Finance 30210
Problem Set #1 Solutions

1) Consider two individuals- Lisa and Mitch. We have the following information about each person's productivity:

Task	**Lisa**	**Mitch**
Ironing Clothes	4 hours	5 hours
Washing Clothes	3 hours	6 hours

a) Calculate Lisa's opportunity cost of ironing clothes and washing clothes

Lisa takes 4 hours to iron a load of clothes. In that time, she could've washed 4/3 (1 1/3) loads. Therefore, the opportunity cost of an ironed load is 4/3 of a washed load.

The opportunity cost of washing is the inverse (1 washed load = ¾ ironed load)

b) Calculate Mitch's opportunity cost of ironing and washing clothes

By similar reasoning as above,

Opportunity cost of ironing is 5/6 of a washed load
Opportunity cost of ironing is 6/5 of a washed load

c) Who has the comparative advantage in ironing?

In Ironing, Mitch has a comparative advantage (lower opportunity cost). Likewise, Lisa has a comparative advantage in Washing.

2) Suppose that we have the following price data

Year	**Price of Gasoline**	**Price of Soda**
1987	$.89 per gallon	$.35 per 16 oz. bottle
2005	$ 2.39 per gallon	$1.49 per 6 oz. bottle

a) Calculate the percentage change in the price of each good.

Gasoline: $\frac{\$2.39-.89}{.89}=1.69\ (169\%)$

Soda: $\frac{\$1.49-.35}{.35}=3.25\ (325\%)$

b) Calculate the percentage change in the *relative* price of gasoline in terms of soda.

Year	**Relative Price of Gasoline**
1987	\$.89 / .35 = 2.54
2005	\$ 2.39 /1.49 = 1.60

$$\frac{1.60-2.54}{2.54} = -.37 \text{ (-37\%)}$$

c) Why do we only worry about relative prices in economics?

Relative prices remove the impact of inflation.

3) Suppose that we have the following information about wheat production:

Producer	Capacity	Cost per bushel
1	100	\$3
2	300	\$4
3	200	\$5
4	400	\$6

Further, we also have some consumer information:

Consumer	Reservation Price	Wheat Purchases
1	\$2	50
2	\$3	40
3	\$4	20
4	\$5	40
5	\$6	30
6	\$7	30

a) Sketch out the demand/supply for wheat

Price	Supply
\$3	0 -100
\$4	**100 - 400**
\$5	400 -600
\$6	600 -1000

Price	Demand
\$2	160 -210
\$3	120 -160
\$4	**100 -120**
\$5	60 -100

$6	30 -60
$7	0 -30

b) Calculate the equilibrium price/quantity of wheat

Price = $4 Quantity = 120

c) Calculate the profits of the wheat producers

Producer #1: ($4 - $3)(100) = $100
Producer #2: ($4 - $4)(20) = $0

4) Explain how each of the following events would influence market prices/quantities

a) The surgeon general announces that eating oranges lowers the risk of a heart attack (market for oranges)

Demand for oranges increases – price and quantity rises

b) Terrorists destroy a major oil pipeline in Iraq (market for oil)

The supply of oil falls – price rises quantity falls

c) Immigration increases in the US by 20% (market for labor – what's the price here?)

Supply of labor increases, wages fall employment rises

d) Consumers start getting their news from the internet (market for newspapers)

Demand for newspapers falls, price of newspaper falls, sales fall

e) Real income in the US increases (the market for BMW's)

Demand for BMW's rises, price rises sales rise

5) Suppose that you have the following demand and supply curve for rental cars:

$$Q_d = 500 - 2P$$
$$Q_s = 100 + 6P$$

a) Solve for the equilibrium price and quantity.

Set demand equal to supply

$$500 - 2P = 100 + 6P$$
$$400 = 8P$$
$$P = 50$$
$$Q = 400$$

b) Calculate consumer expenditures on rental cars

Expenditures = Price(Quantity) = $50(400) = $20,000

6) Suppose that you have the following demand curve:

$$Q_d = 150 - 3P + .001I$$

Where I represents average income and P is the market price.

a) Suppose that average income equals $30,000. Calculate quantity demanded at a market price of $20.

$$Q_d = 150 - 3(\$20) + .001(30{,}000) = 120$$

b) Calculate the price elasticity of demand at a market price of $20 and average income equal to $30,000.

There are a couple ways, we could calculate this elasticity. One way would involve finding a second point on the demand curve. That is, keep income equal to $30,000, but raise price to, say, $22 (an increase of 10%). At a price of $22, demand is equal to

$$Q_d = 150 - 3(\$22) + .001(30{,}000) = 114$$

A drop from 120 to 114 represents a 5% drop in demand.

$$\%\Delta Q = \left(\frac{114 - 120}{120}\right) * 100 = -5\%$$

Now, we can calculate elasticity:

$$\varepsilon = \frac{\%\Delta Q}{\%\Delta P} = \frac{-5}{10} = -.5$$

Alternatively, we could start with a little rearrangement of the elasticity formula:

$$\varepsilon = \frac{\%\Delta Q}{\%\Delta P} = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right)$$

The expression in the first set of brackets represents the change in demand per dollar change in price. Given the demand curve, this will be -3. The expression in the second set of brackets is the price/quantity combination at which we are evaluating the elasticity (here, price equals $20 and quantity is 120).

$$\varepsilon = \frac{\%\Delta Q}{\%\Delta P} = \left(\frac{\Delta Q}{\Delta P}\right)\left(\frac{P}{Q}\right) = -3\left(\frac{20}{120}\right) = -.5$$

c) Calculate the income elasticity of demand at a market price of $20 and income equal to $30,000.

Just as in (b), we can calculate this by either finding a second point on the demand curve (holding price constant and changing income).

Suppose that income increases by 10% to $33,000.

$$Q_d = 150 - 3(\$20) + .001(33{,}000) = 123$$

A rise from 120 to 123 represents a 2.5% increase.

$$\%\Delta Q = \left(\frac{123-120}{120}\right)*100 = 2.5\%$$

Therefore, elasticity is calculated as follows:

$$\varepsilon_I = \frac{\%\Delta Q}{\%\Delta I} = \frac{2.5}{10} = .25$$

Or, again, we could use the demand curve.

$$\varepsilon_I = \frac{\%\Delta Q}{\%\Delta I} = \left(\frac{\Delta Q}{\Delta I}\right)\left(\frac{I}{Q}\right)$$

From the demand equation, we get that the change in demand is .001 per dollar change in income. The point at which we are evaluating the elasticity is income equal to $30,000 and quantity equal to 120.

$$\varepsilon_I = \frac{\%\Delta Q}{\%\Delta I} = \left(\frac{\Delta Q}{\Delta I}\right)\left(\frac{I}{Q}\right) = .001\left(\frac{30{,}000}{120}\right) = .25$$

d) If income equals $30,000. Calculate the price at which demand falls to zero.

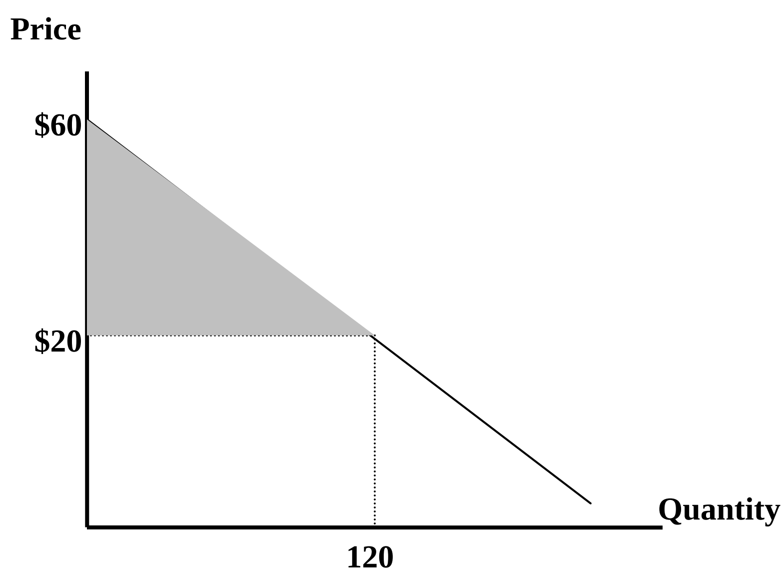
Plug in $30,000 for income and set Quantity equal to zero:

$$Q_d = 150 - 3P + .001[30,000] = 180 - 3P = 0$$

Solving for price, we get P = $60.

e) Using your answer to (d), calculate consumer surplus.

Its easiest to visualize this by plotting out the demand curve.



Recall that consumer surplus is equal to the difference between what someone was willing to pay (a point on the demand curve) and what they actually paid (the market price) added up over all sales. This total surplus, will be the shaded area. Recall that the area of a triangle is one half base times height, or,

Consumer surplus = ½(120)(60-20) = $2400