants to reduce smoking by 20 percent, by how much should it increase the price?

b. If the government permanently increases the price of cigarettes, will the policy have a greater effect on smoking one year from now or five years from now?

c. Studies also find that teenagers have a higher price elasticity than do adults. Why might this be true?

a. $\epsilon_p = \dfrac{percentage\ change\ in\ Q}{percentage\ change\ in\ P} = 0.4 \Leftrightarrow percentage\ change\ in\ P =$
$\dfrac{percentage\ change\ in\ q}{0.4} = \dfrac{20}{0.4} = 50$. The government needs to increase the price by 50%. So the new price will be 10*(1+.5)=15.

b. The policy will have a larger effect five years from now than it does one year from now. The elasticity is larger in the long run, since it may take some time for people to reduce their cigarette usage. The habit of smoking is hard to break in the short run.

c. Since teenagers don't have as much income as adults, they are likely to have a higher price elasticity of demand. Also, adults are more likely to be addicted to cigarettes, making it more difficult to reduce their quantity demanded in response to a higher price.

Fixed Amount Tax on Producer: t=$10 per unit

P

S2

P=10Q+80

$10

S1

P=10Q+70

327

G_2

a

323

G_1

b

P2-10

P=-5Q+450

D

24.7   25.3   Q