Economics for International Affairs

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EXERCISE # 1 - SOLUTIONS

I. Definitions

Provide brief (one sentence) definitions of the following:

(1) Exchange A transaction of goods and services between people that are reciprocal, voluntary and transparent.

(2) **Opportunity cost** the opportunity cost of something is the value of the next-best thing foregone to acquire it.

(3) **Specialization** the re-direction of a person's or country's energies and resources to the production of a particular good.

(4) **Market** : the 'place' (real or abstract) where exchange of goods & services happens

(5) **Demand**: the quantity of a good which consumers are willing and able to buy at a particular price.

(6) **Supply**: quantity of a good producers are willing to produce and sell at a particular price.

(7) **The Law of Markets** (or Law of Supply & Demand or Law of Price): the rule governing price-adjustment in a market, i.e. the price of a good rises when that good is in excess demand and falls when that good is in excess supply.

(8) **Price floor** : a legal minimum, below which the price charged for a good is not permitted by the government to fall.

(9) **Price ceiling**: legal maximum, above which the price charged for a good is not permitted by the government to exceed

(10) **The Theory of Comparative Advantage** Mutual gains can always be made from trade if people or nations specialize in the good in which they have a lower opportunity cost in producing.

Part II -<u>Comparative Advantage</u>

(Q. 1) Suppose a pound of coffee can be produced with four hours of labor in Kenya and six hours of labor in Zimbabwe. A pound of tea can be produced with three hours of labor in Kenya and three hours of labor in Zimbabwe.

(a) In the absence of trade, what is the opportunity cost of (i) a pound of Kenyan coffee (ii) a pound of Zimbabwean coffee; (iii) a pound of Kenyan tea; (iv) a pound of Zimbabwean tea.

Kenya: 1 coffee = 1.33 tea foregone.
Zimbabwe: 1 coffee = 2 tea foregone.
Kenya: 1 tea = 0.75 coffee foregone.
Zimbabwe: 1 tea = 0.5 coffee foregone.

(b) Which country is more efficient in absolute terms?

In absolute terms, Kenya is more efficient at producing both goods.

(c) Which country has the comparative advantage in the production of each good? Who should specialize in what?

In comparative terms, Kenya is more efficient at producing coffee (less tea foregone) and Zimbabwe at producing tea (less coffee foregone).

[Note: A problem some of you had when figuring out comparative advantage is that after computing opportunity costs, you mixed the price of a good with the good itself. e.g. you wrote Kenya 1 lb coffee = 1.33 tea and Zimbabwe 1lb coffee = 2 tea, and then just looked at the lower number (1.33 in this case), saw the word "tea" beside it and then said "Kenya should specialize in tea" -- forgetting that 1.33 & 2 is the price of a pound of *coffee*, not tea. Tea is merely the *measure* of the price of coffee. It's not the tea that is cheaper in Kenya, it's the *coffee* that is cheaper. As a rule of thumb, to avoid confusion, it is advisable to write 1 lb coffee = 1.33 tea *foregone*, so as to remind yourself of what's what when looking back.]

(Q.2) Consider two countries, India and Pakistan. In India, the average worker can produce 18 shirts or 12 jackets in a week. In Pakistan, the average worker can produce 30 shirts or 24 jackets in a week.

(a) In the absence of trade, what is the opportunity cost of (i) an Indian shirt (ii) a Pakistani shirt; (iii) an Indian jacket; (iv) a Pakistani jacket?

India: 1 shirt = 0.67 jackets foregone.
Pakistan: 1 shirt = 0.8 jackets foregone
India: 1 jacket = 1.5 shirts foregone

Pakistan: 1 jacket = 1.25 shirts foregone.

(b) Which country is more efficient in absolute terms? Which country has the comparative advantage in the production of each good?

Pakistan more efficient in both goods.
India has a comparative advantage in shirts (less jackets foregone)
Pakistan has a comparative advantage in jackets (less shirts foregone)

(c) Suppose trade is opened up between India and Pakistan. Assuming only those two countries exist, give an example of a price (i.e. exchange ratio of shirts to jackets) you might expect to see on the world market. Give an example of a market price you are *not* likely to see on the world market.

One Pakistani jacket should exchange anywhere from 1.25 to 1.5 Indian shirts. For example, 1.4 shirts per jacket.

You are unlikely to see prices above 1.5 or below 1.25. e.g. you are *not* going to see 1 Indian shirt trading for 1 Pakistani jacket (at that price, Indian shirts would cost too much for Pakistanis; they could produce shirts themselves at lower cost), *nor* 2 Indian shirts for 1 Pakistani jacket.(Pakistani jackets cost too much for Indians; they could produce jackets themselves at lower cost).

(d) How would the situation change if the average Pakistani worker could produce 35 shirts per week (everything else remaining the same)? Does comparative advantage change?

In this case, in Pakistan 1 jacket = 1.46 shirts. As the Indian opportunity cost remains the same (1 jacket = 1.5 shirts), then Pakistan still has a comparative advantage in making jackets (and thus India in making shirts). Comparative advantage does not change, but the gains from trading would be smaller.

(e) How would the situation change if the average Pakistani worker could produce 40 shirts per week (everything else remaining the same)? Does comparative advantage change?

In this case, in Pakistan 1 jacket = 1.67 shirts foregone, which is higher than the Indian opportunity cost of a jacket (1.5 shirts foregone). Comparative advantage is reversed! So Pakistan should *switch* its specialization and start making shirts and India make jackets.

(Double check: Pakistan 1 shirt = 0.6 jackets foregone, while in India, 1 shirt = 0.67 jackets foregone, so Pakistan has a smaller opportunity cost in making shirts.)

(Q.3) A car can be produced by 15 workers in Alabama and 10 workers in California. A truck can be produced by 25 workers in Alabama and 20 workers in California.

(a) If inter-state commerce is forbidden, what are the domestic price ratios, i.e. the prices in Alabama? In California? Which state has the comparative advantage in the production of which good?

The domestic price ratios are just the opportunity costs. Calculating:

Alabama: opp. cost of 1 car = 0.6 trucks foregone
California: opp. cost of 1 car = 0.5 trucks foregone
Alabama: opp. cost of 1 truck = 1.67 cars foregone
California: opp. cost of 1 truck = 2 cars foregone

So, as California has the lower opp. cost in cars & Alabama the lowest opp. cost in trucks, then California has a comparative advantage in cars & Alabama a comparative advantage in trucks.

(b) Congress passes a law allowing commerce between the states of Alabama and California. Frenzied exchange proceeds. Who is exporting what to whom? Give an example of a possible market price (i.e. cars per truck) you might see.

California should be exporting cars to Alabama and importing trucks from them. The price ratio should be anywhere between 1.67 cars per truck to 2 cars per truck. (e.g. 1.75 Californian cars per Alabamian truck.)

(c) After trade is opened and a lot of exchange happens, you notice that the average truck in *both* California and Alabama sells for $28,000, while the price of a car in *both* California and Alabama is $14,000. Who is reaping the gains from inter-state trade? Explain your answer.

The prices given are truck = $28,000, car = $14, 000. You should see immediately that means you can buy two cars for the price of one truck. i.e. if you had $28,000 in cash, you can buy either one truck or two cars.

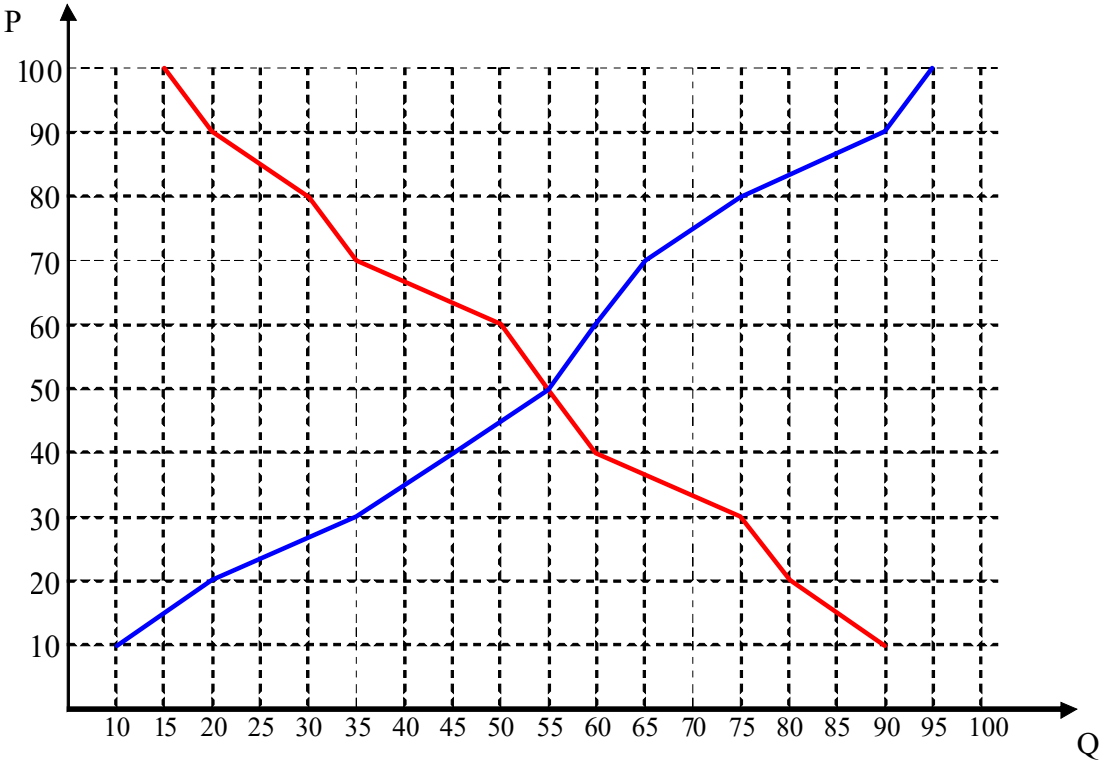
That implies that the interstate exchange ratio, the market price across the states, is precisely two cars for one truck. That happens to be the domestic price ratio in California. The implication is that California is indifferent between importing trucks from Alabama or making trucks themselves, i.e. California is making *no gains* from trading with Alabama.

But Alabama is gaining. Before trade, Alabama used to only be able to get 1.67 cars for every truck it sacrificed. After trade, it can get at least 2 cars for every truck it sacrifices (i.e. for every truck it produces & exports to California).

Part III - <u>Supply & Demand</u>

(Q. 4) The Single Market. Plot the following in the graph below (or on a side-sheet, if you find it easier):

Barley Price per bushel	Demand for Barley (millions of bushels)	Supply of Bushels (millions of bushels)
$100	15	95
$90	20	90
$80	30	75
$70	35	65
$60	50	60
$50	55	55
$40	60	45
$30	75	35
$20	80	20
$10	90	10



Oil Market

(A) If the price of barley is $60, are we in a situation of market-clearing, excess demand or excess supply? By how much is the excess, if any? What do you expect to happen to the price of barley?

At $60, demand is 50 and supply is 60, meaning there is an *excess supply* of 10 bushels. We expect the price of barley to go down.

(B) If the price of barley is $50, are we in a situation of market-clearing, excess demand or excess supply? By how much is the excess, if any? What do you expect to happen to the price of barley?

At $50, demand is 55 and supply is 55. We are in a market-clearing situation. There is no excess, we expect the price of barley to stay put.

(C) If the price of barley is $40, are we in a situation of market-clearing, excess demand or excess supply? By how much is the excess, if any? What do you expect to happen to the price of barley?

At $40, demand is 60 and supply is 45, meaning there is an *excess demand* of 15 bushels. We expect the price of barley to go up.

(D) At what price is the market going to settle at? How much barley will be bought and sold on the market then?

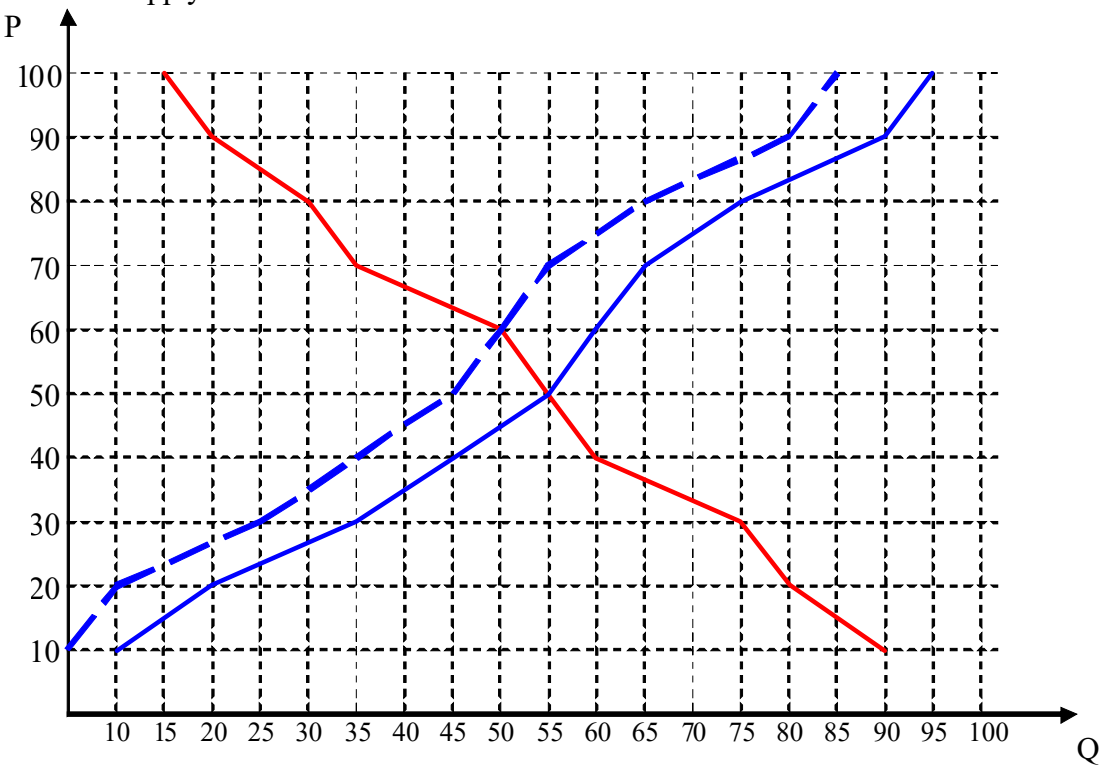
We expect price to settle at the market-clearing price, $50. The quantity exchanged on the market will be 55 bushels.

(E) Suppose a spell of bad weather damages the yield of the barley crop. As a result, the amount supplied at each price is 10 bushels less than normal, so the new supply schedule for barley becomes:

Barley Price per bushel	Supply of Bushels (millions of bushels)
$100	85
$90	80
$80	65
$70	55
$60	50
$50	45
$40	35
$30	25
$20	10
$10	0

(i) Plot the new supply schedule beside the old one (or do it on a separate graph, if you prefer).

The new supply curve will be the dotted one below:



Oil Market

(ii) At what price will the market settle now? How much barley will be bought and sold?

With the new supply schedule, notice that the market-clearing price becomes $60, where the quantity demand and exchange is 50 bushels.

(Q.5) Price Stabilization Scheme

Consider the coffee market a certain unnamed country:

Coffee Price per ton	Demand for Coffee (thousands of tons)	Supply of Coffee (thousands of tons)
$16	10	65
$14	15	55
$12	20	42
$10	30	30
$8	40	24
$6	60	16

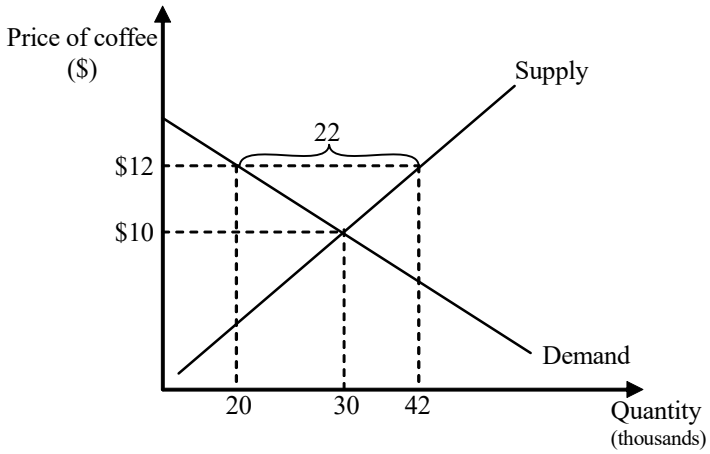
(A) What is market price for coffee? What is the quantity bought & sold?

This is not so hard to figure out. The price will be $10 and quantity exchanged will be 30k.

(B) Facing pressure from coffee growers, the government decides the free market price for coffee is too low for growers to make a living. Suppose the government imposes a binding price floor on the coffee market that is $2 higher than the market price. What is the effect of this policy on the price of coffee and the quantity of coffee sold? Is there a shortage or surplus of coffee? By how much?

If free market price is $10, then the binding price floor is at $12. As the price floor is above the equilibrium price, that means it is binding, that is, the market price will be the floor price.

As a result, at the price of $12, quantity demanded is 20k and quantity supplied is 42k, leaving an excess supply of 22k. Diagrammatically:



(C) Coffee growers complain that the price floor has reduced their revenues and they are *worse* off. Is this possible? Is demand for coffee elastic or inelastic? (Note: revenues = price × quantity sold.)

Of course it is possible. As price rises, the quantity demanded (and thus sales) declines. If the decrease in sales is greater than the rise in price, then revenues should fall.

Coffee revenues at \$10 were \$10 × 30 = \$300.
Coffee revenues at \$12 were \$12 × 20 = \$240.

So the price floor of \$12 actually *decreased* revenues to coffee farmers from \$300 to \$240.

This happens to be the case in our example, but it is not always the case. It is theoretically possible for demand to fall less than price rose, e.g. if demand fell only by a small amount, from 30 to 27 for example, then revenues would be \$12 × 27 = \$324, which would be an increase in revenue.

Whether revenues rise or falls depends on the degree of *elasticity* of demand. Remember, a good is called *elastic* if a rise in price decreases demand more than proportionally. It is called inelastic if a rise in price decreases demand less than proportionally. In our case, demand fell from 30 to 20 (fell by one third), while prices rose from \$10 to \$12 (rose by a quarter). So it is an *elastic* good.

(our second example, when quantity fell from 30 to 27, quantity fell only by a tenth, while price rose by a quarter. In this case, it is *inelastic*. So it is always the rule that for elastic goods, a rise in price will decrease revenues, while for inelastic goods, a rise in price will increase revenues.)

(D) In response to farmers' complaints, the government agrees to purchase any and all surplus coffee at the price floor. Using the numbers used above, calculate how much the government will spend. Compared to the basic price floor, who benefits from this new policy? Who loses? Explain your answer.

This shouldn't be so difficult. At the price floor of \$12, there is an excess supply of 22k. The government has to buy that excess up.

Government spending on coffee = \$12 × 22 = \$264.

So the government will have to spend \$264k to buy up the excess. The evident winners of this policy are the farmers, who receive \$240 in income from coffee sales plus \$264 in income from the government surplus-purchasing program, for a whopping total of \$504. The big losers are, of course, consumers and taxpayers - they pay more for coffee, get less coffee *plus* will probably have to pay higher taxes to fund the surplus-purchasing program.

(E) What do you think the government should do with the surplus coffee it acquires? (There's no correct answer. Be imaginative. Propose the *least* economically harmful way to use it and defend your answer. Not looking for a thesis, just a few sentences.)

Unfortunately, there's no good answer here. A lot of you proposed giving the surplus away to, e.g. to the poor. But that is partly self-defeating. At least some of the poor previously purchased coffee, now they will not. As a result, demand for coffee declines *further* and thus the excess supply will be greater, forcing the government to buy up *more* surplus and end up with *more* coffee it doesn't know what to do with.

Giving it in aid abroad, as others proposed, has an disrupting effect on a global scale. Many poor countries are coffee producers. Dumping the coffee surpluses from our country on them (at basically near-zero cost) will leave *them* with huge excess supplies, and drive down market prices there (possibly destroying the viability of their coffee production sector). To prevent that, *their* governments may be forced to buy up the surpluses. So we're just shifting the problem around from one country to another. On a global scale, it is still inefficient.

There were also proposals to recycle the coffee surpluses into other materials, e.g. fertilizer. But that isn't any better. Instead of undermining the coffee market, now you're undermining the fertilizer market. People who previously purchased fertilizer from fertilizer manufacturers will switch to the cheap government-supplied coffee, and drive down fertilizer prices. Now fertilizer producers are in trouble and may beg for the government for a price-support scheme. Again, it is just shifting the problem around, from one sector to another.

The only way to prevent the coffee surpluses from having an disruptive economic effect is to prevent them from reaching the market. One possibility is storing the surpluses away in government-run warehouses and silos, perhaps leaving it there until those years when coffee harvest fails and the price of coffee rises above $12 (whereupon the government may release some of the surplus in some coffee price stabilization scheme).

But no one knows how long that will be. It could be many, many years (even decades) of storing and waiting. And so long as the harvest continues good enough, surpluses will be created year after year, each of which has to be bought and stored. And storage is not zero-cost. Government-run warehouses and silos cost taxpayer money to build & maintain.

It seems our predicament leaves us with the result that maybe the least deleterious way to get rid of the coffee surpluses is simply to destroy them. Burn them. Dump them in the ocean. It leaves markets viable and government at least saves money on storage costs. Of course throwing stuff away - waste- is not efficient, but it may very well be the least inefficient of all the proposals.

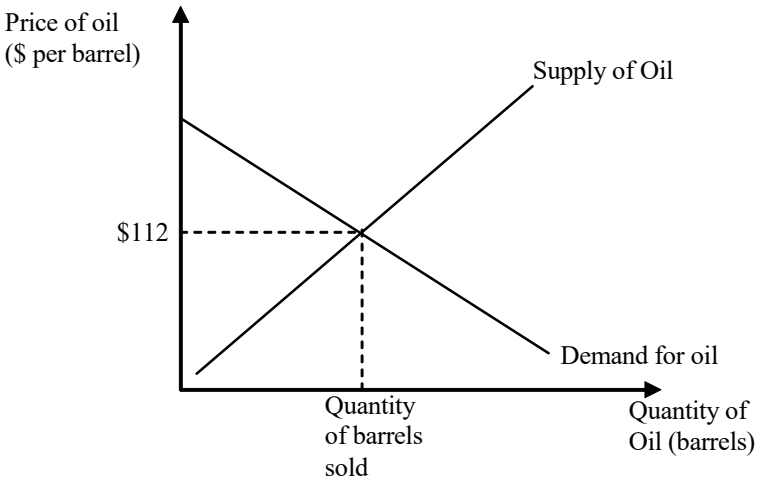
Of course, coffee-dumping makes for terribly embarrassing television. So one final possibility is for the government to pay coffee farmers *not to produce*. The government was going to spend $264k to buy up coffee surpluses it would have problems getting rid off. Why not just spend the $264k on farmers directly but get them *not* to produce the surplus?

Farmers get the income support they want and the government doesn't end up with huge coffee surpluses it can't get rid of. Most rich economies operate agricultural schemes of this sort.

(Q.6) <u>Oil Tales</u>

Consider the following events (i)-(x) in the table below. Decipher how the event will influence the world demand and supply of oil (shift left, shift right or no shift) and the resulting impact on the price of oil (up or down). Provide a brief (one-sentence) reasoning you used to deduce the effect. If the answer is not clear, say so.

To answer this question, I hoped you would have all drawn a demand-and-supply diagram to keep track of things. The diagram would look something like:



(using $112 as the Brent Crude price[1]).

The trick here is to identify only the most *direct* effect on consumers (demand) or producers (supply). Then intuitively using the diagram to detect the outcome on price.

[1] Side note on oil prices: there are only three types of oil openly available for public purchase:
* (1) Brent Crude (British North Sea oil, traded at the International Petroleum Exchange in London),
* (2) West Texas Intermediate (US Gulf Coast oil, traded at the New York Mercantile Exchange NYMEX),
* (3) Dubai Crude (Persian Gulf oil from UAE and Oman, traded in Dubai).
Oil from other sources (notably OPEC: Saudi Arabia, Kuwait, Iraq, Venezuela, Nigeria, etc.), are bought and sold by private contracts. OPEC compiles and publishes a selected index of private contract prices known as the "OPEC Basket" to gauge the average price of OPEC oil. Because oil buyers can move between different oil suppliers, all these prices tend to be pretty close to each other at all times, with only some slight differences due to quality and convenience of transport. 'Brent Crude', an average quality oil, is widely regarded as the benchmark. That means, when the press says "the" price of oil is X dollars per barrel, it is usually quoting the current spot price of Brent Crude.

Event	Demand Curve for oil shifts:	Supply curve for oil shifts:	Price of oil moves:
(i) Brazil discovers massive oil reserves off its coast.	No shift	Shift right	price falls
Discovery of new reserves of oil will mean a greater supply of oil. Supply shifts right. Price will fall.			
(ii) New electric-powered cars are a hit with US consumers.	Shift left	No shift	price falls
One of the biggest sources of demand for oil is the demand for gasoline. If consumers opt for electric-powered cars, the demand for gasoline and consequently the demand for oil drops. Price falls.			
(iii) Global recession reduces consumer incomes worldwide	Shift Left	No shift	price falls
Pretty much the most straightforward answer. If consumer incomes decline, that affects consumer demand directly. Demand declines and prices fall.			
(iv) Coal miners go on strike in Europe, supply of coal is reduced.	Shift right	No shift	price rises
Like natural gas, coal is a substitute for oil. If the price of coal rises because of European miner strikes, then consumers will demand more oil. The price of oil rises.			
(v) More efficient oil drilling equipment is introduced	No shift	Shift right	price falls
More efficient drilling means lowered costs for oil producers, and consequently they can increase production (open more wells, etc.). So, supply increases and prices fall.			
(vi) Libya builds solar panels throughout the Libyan desert, and begins exporting energy to the EU..	Shift left.	No shift	price falls
Solar power is an oil substitute for energy needs. Increased supply of solar energy will lower solar energy prices, drawing consumer demand away from oil. Prices fall			
(vii) Under pressure from unions, US oil companies agree to give oil workers on	No shift	shift left	price rises

the Gulf Coast large wage increases.			
If wages of US oil workers increase, that means increasing wage costs for US oil producers, and consequently they'll cut back production (can't afford to keep some oil platforms/refineries open, etc. with these higher wage costs). Thus supply falls and prices rise. Some of you suggested that richer oil workers may mean more demand for oil. Perhaps. But oil workers are only a tiny segment of the population and they consume other things as well. So, while there may be a small effect from that, it is not the most obvious and direct one. The direct and more obvious one is the impact on oil production costs.			
(viii) Nuclear reactors are built in Kazakhstan to meet the energy needs of several Central Asian countries.	Shift left.	No shift.	price falls
Nuclear power is a substitute for oil in the production of energy. Increased supply of nuclear energy will lower nuclear energy prices and thus draw consumer demand away from oil. Prices fall.			
(ix) War breaks out between Bahrain and Qatar	No shift	Shift left	price rises
War in the Persian Gulf almost inevitably endangers shipping lanes of oil tankers which frequent the area, thus interrupting supply and raising the price.			
(x) An unexpectedly nasty hurricane season in the Caribbean immobilizes natural gas platforms (not oil) throughout the summer.	Shift right	No shift	price rises
This event in another market (natural gas) affects oil via the substitution effect. Hurricane damage will lower the supply and thus raise the price of natural gas. If the price of natural gas rises, consumers will likely switch away from gas and towards oil for their energy needs. That will raise the demand for oil and thus the price of oil. [I made a mistake here, in that although oil and natural gas are substitutes on the demand side, they are apparently produced together on the supply side, meaning it is practically impossible for production of natural gas to be affected but not production of oil).			

(Q.7) Supply & Demand Equations

What we can do with tables and diagrams, we can also do with supply & demand equations

Let us consider the market for wool.

Demand for wool is governed by the equation:

$$Q^d = -3P + 30$$

Supply for wool is government by the equation:

$$Q^s = 2P + 5$$

where Qd is the quantity demanded, Qs is quantity supplied and P is price.

(A) Fill in the following table:
(I filled in two of the entries myself, just so you can make sure you're on track)

Pretty straightforward. The equations are just "if...then" statements.

e.g. for quantity demanded, as $Q^d = -3P + 30$

if P = \$0, then $Q^d = -3(0) + 30 = 30$
if P = \$1, then $Q^d = -3(1) + 30 = -3 + 30 = 27$
if P = \$2, then $Q^d = -3(2) + 30 = -6 + 30 = 24$

and so on up the quantity demanded column.

Similarly, for quantity supplied, as $Q^s = 2P + 5$:

if P = \$0, then $Q^s = 2(0) + 5 = 5$
if P = \$1, then $Q^s = 2(1) + 5 = 2 + 5 = 7$
if P = \$2, then $Q^s = 2(2) + 5 = 4 + 5 = 9$

and so on for quantity supplied column.

Price	Quantity Demanded	Quantity Supplied
\$10	0	25
\$9	3	23
\$8	6	21
\$7	9	19
\$6	12	17
\$5	15	15

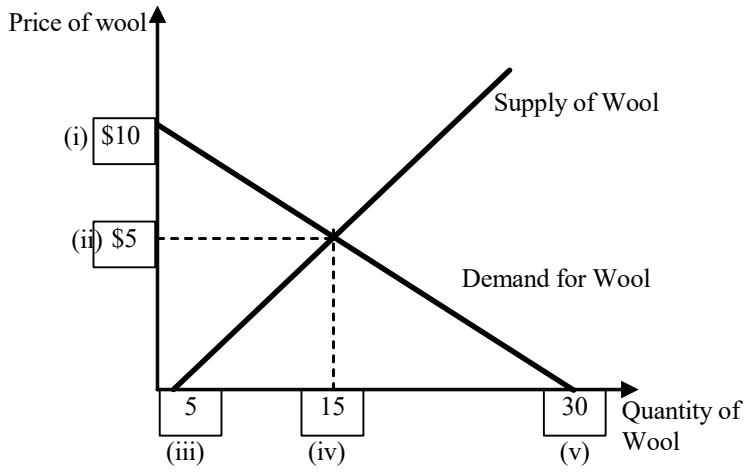
$4	18	13
$3	21	11
$2	24	9
$1	27	7
$0	30	5

(B) What is the market-clearing price? What is the market-clearing quantity bought & sold?

The market clearing price is the price where $Q^d = Q^s$. The only price for which this is true is \$5, where $Q^d = Q^s = 15$. So the quantity bought and sold is 15.

(C) Using your data from the table, fill in the values in the boxes (i) through (v) below (i.e. the values of the equilibrium price, quantity and the intercepts)

This is just a silly diagrammatic exercise using the table to decipher intercepts. Just to ensure your comfort level around interpreting the diagram.



(Q.8) Supply & Demand Equations (Algebra time!)

Why do we even need tables? Let's just use the equations directly.

(A) Consider the market for oranges.

Demand for oranges is governed by the equation:

$$Q^d = -3P + 60$$

Supply of oranges is government by the equation:

$$Q^s = 3P + 6$$

What is the market clearing price? What is the market clearing quantity?

Using direct algebra, as recommended. You know that at the market-clearing equilibrium, quantity demanded must be equal to quantity supplied, i.e.

$Q^d = Q^s$.

So just plug in the equations for Q^d and Q^s given above:

$-3P + 60 = 3P + 6$

so now we try to solve for P*. Bringing constants to one side and variable Ps to the other:

$60 - 6 = (3 + 3)P$

$54 = 6P$

So $P = 54/6 = 9$.

P = __9___

And that's your equilibrium price.

To find the equilibrium quantity, just plug in the variable P into either the Q^d or Q^s equation (doesn't matter which), e.g. let's use Q^s equation:

Q = 3 (plug your P here) + 6

Since P = 9, then:

$Q = 3(9) + 6 = 27 + 6 = 33$

Q = __33__

That's your equilibrium quantity. Simple wasn't it?

(B) Let's do it again! Suppose a unexpectedly sunny season boosts the harvest. The demand curve is as before:

$$Q^d = -3P + 60$$

But the supply curve is now governed by:

$$Q^s = 3P + 15$$

(notice the supply intercept has increased from 6 to 15)

What is the new market clearing price? What is the new market clearing quantity?

Solution: same technique as before. Set $Q^d = Q^s$, thus

$$-3P + 60 = 3P + 15$$

so putting constants to one side, variables to the other:

$$60 - 15 = (3+3)P$$

$$45 = 6P$$

$$P = 45/6 = \$7.5$$

And that's our price. To get quantity, let's use $Q^s = 3P + 15$

$$Q = 3(7.5) + 15 = 22.5 + 15 = 37.5$$

so with the increase in supply, the new equilibrium price is \$7.5 (lower than before) and quantity bought & sold is 37.5 (higher than before)