IB HIGHER LEVEL ECONOMICS

QUANTITATIVE ECONOMICS

THE COMPLETE TEACHING GUIDE

Prepared by IAN DORTON

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IAN DORTON & JOCELYN BLINK

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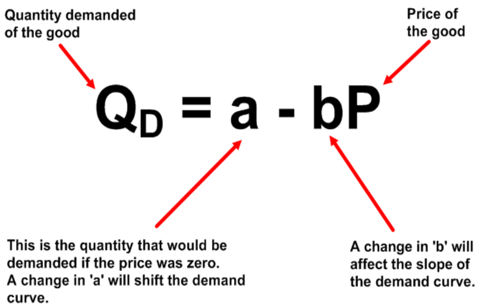
Topic 1 – Linear Demand and Supply Functions and Equilibrium

DEMAND FUNCTIONS

You need to be able to:

- Explain a demand function (equation) of the form Qd = a – bP.
- Plot a demand curve from a linear function (eg: Qd = 60 – 5P).
- Outline why, if the "a" term changes, there will be a shift of the demand curve.
- Outline why, if the "b" term changes, the slope of the demand curve will change.



Intercepts

The x-intercept: This is the point where the demand curve meets the x-axis. It is the quantity demanded where price equals zero. It is 'a'.

The y-intercept: This is the point where the demand curve meets the y-axis. It is the price at which quantity demanded becomes zero. All consumers have been driven out of the market.**(a divided by b!)**

How to plot / draw the demand curve from a demand function (Using the example $Q_D = 400 – 8P$)

Follow the steps:

1. Find the quantity demanded when the price is zero. This will be the 'a' value. In the example, it is 400 units. This gives one point on the demand curve, known as the x-intercept. In the example, it is the point (400,0), where 400 units are demanded at a price of $0.

2. Find the price where demand is zero. Make $Q_D = 0$ in the equation. In the example, we get 0 = 400 – 8P, and so by adding 8P to each side, we then get 8P = 400, and so P = 50. This gives a second point at the other end of the demand curve, known as the Y-intercept. In the example, it is the point (0,50), where 0 units are demanded at a price of $50. (**Or you can just divide a by b = 400/8 = 50!**)

3. So, you now have two points on the demand curve.

4. Draw your axes for the market on a piece of graph paper and insert values for price and quantity. (In IB exams, the axes will already have values on, but **not** labels.

5. Insert the two points that you have calculated. For our example, this is shown below left:

6. Label the axes and the demand curve. You have done it!

Now you have a go!

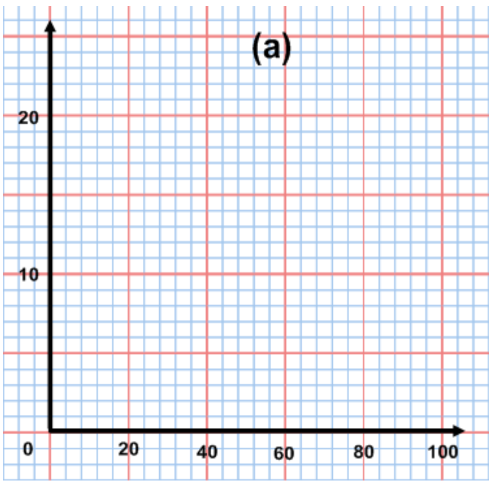
Question 1.1
On the axes below, plot the following linear demand functions:

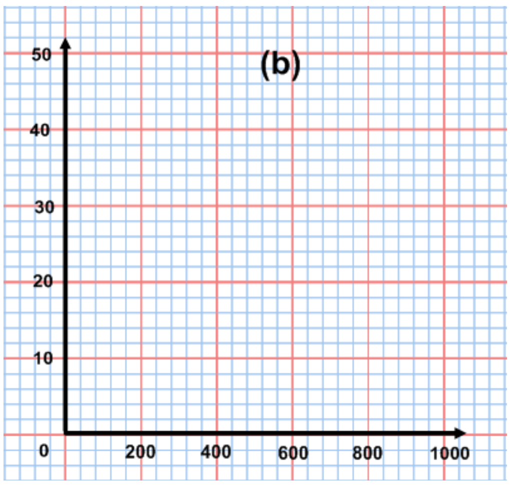
a. $Q_D = 100 - 4P$

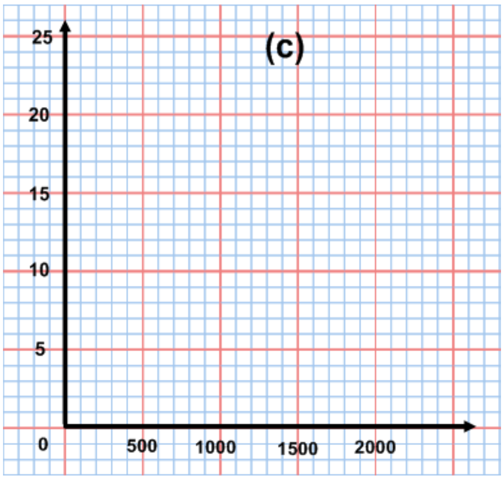
b. $Q_D = 1000 - 20P$

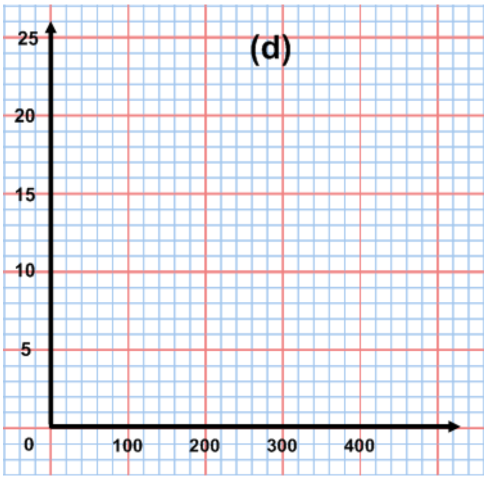
c. $Q_D = 1500 - 60P$

d. $Q_D = 280 - 14P$









Have you fully labelled the axes?

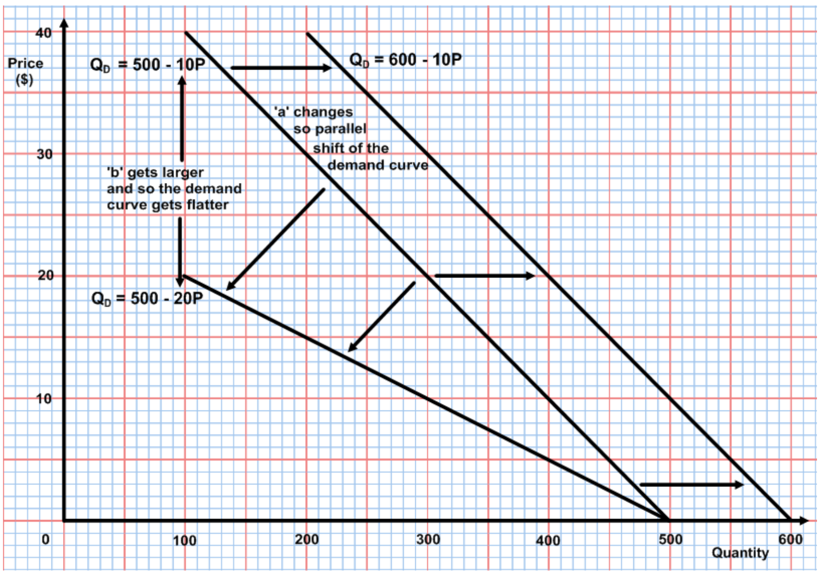
Explaining changes in “a” and “b”

If the value of ‘a’ in the demand function changes, then the demand curve shifts to the left or the right, parallel to the original curve.

If the demand curve shifts to the right, then it means that there has been a change in one of the non-price determinants of demand that has made the product more attractive to the consumer and so more is demanded at each price.

If the demand curve shifts to the left, then it means that there has been a change in one of the non-price determinants of demand that has made the product less attractive to the consumer and so less is demanded at each price.

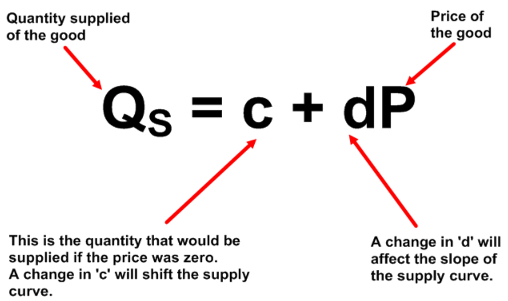
If the value of ‘b’ changes in the demand function, then the slope of the demand curve will change. The slope of the demand curve is ‘– b’. If ‘b’ gets smaller, then the slope of the curve gets steeper and if ‘b; gets bigger, the curve will be flatter.



SUPPLY FUNCTIONS

You need to be able to:

- Explain a supply function (equation) of the form Qs = c + dP.
- Plot a supply curve from a linear function (eg, Qs = –30 + 20 P).
- Outline why, if the “c” term changes, there will be a shift of the supply curve.
- Outline why, if the “d” term changes, the slope of the supply curve will change.



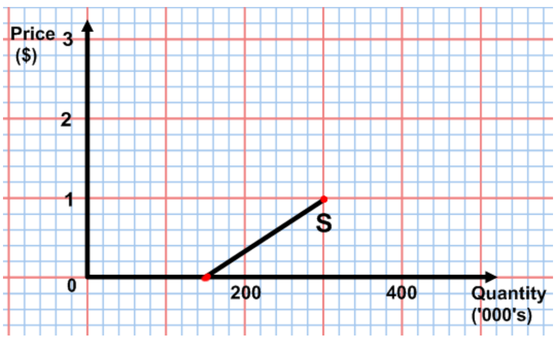
How to plot / draw the supply curve from a supply function
(Using the example $Q_S = 150 + 150P$)

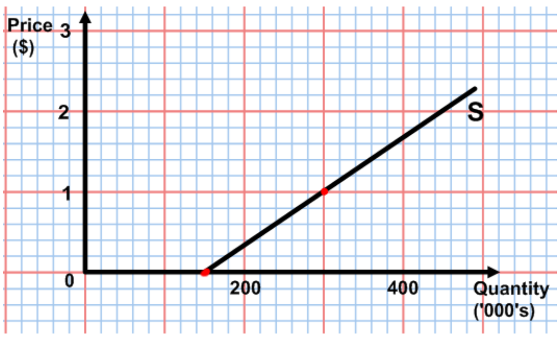
Follow the steps:

1. Find the quantity supplied when the price is zero. This will be the ‘c’ value. In the example, it is 150 units. This gives one point on the supply curve, known as the x-intercept. In this case, it is the point (150,0), where 150 units are supplied at a price of $0. (It might be a point with a negative quantity and a price of zero, if ‘c’ is negative.)

2. Choose a price above zero. (In IB questions, you will be given the range of price values that you are to consider, so you can choose one of the prices given.) Put it into the equation instead of P, in order to get a quantity supplied at that price. In the example, we could choose a price of $1. We get $Q_S = 150 + (150 \times 1) = 150 + 150 = 300$. So, you now have another point on the supply curve, in the example, it is (300,1).

3. Draw your axes for the market on a piece of graph paper and insert values for price and quantity. (In IB exams, the axes will already have values on, but **not** labels.
4. Insert the two points that you have calculated. For our example, this is shown below left:





5. Now extend the line upwards. For our example, this is shown above right.

6. Label the axes and the supply curve. You have done it!

Now you have a go!

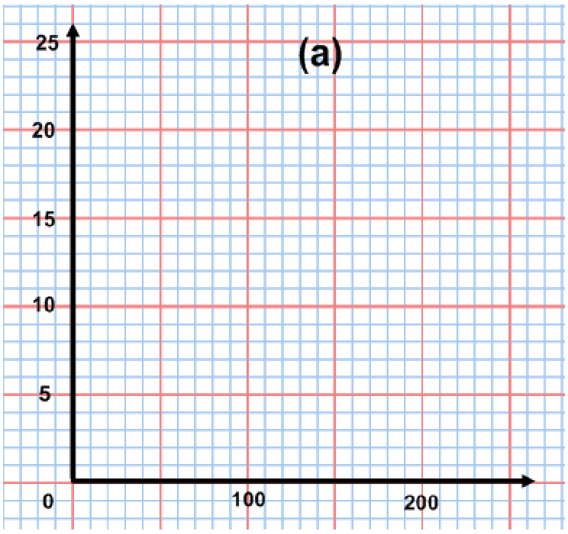
Question 1.2
On the axes below, plot the following linear supply functions:

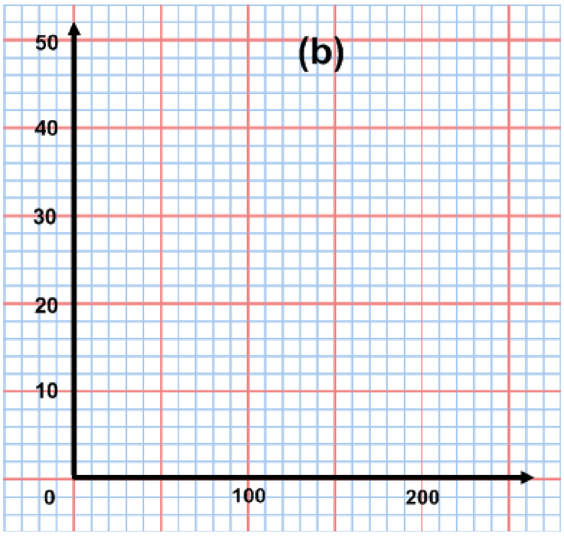
a. $Q_s = 20 + 4P$

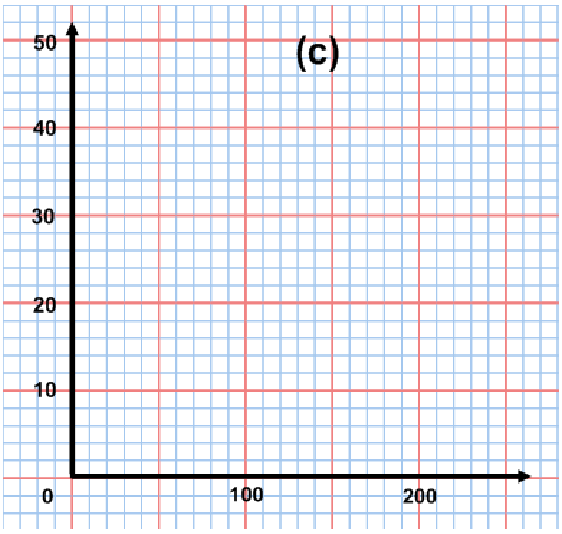
b. $Q_s = -20 + 4P$

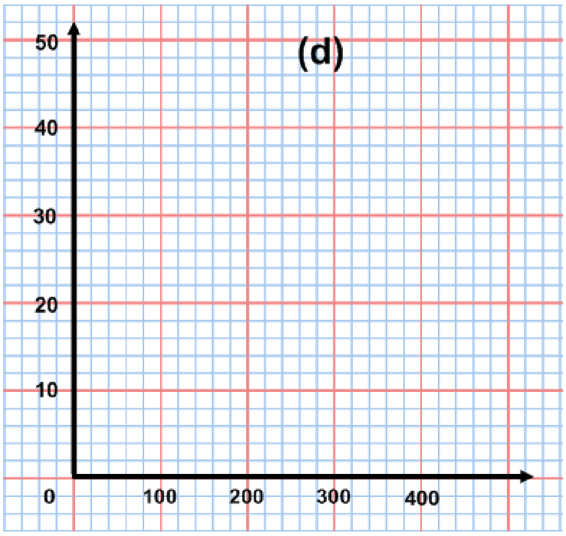
c. $Q_s = 4P$

d. $Q_s = 120 + 6P$









Have you fully labelled the axes?

EQUILIBRIUM PRICE AND QUANTITY

You need to be able to:

- Calculate the equilibrium price and equilibrium quantity from linear demand and supply functions.
- Plot demand and supply curves from linear functions, and identify the equilibrium price and equilibrium quantity.
- State the quantity of excess demand or excess supply in the above diagrams.

Calculating Equilibrium Price and Quantity

In order to do this, we need to find where $Q_D = Q_S$.

The steps are as follows:

1. Take the two functions that you are given and substitute Q_D and Q_S from them into an equilibrium equation.
   E.g. $Q_D = 200 – 4P$ and $Q_S = 4P$

   So: $200 – 4P = 4P$

2. Solve the equation for P and this gives the equilibrium price.
   E.g. $200 – 4P = 4P$
   $200 = 8P$
   $\frac{200}{8} = P$
   $25 = P$

3. Substitute P into either of the demand or supply functions and solve for Q.
   E.g. $Q_D = 200 – 4P$
   $Q_D = 200 – (4 \times 25)$
   $Q_D = 200 – 100$
   $Q_D = 100$

4. You can check this by solving for Q in the function that you did not use the first time.
   E.g. $Q_S = 4P$
   $Q_S = 4 \times 25$
   $Q_S = 100$

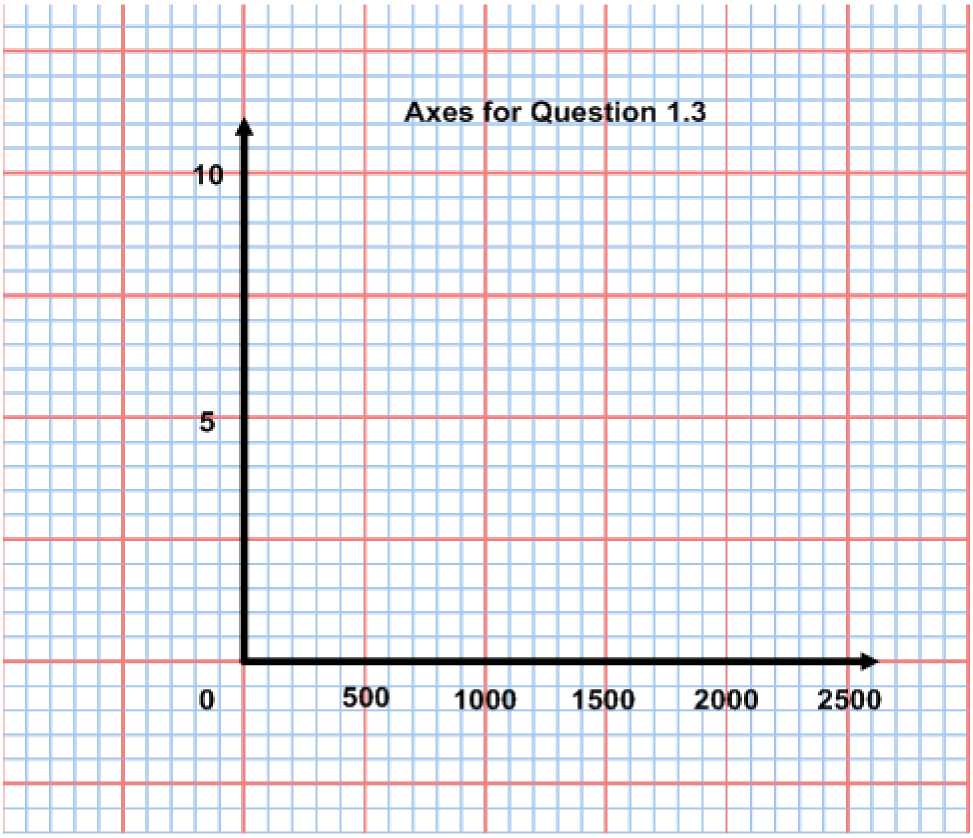
Now you have a go!

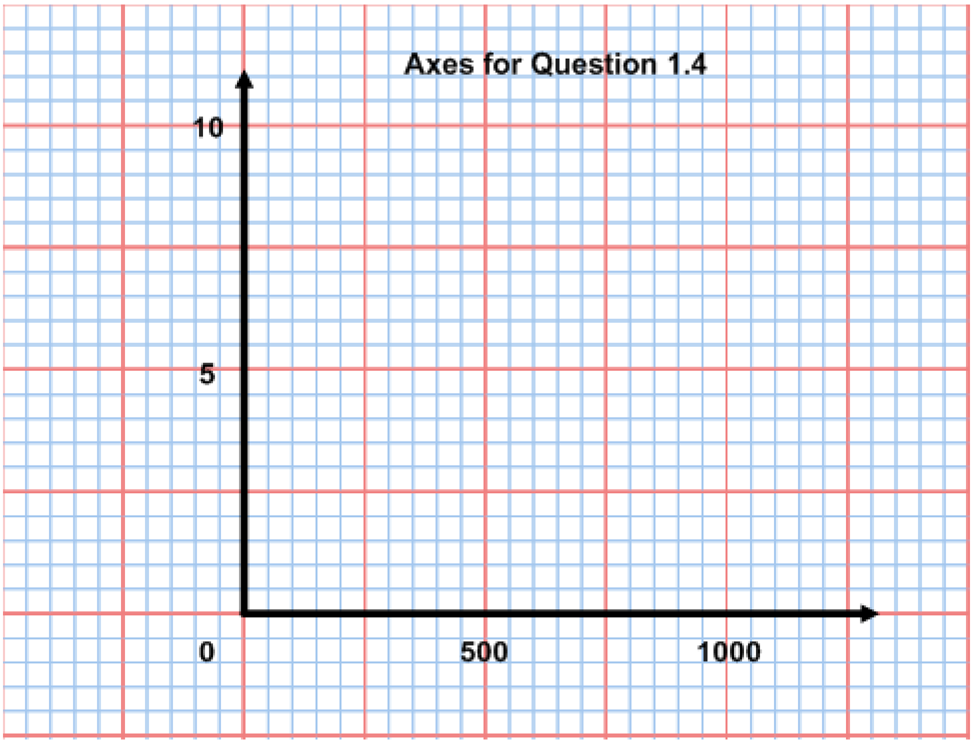
Question 1.3
In the market for toothpaste, the demand function is $Q_D = 2000 – 200P$ and the supply function is $Q_S = -400 + 400P$, where price is given in $ per tube of toothpaste and quantity is given in thousands of tubes of toothpaste per month. Calculate the equilibrium price and quantity.

Question 1.4
In the market for chocolate bars, the demand function is $Q_D = 900 – 100P$ and the supply function is $Q_S = 200P$, where price is given in $ per chocolate bar and quantity is given in thousands of chocolate bars per month. Calculate the equilibrium price and quantity.

Question 1.5

On the graphs below, plot the curves for questions 1.3 and 1.4 above and identify the equilibrium prices and quantities. Fully label the diagrams.





Calculating Excess Demand or Supply

You may be given demand and supply functions and a price that is not the equilibrium price. You may then be asked to calculate any excess demand or excess supply that exists.

The steps are as follows:

1. Take the price that is given and substitute it into the demand function.
   E.g. If the price suggested is $20 and the demand function is $Q_D = 200 – 4P$.

   Then at $20, $Q_D = 200 – (4 \times 20) = 200 – 80 = 120$.

2. Then take the price that is given and substitute it into the supply function.
   E.g. If the price suggested is $20 and the demand function is $Q_S = 4P$.

   Then at $20, $Q_S = 4 \times 20 = 80$.

3. See which one is larger and then explain what it is in terms of either excess demand or excess supply.
   E.g. In this case, at a price of $20, 120 units are demanded and 80 units are supplied and so there is an excess demand of 40 units.

Now you have a go!

Question 1.6
In the market for toothpaste, the demand function is $Q_D = 2000 – 200P$ and the supply function is $Q_S = -400 + 400P$, where price is given in $ per tube of toothpaste and quantity is given in thousands of tubes of toothpaste per month. Calculate the excess demand or supply at a price of $3 per tube.

Question 1.7
In the market for chocolate bars, the demand function is $Q_D = 900 – 100P$ and the supply function is $Q_S = 200P$, where price is given in $ per chocolate bar and quantity is given in thousands of chocolate bars per month. Calculate the excess demand or supply at a price of $4 per bar.

Topic 2 – Elasticities

Price Elasticity of Demand (PED)

You need to be able to:

- Calculate PED using the following equation.

$$PED = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ price}$$

- Calculate PED between two designated points on a demand curve using the PED equation above.

Calculating PED
Step 1
Calculate the percentage changes in price and quantity demanded.

The change in price is worked out by taking the original price away from the new price and then dividing that by the original price.

$$\%\ \Delta\ in\ Price = \frac{New\ Price - Old\ Price}{Old\ Price}\ x\ 100$$

The change in quantity demanded is worked out by taking the original quantity away from the new quantity and then dividing that by the original quantity.

$$\%\ \Delta\ in\ Quantity\ Demanded = \frac{New\ Quantity - Old\ Quantity}{Old\ Quantity}\ x\ 100$$

E.g. If the quantity demanded of white chocolate Easter eggs falls from 40,000 to 32,000 per year, when the price is increased from \$5 to \$5.50.

Then the percentage change in price is:

$$\%\ \Delta\ in\ Price = \frac{5.50 - 5.00}{5.00}\ x\ 100 = \frac{0.50}{5.00}\ x\ 100 = +10\%$$

and the percentage change in quantity demanded is:

$$\%\ \Delta\ in\ Quantity\ Demanded = \frac{32000 - 40000}{40000}\ x\ 100 = \frac{-8000}{40000} \times 100 = -20\%$$

Step 2
Divide the percentage change in quantity demanded by the percentage change in price, in order to get the value of the PED.

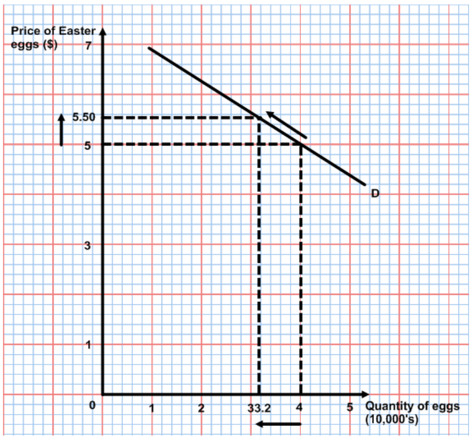
E.g. In the example above, $PED = \frac{-20\%}{+10\%} = -2$.

The negative value is usually ignored, but you could get a question that expresses PED as a negative value and, if you do, then you should do the same.

Calculating the PED between two points on a demand curve
This is really just the same as the above.

Step 1
Identify the price and quantity demanded associated with each point.

E.g. In the diagram below, price is $5.00 and quantity demanded is 40,000 eggs. Price rises to $5.50 and the quantity demanded falls to 32,000.



Step 2
Follow Steps 1 and 2 in the section above, ***"Calculating PED"***.

Now you have a go!

Question 2.1
Calculate the PED for the following changes:

a. If the price of a good increases by 16% and the quantity demanded falls by 10%.
b. If price increases from $7.00 to $7.70 and quantity demanded falls from 75 units to 60 units.
c. If price falls from $6.50 to $5.20 and quantity demanded increases from 1,200 to 1,260 units.

Question 2.2
Answer the following questions by using the formula for PED:

a. If the value of PED is 0.75 and the price of the product increases by 12%, what will the percentage fall in quantity demanded be?
b. If the value of PED is 1.25 and quantity demanded rises by 20%, when the price of a good is lowered, what was the percentage fall in the price of the good?

Question 2.3
Again, use the formula for PED, but also remember that total revenue is calculated by multiplying the quantity demanded by the price of the good.

a. A businesswoman is selling 400 units of her good per week at a price of $300 per unit. The PED for the good is 1.6. She decides to lower the price of the good by $15. What will be the effect of her decision to lower prices on her total revenue from sales?
b. A producer is making $400 per week selling a product at $20. The producer lowers the price of the good by $3 and sells 4 more units of the product. What is the PED of the product? What is the change in total revenue received from sales of the product?

Cross Elasticity of Demand (XED)

You need to be able to:

- Calculate XED using the following equation.

$$XED = \frac{percentage\ change\ in\ quantity\ demanded\ of\ good\ x}{percentage\ change\ in\ price\ of\ good\ y}$$

Calculating XED

Step 1

Calculate the percentage changes in price of one good and the quantity demanded of the other good.

The change in price is worked out by taking the original price of the first good away from the new price and then dividing that by the original price.

$$\%\,\Delta\ in\ Price\ of\ Good\ Y = \frac{New\ Price - Old\ Price}{Old\ Price}\ x\ 100$$

The change in quantity demanded is worked out by taking the original quantity of the second good away from the new quantity and then dividing that by the original quantity.

$$\%\,\Delta\ in\ Quantity\ Demanded\ of\ Good\ X = \frac{New\ Quantity - Old\ Quantity}{Old\ Quantity}\ x\ 100$$

E.g. If the quantity demanded of white chocolate Easter eggs falls from 40,000 to 32,000 per year, when the price of dark chocolate Easter eggs is reduced from $5 to $4.50.

Then the percentage change in price is:

$$\%\,\Delta\ in\ Price\ of\ Good\ Y = \frac{4.50 - 5.00}{5.00}\ x\ 100 = \frac{-0.50}{5.00}\ x\ 100 = -10\%$$

and the percentage change in quantity demanded is:

$$\%\,\Delta\ in\ Quantity\ Demanded\ of\ Good\ X = \frac{32000 - 40000}{40000}\ x\ 100 = \frac{-8000}{40000} \times 100 = -20\%$$

Step 2

Divide the percentage change in quantity demanded of the second good by the percentage change in price of the first good, in order to get the value of the XED.

E.g. In the example above, $PED = \frac{-20\%}{-10\%} = +2$.

The positive value means that the two goods in question are substitutes for each other. If a negative value is found, then the goods are complements. A value of zero would mean that the goods were unrelated.

Now you have a go!

Question 2.4

Calculate the XED for the following changes and state whether the goods are complements or substitutes:

a. If the price of a good increases by 16% and the quantity demanded of another good falls by 10%.
b. If the price of a good increases from $7.00 to $7.70 and quantity demanded of another good falls from 75 units to 60 units.
c. If the price of a good falls from $6.50 to $5.20 and quantity demanded of another good falls from 1,200 to 1,140 units.

Income Elasticity of Demand (YED)

You need to be able to:

- Calculate YED using the following equation.

$$YED = \frac{percentage\ change\ in\ quantity\ demanded}{percentage\ change\ in\ income}$$

Calculating YED

Step 1

Calculate the percentage changes in income and quantity demanded.

The change in income is worked out by taking the original income away from the new income and then dividing that by the original income.

$$\%\ \Delta\ in\ Income = \frac{New\ Income - Old\ Income}{Old\ Income}\ x\ 100$$

The change in quantity demanded is worked out by taking the original quantity away from the new quantity and then dividing that by the original quantity.

$$\%\ \Delta\ in\ Quantity\ Demanded = \frac{New\ Quantity - Old\ Quantity}{Old\ Quantity}\ x\ 100$$

E.g. If the quantity demanded of white chocolate Easter eggs increases from 40,000 to 48,000 per year, when per capita income increase from $30,000 to $33,000 per year.

Then the percentage change in income is:

$$\%\ \Delta\ in\ Income = \frac{33 - 30}{30}\ x\ 100 = \frac{3}{30}\ x\ 100 = +10\%$$

and the percentage change in quantity demanded is:

$$\%\ \Delta\ in\ Quantity\ Demanded = \frac{48000 - 40000}{40000}\ x\ 100 = \frac{8000}{40000} \times 100 = +20\%$$

Step 2

Divide the percentage change in quantity demanded by the percentage change in income, in order to get the value of the PED.

E.g. In the example above, $YED = \frac{+20\%}{+10\%} = 2$.

The positive value means that the good is a normal (or superior) good. A negative value would mean that the product was an inferior good, where demand fell as income increased

Now you have a go!

Question 2.5

Calculate the YED for the following changes and state whether the goods are superior or inferior:

a. If the annual per capita income in a country increases by 16% and the quantity demanded of a good falls by 10%.
b. If the annual per capita income in a country increases from $25,000 to $27,500 and quantity demanded of a good increases from 80 million units to 92 million units.
c. If the annual per capita income in a country increases from $25,000 to $26,250 and quantity demanded of a good decreases from 70 million units to 66.5 million units.

Price Elasticity of Supply (PES)

You need to be able to:

- Calculate PES using the following equation.

$$PES = \frac{percentage\ change\ in\ quantity\ supplied}{percentage\ change\ in\ price}$$

Calculating PES

Step 1

Calculate the percentage changes in price and quantity supplied.

The change in price is worked out by taking the original price away from the new price and then dividing that by the original price.

$$\%\ \Delta\ in\ Price = \frac{New\ Price - Old\ Price}{Old\ Price}\ x\ 100$$

The change in quantity supplied is worked out by taking the original quantity away from the new quantity and then dividing that by the original quantity.

$$\%\ \Delta\ in\ Quantity\ Supplied = \frac{New\ Quantity - Old\ Quantity}{Old\ Quantity}\ x\ 100$$

E.g. If the quantity supplied of white chocolate Easter eggs increases from 40,000 to 48,000 per year, when the price increases from $5 to $5.50:

Then the percentage change in price is:

$$\%\ \Delta\ in\ Price = \frac{5.50 - 5.00}{5.00}\ x\ 100 = \frac{0.50}{5.00}\ x\ 100 = +10\%$$

and the percentage change in quantity supplied is:

$$\%\ \Delta\ in\ Quantity\ Supplied = \frac{48000 - 40000}{40000}\ x\ 100 = \frac{8000}{40000} \times 100 = +20\%$$

Step 2

Divide the percentage change in quantity supplied by the percentage change in price, in order to get the value of the PES.

E.g. In the example above, $PES = \frac{+20\%}{+10\%} = +2$.

Now you have a go!

Question 2.6

Calculate the PES for the following changes:

a. If the price of a good increases by 16% and the quantity supplied increases by 10%.
b. If price increases from $7.00 to $7.70 and quantity supplied increases from 75 units to 90 units.
c. If price falls from $6.50 to $5.20 and quantity supplied falls from 1,200 to 1,140 units.

Question 2.7

Answer the following questions by using the formula for PES:

a. If the value of PES is 0.75 and the price of the product increases by 12%, what will the percentage increase in quantity supplied be?
b. If the value of PES is 1.25 and quantity supplied falls by 20%, when the price of a good is decreased, what was the percentage fall in the price of the good?

Topic 3 – Specific Taxes and Subsidies

You need to be able to:

- Plot demand and supply curves for a product from linear functions and then illustrate and/or calculate the effects of the imposition of a specific tax on the market (on price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus and producer surplus).

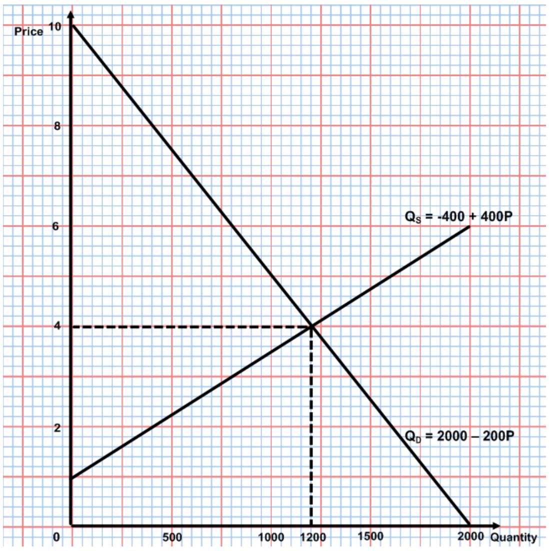
- Plot demand and supply curves for a product from linear functions and then illustrate and/or calculate the effects of the provision of a subsidy on the market (on price, quantity, consumer expenditure, producer revenue, government expenditure, consumer surplus and producer surplus).

SPECIFIC TAXES

Plot demand and supply curves for a product from linear functions and then illustrate the effects of the imposition of a specific tax on the market (on price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus and producer surplus).

Step 1
Use the linear functions given to draw the relevant demand and supply curves and to identify the equilibrium price and quantity. (See pages 3 & 5, if you cannot remember how to do this.

E.g. If the demand and supply functions for a product are Q_D = 2000 – 200P and Q_S = -400 + 400P.



Step 2
Change the supply function by taking the amount of the specific tax away from P, simplify the equation, and then draw the new supply curve.

E.g. If the government imposes a specific tax of $0.75, then the supply function is changed, because the producers will have to pay the tax and so the price they receive falls by $0.75. Thus, the price in the equation is (P – 0.75) at each level.

If we put this in the equation, we get Q_S = - 400 + 400(P - 0.75).

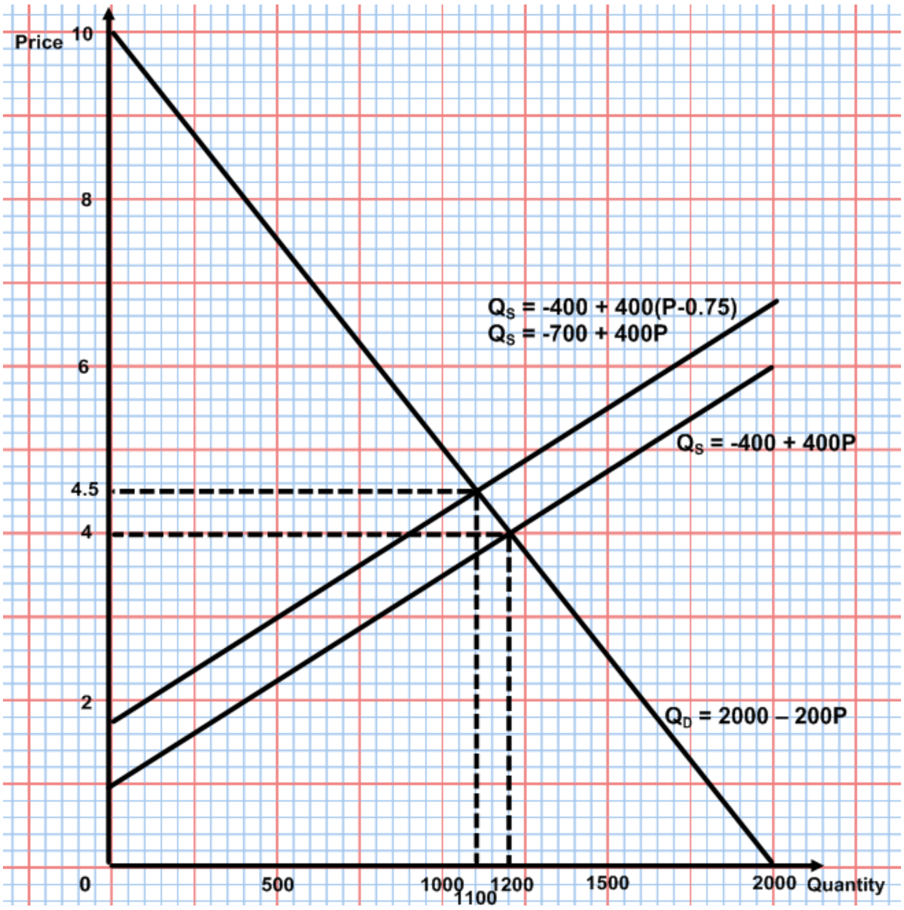
Then, we can simplify the supply function and draw the new supply curve.

$Q_S = -400 + 400(P - 0.75)$

$Q_S = -400 + (400xP) – (400 \times 0.75)$

$Q_S = -400 + 400P – 300$

$Q_S = -700 + 400P$



Step 3
Identify the effects that are requested by the question in terms of price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus or producer surplus.

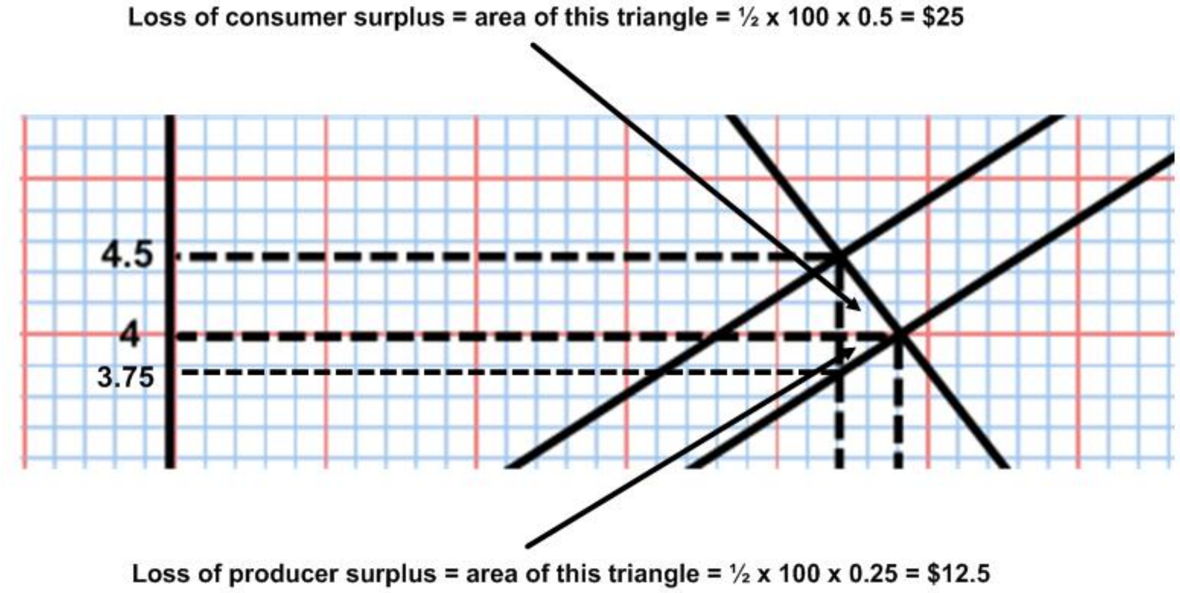
E.g. In the diagram above, the new equilibrium price is \$4.50 and the new quantity demanded is 1100 units.

Consumer expenditure goes from 1200 units at \$4 = \$4,800, to 1100 units at \$4.50 = \$4,950 – an increase of \$150.

Producer revenue, after paying the tax of \$0.75 per unit, goes from 1200 units at \$4 = \$4,800 to 1100 units at \$3.75 = \$4,125 – a fall of \$675.

Government revenue is 1100 units at a tax per unit of \$0.75 = \$825.

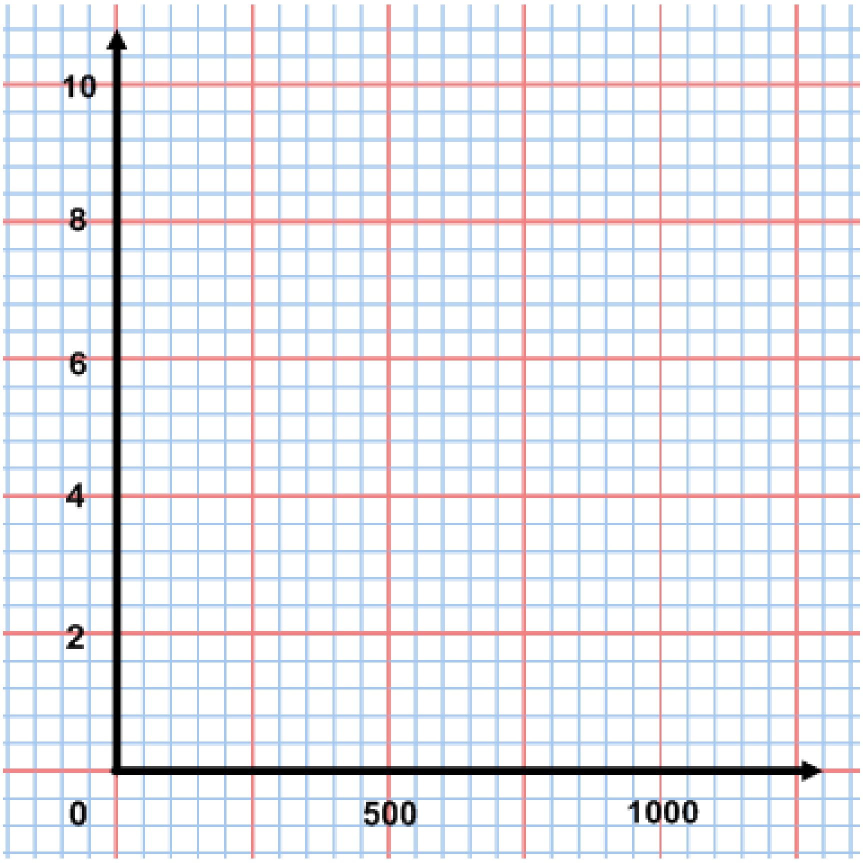
The loss of consumer surplus and producer surplus can be calculated as shown below:



Now you have a go!

Question 3.1
In the market for chocolate bars, the demand function is Q_D = 900 – 100P and the supply function is Q_S = 200P, where price is given in $ per chocolate bar and quantity is given in thousands of chocolate bars per month. The government then imposes a specific tax of $1.50 on chocolate bars, to discourage their sales.

i. On the graph below, draw the original demand and supply curves and indicate equilibrium.



ii. Calculate the new supply function, after the tax, draw it on the diagram and indicate the new equilibrium price and quantity.

iii. Calculate the change in consumer expenditure.

iv. Calculate the change in producer revenue.

v. Calculate the government tax revenue.

vi. Calculate the loss of consumer surplus.

vii. Calculate the loss of producer surplus.

Calculate the effects of the imposition of a specific tax on the market (on price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus and producer surplus).

Step 1
Calculate the original equilibrium price and quantity from the demand and supply functions.

E.g. If the demand and supply functions for a product are Q_D = 2000 – 200P and Q_S = -400 + 400P. Then equilibrium can be calculated by setting the equations against each other, so that:

$Q_D = Q_S$,

2000 – 200P = -400 + 400P

2400 = 600P

P = $4

Substitute $4 as P in either equation to get the equilibrium quantity, which is 1,200 units.

Step 2
Rearrange the supply function to take account of the specific tax that is set and then find the new equilibrium.

E.g. If the government imposes a specific tax of $0.75, then the supply function is changed, because the producers will have to pay the tax and so the price they receive falls by $0.75. Thus, the price in the equation is (P - 0.75) at each level.

If we put this in the equation, we get $Q_S = -400 + 400(P - 0.75)$.

Then, we can simplify the supply function.

$Q_S = -400 + 400(P - 0.75)$

$Q_S = -400 + (400xP) – (400 x 0.75)$

$Q_S = -400 + 400P – 300$

$Q_S = -700 + 400P$

Now, equilibrium is where the old demand equation meets the new supply equation:

$2000 – 200P = -700 + 400P$

$2700 = 600P$

$P = \$4.50$

Substitute $4.50 as P in either equation to get the new equilibrium quantity, which is 1,100 units.

Step 3
Calculate the further effects that are requested by the question in terms of consumer expenditure, producer revenue, government revenue, consumer surplus or producer surplus.

E.g. Consumer expenditure goes from 1200 units at $4 = $4,800, to 1100 units at $4.50 = $4,950 – an increase of $150.

Producer revenue, after paying the tax of $0.75 per unit, goes from 1200 units at $4 = $4,800 to 1100 units at $3.75[1] = $4,125 – a fall of $675.

Government revenue is 1100 units at a tax per unit of $0.75 = $825.

Now you have a go!

[1] This is because the producers get $4.50 per unit, but have to pay $0.75 in tax.

Question 3.2
In the market for chocolate bars, the demand function is $Q_D = 900 - 100P$ and the supply function is $Q_S = 200P$, where price is given in $ per chocolate bar and quantity is given in thousands of chocolate bars per month. The government then imposes a specific tax of $1.50 on chocolate bars, to discourage their sales.

Without using a graph, calculate, showing your working fully:

i. The original equilibrium price and quantity before the tax.

ii. The new supply function, after the tax.

iii. The new equilibrium price and quantity.

iv. The change in consumer expenditure.

v. The change in producer revenue.

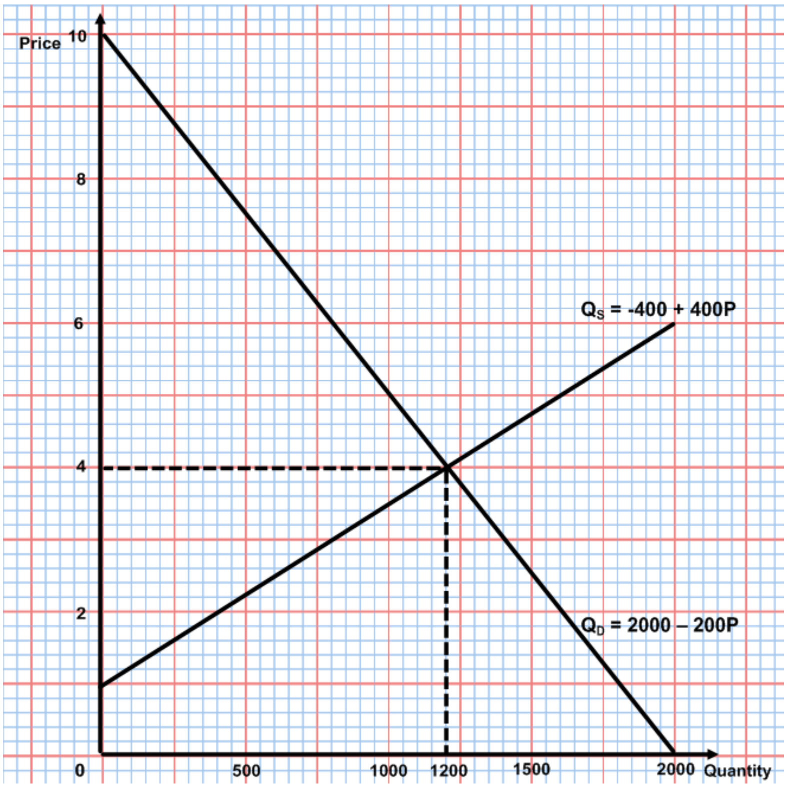
vi. The government tax revenue.

SUBSIDIES

Plot demand and supply curves for a product from linear functions and then illustrate and then illustrate the effects of the provision of a subsidy on the market (on price, quantity, consumer expenditure, producer revenue, government expenditure, consumer surplus and producer surplus).

Step 1
Use the linear functions given to draw the relevant demand and supply curves and to identify the equilibrium price and quantity. (See pages 3 & 5, if you cannot remember how to do this.)

E.g. If the demand and supply functions for a product are $Q_D = 2000 – 200P$ and $Q_S = -400 + 400P$.



Step 2
Change the supply function by adding the amount of the subsidy to P, simplify the equation, and then draw the new supply curve.

E.g. If the government grants a subsidy of $0.75 per unit, then the supply function is changed, because the producers receive the subsidy and so the price they receive rises by $0.75. Thus, the price in the equation is (P + 0.75) at each level.

If we put this in the equation, we get $Q_S = - 400 + 400(P + 0.75)$.

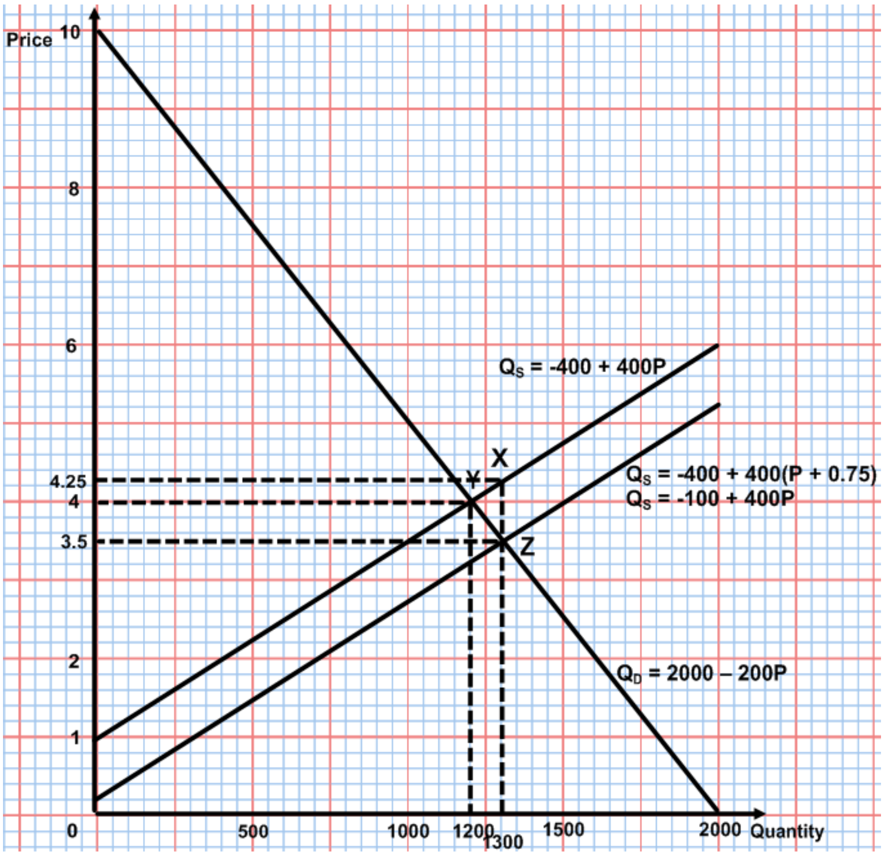
Then, we can simplify the supply function and draw the new supply curve.

$Q_S = - 400 + 400(P + 0.75)$

Q_S = - 400 + (400xP) + (400 x 0.75)

Q_S = - 400 + 400P + 300

Q_S = 100 + 400P



Step 3
Identify the effects that are requested by the question in terms of price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus or producer surplus.

E.g. In the diagram above, the new equilibrium price is $3.50 and the new quantity demanded is 1300 units.

Consumer expenditure goes from 1200 units at $4 = $4,800, to 1300 units at $3.50 = $4,550 – a decrease of $250.
Producer revenue, after receiving the subsidy of $0.75 per unit, goes from 1200 units at $4 = $4,800 to 1300 units at $4.25 = $5,525 – an increase of $725.

Government cost of the subsidy is 1300 units at a subsidy per unit of $0.75 = $975.

The gains of consumer surplus and producer surplus can be identified from the diagram and then calculated.

The original consumer surplus was the triangle 4,10,Y. So it is the area of that, which is ½ x $6 x 1200 = $3,600. The new consumer surplus is the triangle 3.50,10,Z. So it is the area of that, which is ½ x $6.50 x 1300 = $4,225.

The increase in consumer surplus is $4,225 - $3,600 = $625.

The original producer surplus was the triangle 4,1,Y. So it is the area of that, which is ½ x $3 x 1200 = $1,800. The new producer surplus is the triangle 4.25,1,X. So it is the area of that, which is ½ x $3.25 x 1300 = $2,112.5.

The increase in producer surplus is $2,112.5 - $1,800 = $312.5.

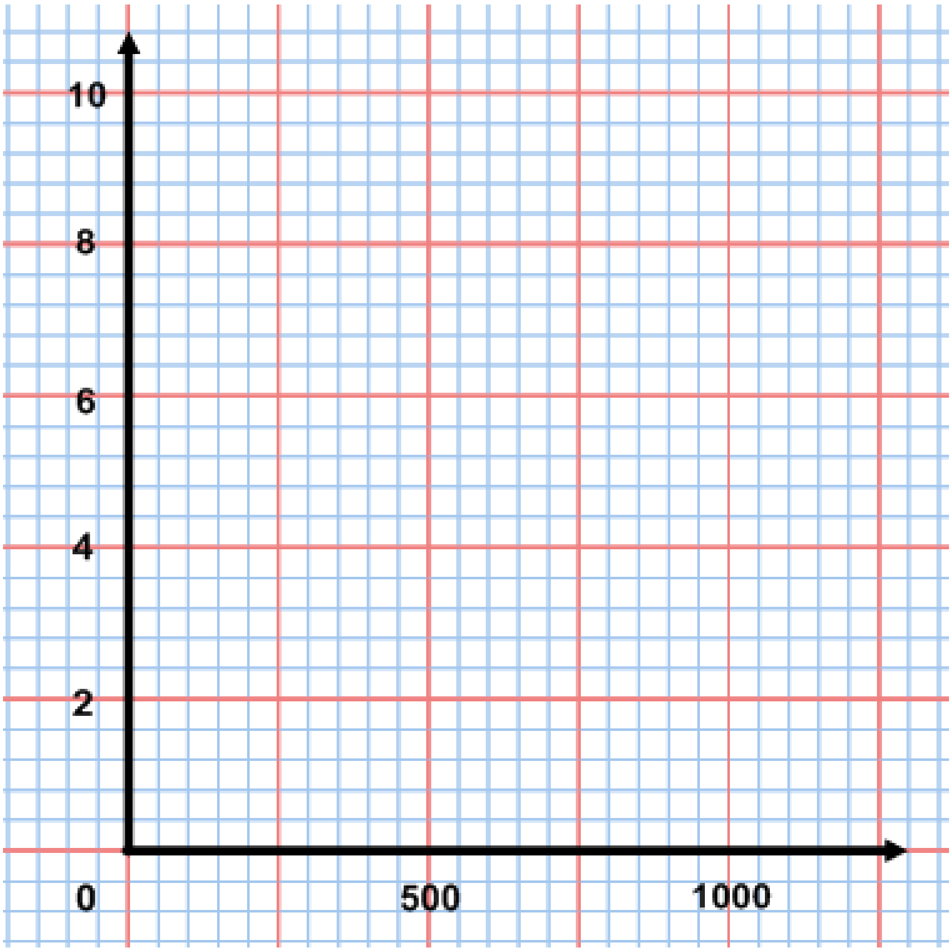
[Out of interest, community surplus, which is consumer surplus + producer surplus, goes from $5,400 to $6,337.50. This is an increase of $937.50. The cost of the subsidy to the government is $975 (see above). So, it follows that the subsidy created a dead-weight loss of $975 - $937.50 = $37.50. This occurs because the extra hundred units produced because of the subsidy would not have been produced in a free market.

The dead-weight loss is indicated by the triangle XYZ, and so it can also be calculated by finding the area of that triangle, which is ½ x $.75 x 100 = $37.5.]

Now you have a go!

Question 3.3
In the market for baby milk, the demand function is Q_D = 900 – 100P and the supply function is Q_S = 200P, where price is given in $ per carton and quantity is given in thousands of cartons per month. The government then grants a subsidy of $1.50 per carton, to make the milk cheaper for parents.

i. On the graph below, draw the original demand and supply curves and indicate equilibrium.



ii. Calculate the new supply function, after the subsidy, draw it on the diagram and indicate the new equilibrium price and quantity.

iii. Calculate the change in consumer expenditure.

iv. Calculate the change in producer revenue.

v. Calculate the government subsidy costs.

vi. Calculate the increase in consumer surplus.

vii. Calculate the increase in producer surplus.

viii. Calculate the dead-weight loss arising from the subsidy. [Extra credit]

Calculate the effects of the granting of a subsidy on the market (on price, quantity, consumer expenditure, producer revenue, government revenue, consumer surplus and producer surplus).

Step 1
Calculate the original equilibrium price and quantity from the demand and supply functions.

E.g. If the demand and supply functions for a product are $Q_D = 2000 - 200P$ and $Q_S = -400 + 400P$. Then equilibrium can be calculated by setting the equations against each other, so that:

$Q_D = Q_S$,

$2000 - 200P = -400 + 400P$

$2400 = 600P$

$P = \$4$

Substitute $4 as P in either equation to get the equilibrium quantity, which is 1,200 units.

Step 2
Rearrange the supply function to take account of the subsidy that is given and then find the new equilibrium.

E.g. If the government grants a subsidy of $0.75 per unit, then the supply function is changed, because the producers will get the subsidy and so the price they receive rises by $0.75 per unit. Thus, the price in the equation is (P + 0.75) at each level.

If we put this in the equation, we get $Q_S = -400 + 400(P + 0.75)$.

Then, we can simplify the supply function.

$Q_S = -400 + 400(P + 0.75)$

$Q_S = -400 + (400 \text{x} P) + (400 \text{ x } 0.75)$

$Q_S = -400 + 400P + 300$

$Q_S = -100 + 400P$

Now, equilibrium is where the old demand equation meets the new supply equation:

$2000 – 200P = -100 + 400P$

$2100 = 600P$

$P = \$3.50$

Substitute $3.50 as P in either equation to get the new equilibrium quantity, which is 1,300 units.

Step 3
Calculate the further effects that are requested by the question in terms of consumer expenditure, producer revenue, government revenue, consumer surplus or producer surplus.

E.g. Consumer expenditure goes from 1200 units at $4 = $4,800, to 1300 units at $3.50 = $4,550 – a decrease of $250.

Producer revenue, after receiving the subsidy of $0.75 per unit, goes from 1200 units at $4 = $4,800 to 1300 units at $4.25[2] = $5,525 – a rise of $725.

Government cost of the subsidy is 1300 units at a subsidy per unit of $0.75 = $975.

[2] This is because the producers get $3.50 per unit from consumers plus $0.75 in subsidy.

Now you have a go!

Question 3.4
In the market for baby milk, the demand function is $Q_D = 900 - 100P$ and the supply function is $Q_S = 200P$, where price is given in $ per carton and quantity is given in thousands of cartons per month. The government then grants a subsidy of $1.50 per carton, to make the milk cheaper for parents.

Without using a graph, calculate, showing your working fully:

i. The original equilibrium price and quantity before the subsidy.

ii. The new supply function, after the subsidy.

iii. The new equilibrium price and quantity.

iv. The change in consumer expenditure.

v. The change in producer revenue.

vi. The government cost of the subsidy.

Topic 4 – Price ceilings and price floors

You need to be able to:

- Calculate possible effects from the price ceiling (maximum price) diagram, including the resulting shortage, change in expenditure and total expenditure.

- Calculate possible effects from the price floor (minimum price) diagram, including the resulting surplus, change in expenditure and total expenditure.

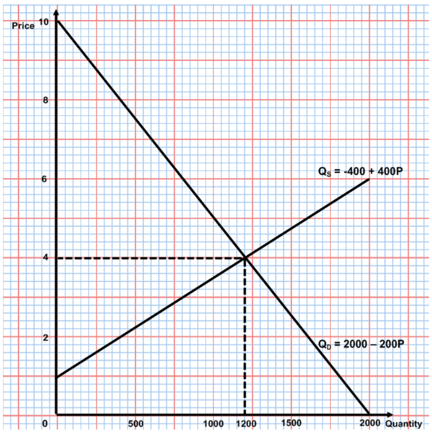
PRICE CEILINGS

Calculate possible effects from the price ceiling (maximum price) diagram, including the resulting shortage, change in expenditure and total expenditure.

Step 1

Use the linear functions given to draw the relevant demand and supply curves and to identify the equilibrium price and quantity. (See pages 3 & 5, if you cannot remember how to do this.)

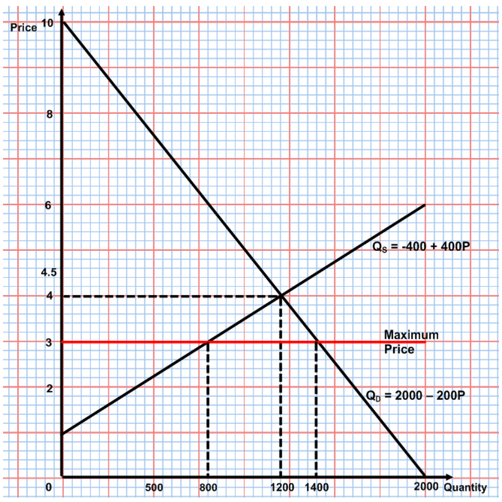
E.g. If the demand and supply functions for a product are $Q_D = 2000 – 200P$ and $Q_S = -400 + 400P$.



Step 2

Draw the ceiling price onto the diagram, below the equilibrium price. Then indicate the quantity demanded and the quantity supplied at the ceiling price. Then calculate the shortage (excess demand) that is created by imposing the ceiling price.

E.g. The government decided to impose a maximum price of $3. This is shown on the diagram below:



The quantity demanded is now 1,400 units and the quantity supplied is 800 units, so the excess demand (shortage) is 600 units.

Step 3
Calculate from the diagram total expenditure and changes in expenditure.

E.g. The total expenditure on the product before the ceiling price was \$4 x 1200 units = \$4,800.

The total expenditure on the product after the ceiling price was \$3 x 800 units = \$2,400.

Expenditure has fallen by \$2,400 or 50%.

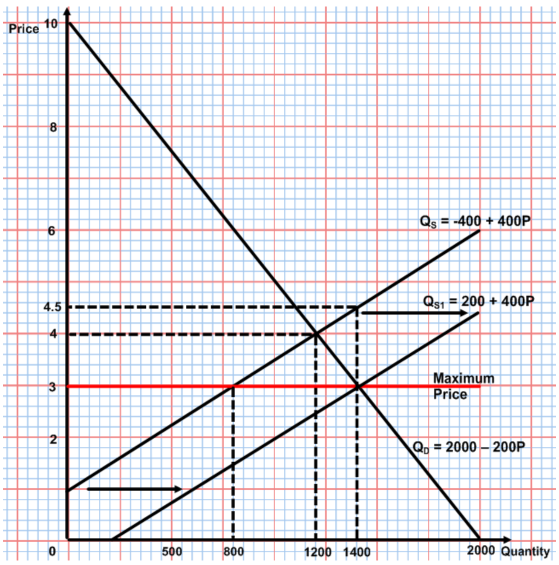
[**Remember** that the expenditure of the consumers is the same as the revenue of the producers.]

Step 4
Calculate any further effects that are requested by the question, in terms of the subsidy that might be necessary to eliminate the excess demand created by the minimum price and the total government expenditure on the subsidy.

E.g. If there is an excess demand of 600 units, then the government, if they wish to rectify this, will need to shift the supply curve to the right by 600 units at every price. This would add 600 units to the supply function:

Originally: $Q_S = -400 + 400 P$

Now, it would need to be: $Q_{S1} = -400 + 600 + 400P = 200 + 400P$.



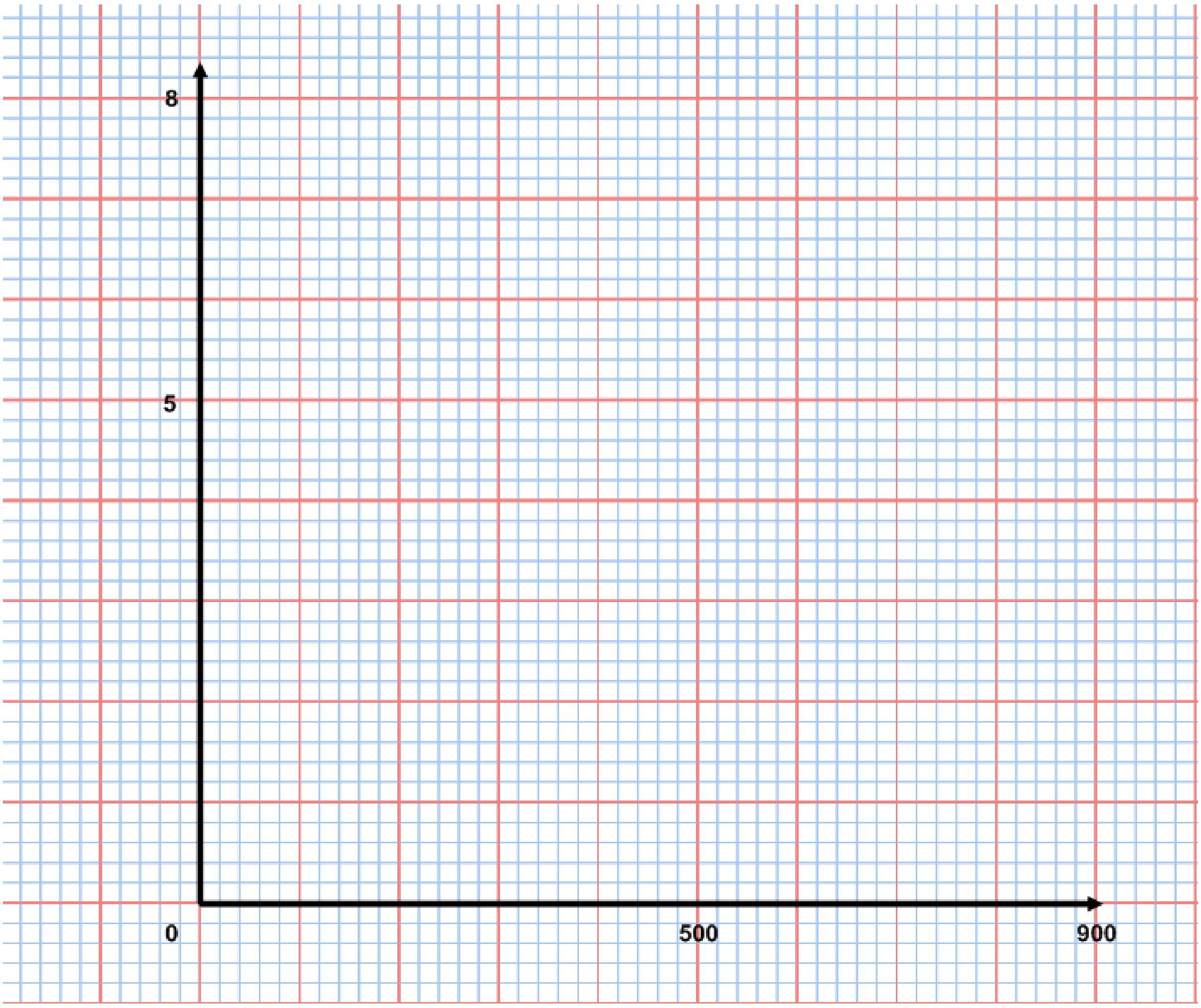
As we can see from the diagram, producers will now produce at the equilibrium, where 1,400 units are demanded and supplied at a price of \$3. We can see from the original supply curve, without the subsidy, that in order to supply 1400 units, the producers need to receive \$4.50. Thus, the subsidy per unit is \$1.50.

The total subsidy payment by the government will be 1,400 x \$1.50 = \$2,100.

Now you have a go!

Question 4.1
In the market for beef, the demand function is $Q_D = 800 - 100P$ and the supply function is $Q_S = 150P$, where price is given in $ per kilo and quantity is given in thousands of kilos per month. The government then imposes a maximum price of $2 per kilo in order to protect consumers.

i. On a graph below, draw the original demand and supply curves and indicate equilibrium.
ii. On the graph below, show the maximum price and indicate the quantities demanded and supplied at that price.
iii. From the graph, calculate the excess demand created.
iv. From the graph, calculate the change in consumer expenditure.
v. Give the supply function, following a subsidy, which would eliminate the excess demand.
vi. Draw the new supply curve on the graph and calculate the necessary subsidy per unit that the government would have to pay in order to eliminate the excess demand.
vii. Calculate the total subsidy payment that the government would have to make.
viii. Not using the graph, calculate the shortage at the maximum price. [Extra credit]
ix. Not using the graph, calculate the amount of the subsidy necessary to eliminate the shortage. [Extra credit]

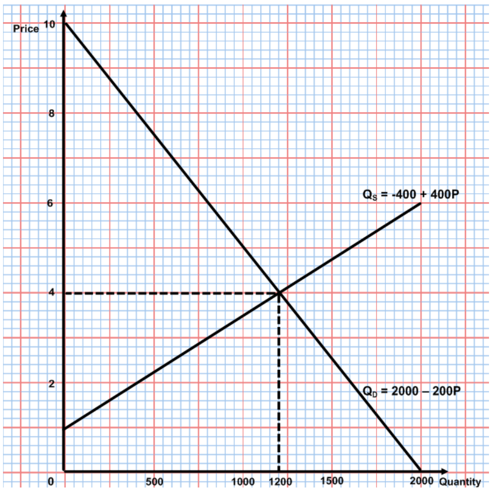


PRICE FLOORS

Calculate possible effects from the price floor (minimum price) diagram, including the resulting surplus, change in expenditure and total expenditure.

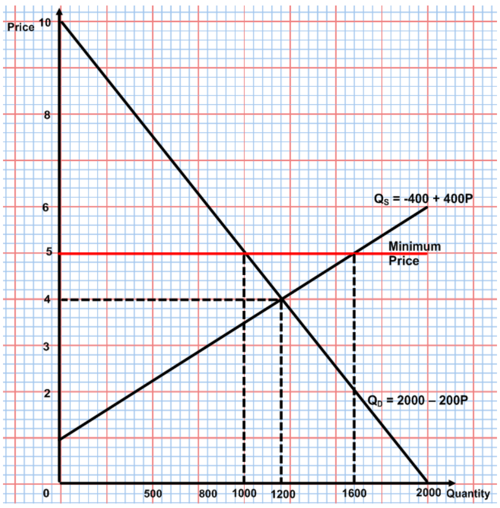
Step 1
Use the linear functions given to draw the relevant demand and supply curves and to identify the equilibrium price and quantity. (See pages 3 & 5, if you cannot remember how to do this.)

E.g. If the demand and supply functions for a product are Q_D = 2000 – 200P and Q_S = -400 + 400P.



Step 2
Draw the floor price onto the diagram, above the equilibrium price. Then indicate the quantity demanded and the quantity supplied at the floor price. Then calculate the surplus (excess supply) that is created by imposing the floor price.

E.g. The government decided to impose a minimum price of $5. This is shown on the diagram below:



The quantity demanded is now 1,000 units and the quantity supplied is 1,600 units, so the excess supply (surplus) is 600 units.

Step 3
Calculate from the diagram the total amount that the government would have to pay to buy up the surplus. This would be the excess supply times the minimum price.

E.g. The government would need to buy 600 units at $5 per unit = $3,000.

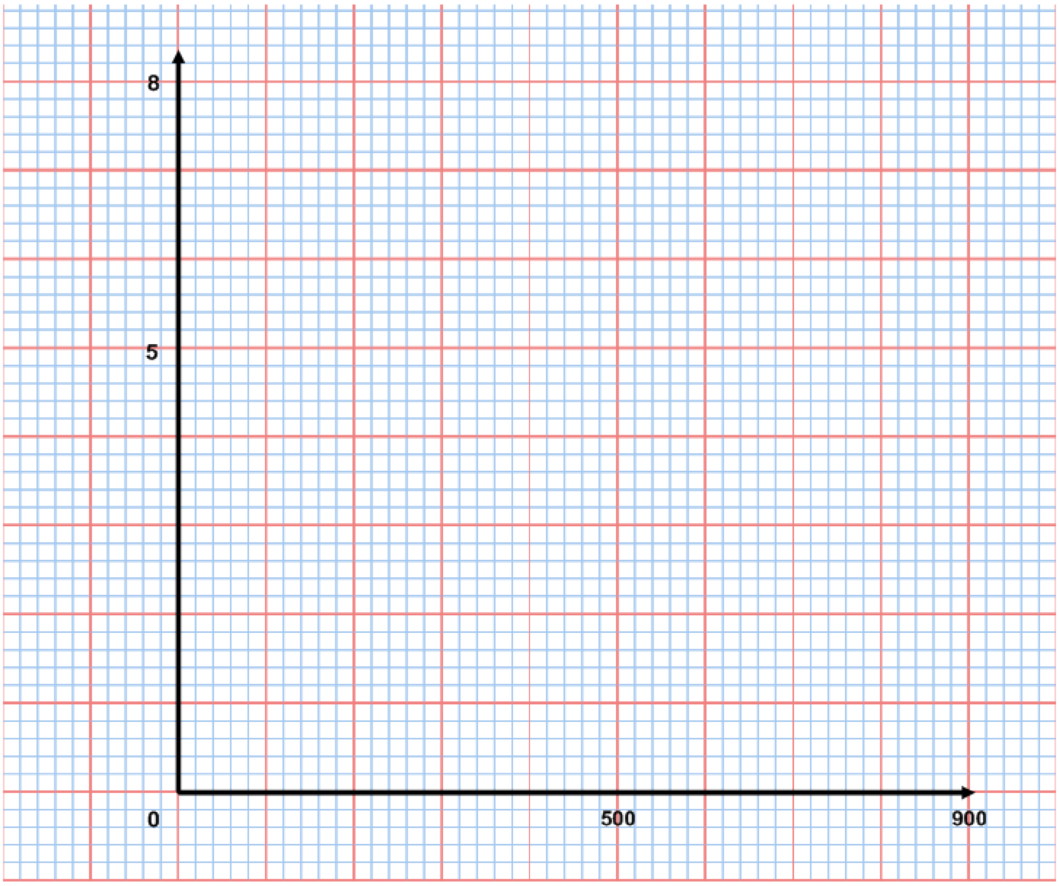
Step 4
Calculate the total income of the producers. This will come from sales to the consumers and sales to the government.

E.g. The consumers will sell 1,600 units at a price of $5 = $8,000. They will receive $5,000 from the consumers (1000 units x $5) and $3,000 from the government (600 units x $5).

Now you have a go!

Question 4.2
In the market for beef, the demand function is $Q_D = 800 - 100P$ and the supply function is $Q_S = 150P$, where price is given in $ per kilo and quantity is given in thousands of kilos per month. The government then imposes a minimum price of $4 per kilo in order to protect the farmers.

i. On a graph, draw the original demand and supply curves and indicate equilibrium.
ii. On the graph, show the minimum price and indicate the quantities demanded and supplied at that price.
iii. From the graph, calculate the excess supply created.
iv. Calculate the amount the government will have to pay to buy up the surplus.
v. Calculate the total revenue received by the farmers, if the government buys up the surplus.



Topic 5 - Calculating costs, revenues, profits, and levels of output

You need to be able to:

- Calculate total, average and marginal product from a set of data and/or diagrams.
- Calculate total fixed costs, total variable costs, total costs, average fixed costs, average variable costs, average total costs and marginal costs from a set of data and/or diagrams.
- Calculate total revenue, average revenue and marginal revenue from a set of data and/or diagrams.
- Calculate different profit levels from a set of data and/or diagrams.
- Calculate the shut-down price and the break-even price from a set of data.
- Calculate from a set of data and/or diagrams the revenue maximizing level of output.

Calculate total, average and marginal product from a set of data and/or diagrams.

Step 1

If you are given a table that is incomplete, you need to calculate the total product, average product, and the marginal product values that are missing, using the appropriate equations:

Total product = TP (of n - 1 variable factors) + MP of the n^{th} variable factor

Average product = $\frac{Total\ Product}{No\ of\ variable\ factors} = \frac{TP}{V}$

Marginal product = $\frac{\Delta TP}{\Delta V}$

Number of Variable Factors (V)	Total Product (TP) (Output)	Average Product (AP)	Marginal Product (MP)
0	0	0	0
1	5		
2		6	7
3	21		9
4	32		
5		9	
6	56		11
7		9	
8		8.5	
9		8	4
10	75		

E.g. Total product = TP (of n - 1 variable factors) + MP of the n^{th} variable factor

In the table above, TP from 2 variable factors = TP from 1 variable factor + MP of the second variable factor = 5 + 7 = 12 units.

Average product = $\frac{Total\ Product}{No\ of\ variable\ factors} = \frac{TP}{V}$

In the table above, AP of the third variable factor = $\frac{TP}{V} = \frac{21}{3} = 7$

Marginal product = $\frac{\Delta TP}{\Delta V}$

In the table above, the marginal product of the fourth variable factor = $\frac{\Delta TP}{\Delta V} = \frac{32-21}{4-3} = \frac{11}{1} = 11\ units$

Now you have a go!!

Question 5.1
In the table above, on page 27, calculate and fill in all of the missing product values.

Calculate total fixed costs, total variable costs, total costs, average fixed costs, average variable costs, average total costs and marginal costs from a set of data and/or diagrams.

Step 1
If you are given a table that is incomplete, you need to calculate the cost figures that are missing, using the appropriate equations:

$$Total\ cost\ (TC) = Total\ fixed\ cost + Total\ variable\ cost$$

$$Total\ fixed\ cost\ (TFC) = Number\ of\ fixed\ factors\ x\ Cost\ of\ fixed\ factors$$

$$Total\ variable\ cost\ (TVC) = Number\ of\ variable\ factors\ x\ Cost\ of\ variable\ factors$$

$$Average\ fixed\ cost\ (AFC) = \frac{TFC}{Output}$$

$$Average\ variable\ cost\ (AVC) = \frac{TVC}{Output}$$

$$Average\ total\ cost\ (ATC) = \frac{TC}{Output}$$

$$Average\ total\ cost = AFC + AVC$$

$$Marginal\ cost\ (MC) = \frac{\Delta TC}{\Delta Output}$$

E.g. The firm below has costs based upon four machines costing $100 per week and a varying number of workers costing $200 per week.

Workers	Output	TFC	TVC	TC	AFC	AVC	ATC	MC
0	0							
1	10							
2	25							
3	45							
4	70	400	800	1200	5.71	11.43	17.14	8.00
5	90							
6	105							
7	115							
8	120							

$Total\ fixed\ cost\ (TFC) = Number\ of\ fixed\ factors\ x\ Cost\ of\ fixed\ factors$
In the table above, the TFC of producing 70 units is 4 machines x \$100 = \$400.

$Total\ variable\ cost\ (TVC)$
$= Number\ of\ variable\ factors\ x\ Cost\ of\ variable\ factors$
In the table above, the TVC of producing 70 units is 4 workers x \$200 = \$800.

$Total\ cost\ (TC) = Total\ fixed\ cost + Total\ variable\ cost$
In the table above, the TC of producing 70 units is TFC + TVC = \$400 + \$800 = \$1,200.

$$Average\ fixed\ cost\ (AFC) = \frac{TFC}{Output}$$
In the table above, the AFC of producing 70 units is $\frac{\$400}{70}$ = \$5.71.

$$Average\ variable\ cost\ (AVC) = \frac{TVC}{Output}$$
In the table above, the AVC of producing 70 units is $\frac{\$800}{70}$ = \$11.43.

$$Average\ total\ cost\ (ATC) = \frac{TC}{Output}$$
In the table above, the ATC of producing 70 units is $\frac{\$1200}{70}$ = \$17.14.

$Average\ total\ cost = AFC + AVC$
In the table above, the ATC of producing 70 units is AFC + AVC = \$17.14

$$Marginal\ cost\ (MC) = \frac{\Delta TC}{\Delta Output}$$
In the table above, the MC of producing 70 units is $\frac{1200 - 1000}{70 - 45} = \frac{200}{25}$ = \$8.

Now you have a go!!

Question 5.2
In the table above, on page 28, calculate and fill in all of the missing cost values.

Calculate total revenue, average revenue and marginal revenue from a set of data.
Step 1
If you are given a table that is incomplete, you need to calculate the revenue figures that are missing, using the appropriate equations:

$Total\ revenue\ (TR) = Price\ (p) x\ Quantity\ (q)$

$$Average\ revenue\ (AR) = \frac{TR}{q} = p$$

$$Marginal\ revenue\ (MR) = \frac{\Delta TR}{\Delta q}$$

E.g. The firm below has revenues based upon their weekly sales in $:

Quantity sold (q)	Price (p)	Average revenue (AR)	Total revenue (TR)	Marginal revenue (MR)
0	-	-	-	-
10	70			
20	60		1200	
30	50	50	1500	30
40	40		1600	
50	30			-10
60	20			
70	10			
80	-	-	-	-

$$Total\ revenue\ (TR) = Price\ (p) x\ Quantity\ (q)$$

In the table above, the TR from selling 30 units is $50 x 30 = $1500.

$$Average\ revenue\ (AR) = \frac{TR}{q} = p$$

In the table above, the AR from selling 40 units is $\frac{\$1600}{40} = \$40$.

(Please take note that the AR is the same as the price, AR = P.)

$$Marginal\ revenue\ (MR) = \frac{\Delta TR}{\Delta q}$$

In the table above, the MR from selling 30 units is $\frac{1500 - 1200}{30 - 20} = \frac{300}{10} = \$30$.

Now you have a go!!

Question 5.3

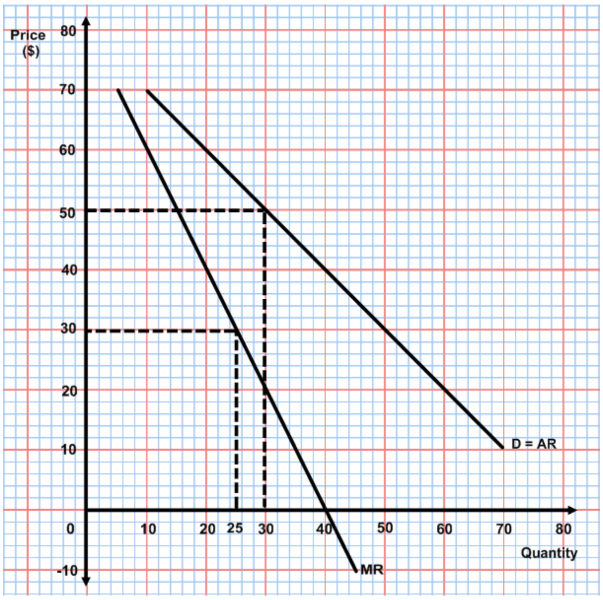
In the table above, calculate and fill in all of the missing revenue values.

Calculate total revenue, average revenue and marginal revenue from diagrams.

Step1

If you are given a diagram and asked to calculate revenues, then you simply use the revenue equations given above and the values given in the diagram.

E.g.



In the table above, the total revenue from selling 30 units is calculated by finding the price at which 30 units are sold and then multiplying it by 30 units as per the TR equation. In this case, it will be 30 x $50 = $1,500.

To find any average revenue, remember that it is the same as price. So, if asked for the average revenue of selling 30 units, you just need to find the price and that is the average revenue as well; in this case, $50.

To find marginal revenue, you just need to use the marginal revenue curve. So, in this case, to find the marginal revenue of increasing from 20 to 30 units of sales, you go to the mid-point of 20 and 20 units, 25 units, read up to the MR curve and across, and the MR is $30.

Now you have a go!!

Question 5.4
From the above diagram, find:

a) the total revenue when sales are 50 units
b) the total revenue when the price is $40
c) the average revenue when sales are 60 units
d) the average revenue when the price is $20
e) the marginal revenue when sales increase from 10 units to 20 units
f) the marginal revenue when sales increase from 40 to 50 units

Question 5.5 (extra credit)
Calculate the price elasticity of demand from the figures on the diagram above when:

a) price increases from $20 to $30
b) price increases from $50 to $60
c) explain why the values above, in a) and b), are different

Calculate different profit levels from a set of data.
Step 1
If you are given a set of data, then you can work out the profit by using the equations below:

$$Profit\ per\ unit = Price\ per\ unit\ (P) - Cost\ per\ unit\ (ATC)$$

$$Total\ profit = Profit\ per\ unit\ x\ Number\ of\ units\ sold$$

$$Total\ profit = Total\ revenue\ (TR) -\ Total\ cost\ (TC)$$

E.g.(1) The firm below has the following output, price, and cost figures:

Output	Price per unit	ATC	Profit per unit
100	$25		$8
200	$19	$15	$4
300		$12	$0

At an output of 200 units, the profit per unit is price per unit – average total cost = $19 - $15 = $4 per unit.

E.g.(2) The firm below has the following output, price, and cost figures:

Output	Total revenue	Total cost	Total profit
100	$2500	$1700	
200	$3800	$3000	$800
300	$3600		$0

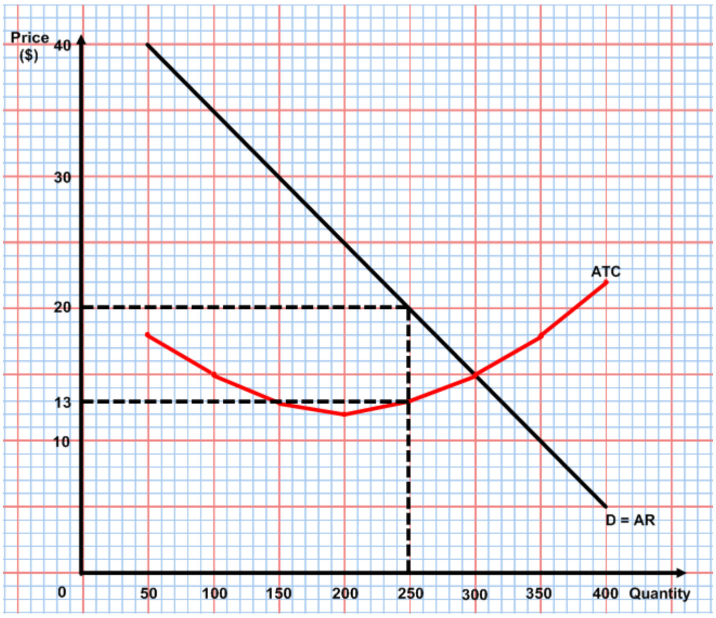
At an output of 200 units, the total profit is total revenue – total cost = $3,800 - $3,000 = $800.

It can also be calculated by taking the profit per unit at the output, i.e. $4, and multiplying by the number of units sold, i.e. 200, to get $4 x 200 = $800.

Now you have a go!!

Question 5.6
In the tables above, calculate and fill in the missing profit figures.

Calculate different profit levels from diagrams.
Step1
If you are given a diagram and asked to calculate profits, then you simply use the profit equations given above and the values given in the diagram.



E.g. In the diagram above, the profit per unit from selling 250 units is calculated by finding the price at which 250 units are sold, the average cost at which 250 units are sold, and then taking away the cost from the price. In this case, it will be: price – average cost = $20 x $13 = $7.

To find the total profit from selling 250 units, we need to take the profit per unit and multiply it by the number of units sold. In this case, it will be: profit per unit x number of units sold = $7 x 250 units = $1,750.

Now you have a go!!

Question 5.7
From the above diagram, find the profit per unit and the total profit at each of the following levels of output:

a) 50 units
b) 100 units
c) 150 units
d) 200 units
e) 300 units
f) 350 units

Calculate the short run shut-down price and the break-even price from a set of data.
Step 1
Use the information below to identify the necessary data from the table of data given.

Firms will shut down in the short run if they cannot cover their variable costs. So, the shut-down price is where the price that a firm gets for their good is equal to the average variable cost. It is actually the lowest point on the AVC curve.

$$Shut - down\ price: Price\ (AR) = Average\ variable\ cost$$

Firms will break-even, in the long run, if they produce at the level of output where price is equal to average total cost. It is actually the lowest point on the ATC curve.

$$Break - even\ price: Price\ (AR) = Average\ total\ cost$$

E.g.

Output	AVC	ATC
100	$18	$22.00
200	$15	$18.60
300	$12	$15.20
400	$12	$15.00
500	$15	$17.70
600	$17	$19.50

In the above table, the lowest value of AVC is $12, and so the firm would shut down if they could only sell at a price below $12.

In the table above, the lowest value of ATC is $15. This is the break-even price. A firm would shut down in the long run if they could only sell at a price below this.

Now you have a go!!

Question 5.8
In the following examples:

i. Is the firm making profits?
ii. Will the firm close down in the short run?
iii. Will the firm close down in the long run?

a) Firm A

Quantity	Price	AVC	ATC
200	$20	$18	$22

b) Firm B

Quantity	Price	AVC	ATC
300	$30	$24	$28

c) Firm C

Quantity	Price	AVC	ATC
250	$20	$22	$25

d) Firm D

Quantity	Price	AVC	ATC
200	$20	$18	$20

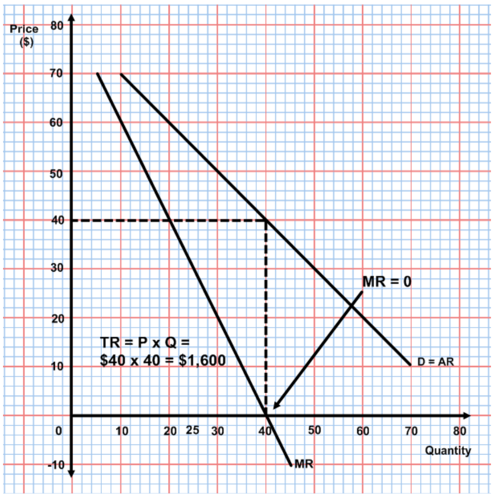
Calculate from a set of data and/or diagrams the revenue maximizing level of output.
Step 1
Revenue is maximised when a firm produces at a level of output where marginal revenue (MR) is equal to zero.

In either a set of data or a diagram, it is simply necessary to identify the level of output where MR = 0 and this will be the revenue maximising level of output.

E.g. In the table below, MR is at zero between 35 and 45 units. This is the revenue maximising level of output. The output is 40 units and the total revenue is maximised at $1,600.

Quantity sold (q)	**Price (p)**	**Average revenue (AR)**	**Total revenue (TR)**	**Marginal revenue (MR)**
0	-	-	-	-
				70
10	70		700	
				50
20	60		1200	
				30
30	50	50	1500	
				10
40	40		1600	
				-10
50	30		1500	
				-30
60	20		1200	
70	10			
80	-	-	-	-

In the diagram below, MR is at zero between 35 and 45 units. This is the revenue maximising level of output. The output is 40 units. The total revenue is maximised at 40 units x $40 = $1,600.



Now you have a go!!

Question 5.9

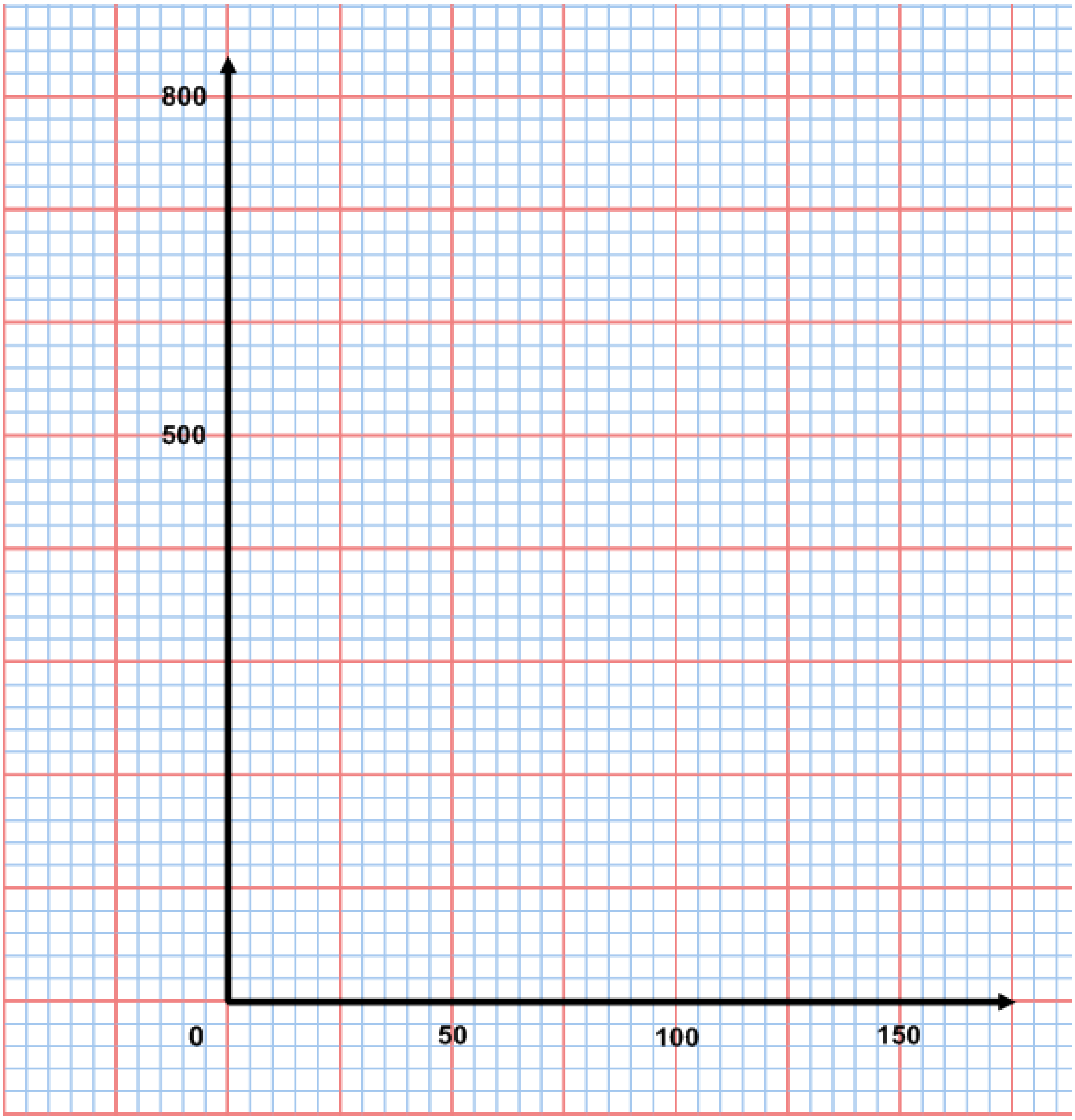
Quantity sold (q)	Price (p)($)	Average revenue (AR)	Total revenue (TR)	Marginal revenue (MR)
0	-	-	-	-
100	140			
200	120			
300	100			
400	80			
500	60			
600	40			
700	20			
800	-	-	-	-

Using the figures from the table above:

a) Complete the columns for AR, TR, and MR.
b) Identify the revenue maximising level of output.
c) Label the axes on the graph on Page 42.
d) Plot the AR and MR curves on the graph.
e) On the graph, identify the revenue maximising level of output.
f) On the graph, calculate the revenue maximising level of output.

Question 5.10 (Extra credit)

a) From the graph above, calculate the PED when price goes from $100 to $120.
b) From the graph above, calculate the PED when price goes from $40 to $60.


800
500
0
50
100
150

Now you have a go!!

Question 11.1
Using the figures in the table above:

a) Calculate the total tax paid in Year 1 by each of the individuals.
b) Calculate the average tax rate for each individual in Year 1.
c) Calculate the total tax paid in year 2 by each individual.
d) Calculate the average tax rate for each individual in Year 2.
e) Calculate the marginal tax rate for each individual from Year 1 to Year 2.

Topic 12 – Comparative Advantage

You need to be able to:

- Calculate opportunity costs from a set of data in order to identify comparative advantage.
- Draw a diagram to illustrate comparative advantage from a set of data.

Calculating opportunity costs from a set of data in order to identify comparative advantage.

Step 1

In order to identify the comparative advantage that a country has over another country in producing certain goods, it is necessary to work out their opportunity costs of producing the goods in question.

A country is said to have a comparative advantage in the production of a good if it can produce the good at a lower opportunity cost than another country. In simpler words, country A has to give up fewer units of other goods to produce the good in question than does country B.

In order to work out the opportunity costs, we need to calculate how much of one good a country has to give up, in order to produce a unit of another good, using the equation:

$$Opportunity\ cost\ of\ one\ unit\ of\ good\ A = \frac{Output\ of\ Good\ B}{Output\ of\ Good\ A}$$

E.g.

Country	Litres of wine	Opportunity cost of 1 litre of wine	Kilos of cheese	Opportunity cost of 1 kilo of cheese
France	3	4/3 kilos of cheese	4	3/4 litre of wine
Poland	1	3 kilos of cheese	3	1/3 litre of wine

The table shows the production outcomes where two countries, France and Poland, are using the same quantities of resources to produce wine and cheese.

The opportunity cost of a unit of wine in France, substituting into our equation, is:

$$Opportunity\ cost\ of\ one\ litre\ of\ Wine = \frac{Output\ of\ Cheese}{Output\ of\ Wine} = \frac{4}{3}\ kilos\ of\ cheese$$

The opportunity cost of a unit of cheese in France, substituting into our equation, is:

$$Opportunity\ cost\ of\ one\ kilo\ of\ cheese = \frac{Output\ of\ Wine}{Output\ of\ Cheese} = \frac{3}{4}\ litre\ of\ wine$$

The opportunity cost of a unit of wine in Poland, substituting into our equation, is:

$$Opportunity\ cost\ of\ one\ litre\ of\ Wine = \frac{Output\ of\ Cheese}{Output\ of\ Wine} = \frac{3}{1} = 3\ kilos\ of\ cheese$$

The opportunity cost of a unit of wine in Poland, substituting into our equation, is:

$$Opportunity\ cost\ of\ one\ litre\ of\ Wine = \frac{Output\ of\ Cheese}{Output\ of\ Wine} = \frac{1}{3}\ kilos\ of\ cheese$$

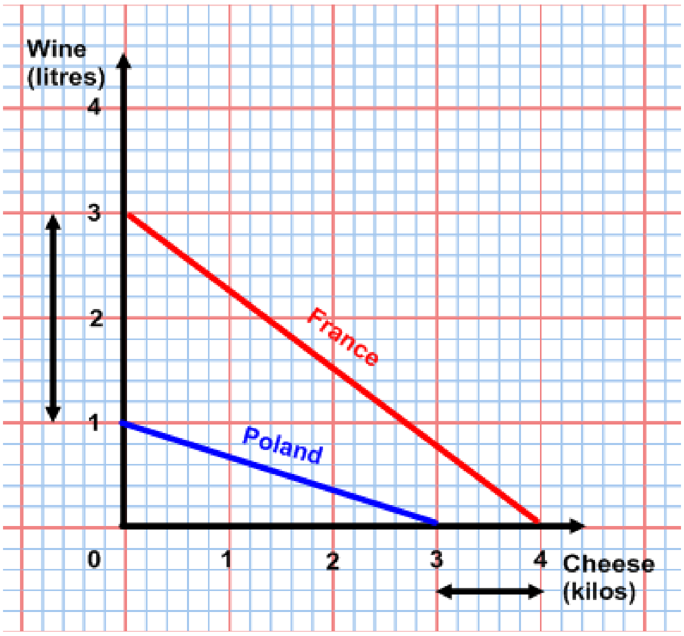
Step 2
Identify the country with the higher opportunity cost for a product and that is the one in which the country should specialise.

E.g. France only has to give up 4/3 kilos of cheese to produce a litre of wine, whereas Poland has to give up 3 kilos, but Poland only has to give up 1/3 litre of wine to produce a kilo of cheese, whereas France has to give up 3/4 litre of wine.

So, France will specialise in producing cheese and Poland will specialise in producing wine.

Drawing a diagram to illustrate comparative advantage from a set of data
Step 1
In order to illustrate comparative advantage from a set of data, we simply need to plot the output data for each country from the table given.

E.g. Using the figures from the table above and plotting the outputs of wine and cheese for France and Poland, we get:



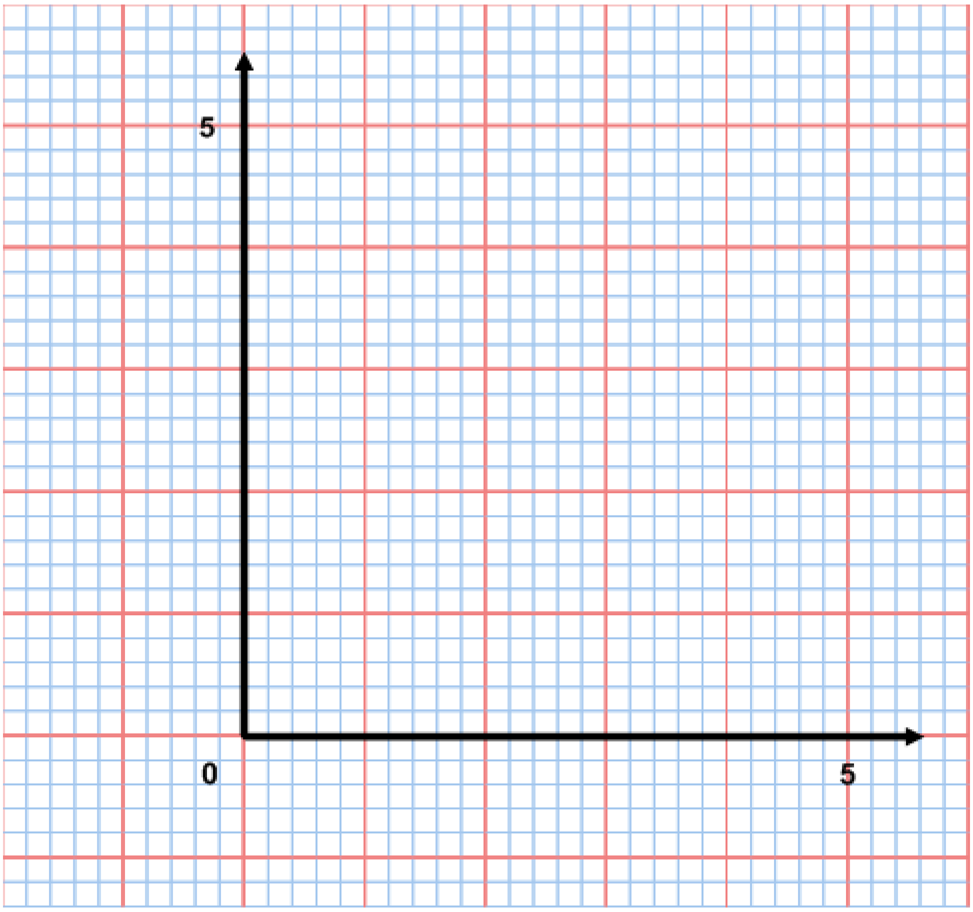
It is worth remembering the trick that the country that is weaker in producing both goods should specialise in the production of the good where the gap is smallest between their output and the output of the more efficient country. In this case, the gap on the diagram for Poland is smallest for cheese.

Now you have a go!!

Question 12.1
Using the same quantities of resources, to produce rice and cloth, China and Pakistan have the following production outcomes:

Country	Kilos of rice	Opportunity cost of 1 kilo of rice	Metres of cloth	Opportunity cost of 1 metre of cloth
China	5		4	
Pakistan	3		3	

a. Calculate the opportunity costs for the table.
b. Draw a fully-labelled diagram to illustrate the information in the table on the graph below:



c. Should trade take place between China and Pakistan? Why?
d. In which product should each country specialize? Why?

Topic 13 – Tariffs, quotas, and subsidies

You need to be able to:

- Calculate from diagrams the effects of imposing a tariff on imported goods on different stakeholders, including domestic producers, foreign producers, consumers and the government.
- Calculate from diagrams the effects of setting a quota on foreign producers on different stakeholders, including domestic producers, foreign producers, consumers and the government.
- Calculate from diagrams the effects of giving a subsidy to domestic producers on different stakeholders, including domestic producers, foreign producers, consumers and the government.

Since the models covered in international trade are microeconomic models, it is possible that you could be asked to construct a demand and supply curve for a product in a domestic market and then be required to carry out some of the procedures below.

Let us first construct such a market:

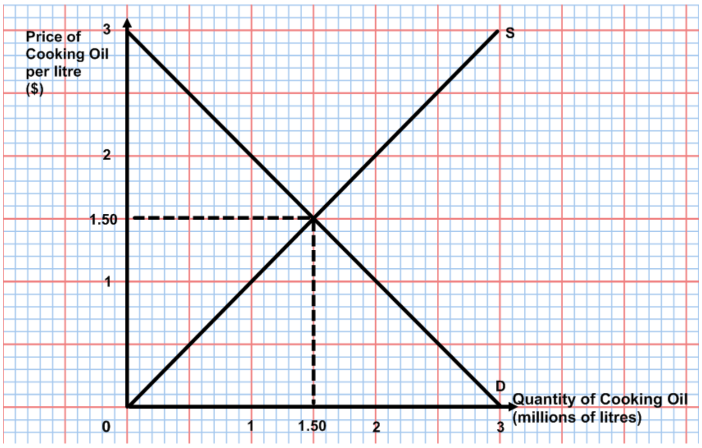
The market for cooking oil has the following demand and supply functions:

$$Q_D = 3 - P \qquad \text{and } Q_S = P$$

Where price is given in dollars per litre of cooking oil and quantity is given in millions of litres of cooking oil per month.

Plot the demand and supply curves for cooking oil from the functions above and identify the equilibrium price and quantity. (If you have forgotten how to do this, then see pages 3 to 7.

When we plot the curves, we get the diagram below:



Calculating from diagrams the effects of imposing a tariff on imported goods on different stakeholders, including domestic producers, foreign producers, consumers and the government.

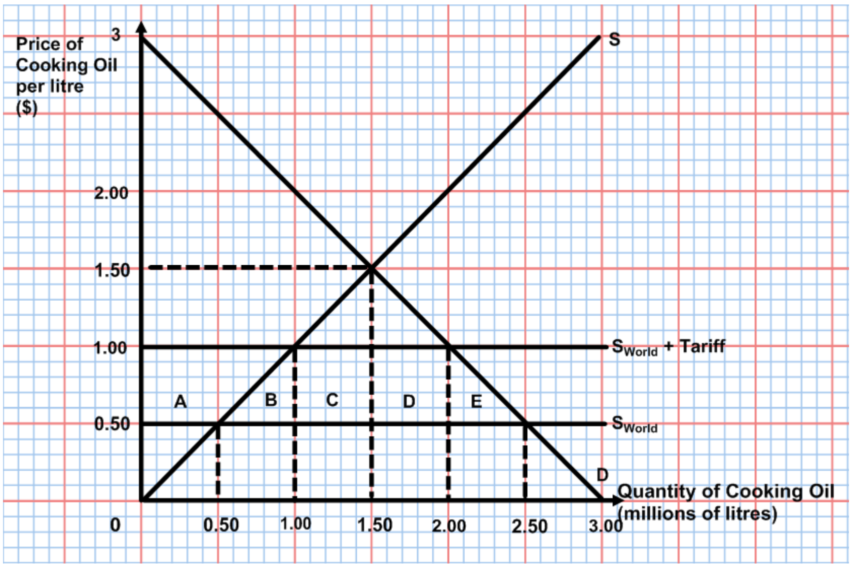
Once a diagram has been given or drawn, you may be asked to include world supply curves and tariffs and to calculate different effects of the tariff.

E.g. Using the diagram above:

1. Add the world supply curve if foreign producers are prepared to supply cooking oil at \$0.50. Then show the effect on the diagram of the government putting a tariff of \$0.50 on all imports of cooking oil.

   This is simple and you just have to add a perfectly elastic supply curve to the diagram, at a price of \$0.50. and label it S_{World}.

   Then you put on another curve, \$0.50 above the first one and label it S_{World} + Tariff.



2. Identify the level of domestic production before the tariff and after.
   Before the tariff, domestic production is where the domestic supply curve meets the world supply curve, i.e. 500,000 litres.
   After the tariff, domestic production is where the domestic supply curve meets the world supply + tariff curve, i.e. 1 million.

3. Calculate the amount of revenue for domestic producers before the tariff and after.
   Before the tariff, domestic producers received 500,000 x 50c = \$250,000.
   After the tariff, domestic producers received 1 million x \$1 = \$1 million.

4. Identify the level of imports before the tariff and after.
   Before the tariff, imports start at the level of output where the domestic supply curve meets the world supply curve, i.e. 500,000 litres, and finish where the world supply curve equals demand, i.e. at 2.5 million litres. Thus the level of imports is 2.5 million – 500,000 = 2 million litres.

   After the tariff, imports start at the level of output where the domestic supply curve meets the world supply + tariff curve, i.e. 1 million litres, and finishes where the world supply + tariff curve equals demand, i.e. at 2 million litres. Thus the level of imports is 2 million – 1 million = 1 million litres.

5. Calculate the amount of revenue for foreign producers before the tariff and after.
   Before the tariff, foreign producers received 2 million x 50c = \$1 million.
   After the tariff, foreign producers received 1 million x 50c = \$500,000.

6. Calculate the amount of government revenue from the tariff.
   The government will receive 50c for each litre of oil that is imported after the tariff is put in place = 1 million x 50c = \$500,000.

7. Calculate the fall in consumer surplus resulting from the imposition of the tariff.
   The consumer surplus will fall by a total of the areas A+B+C+D+E.
   A+B+C+D = 2 million x 50c = $1 million. E = ½ x 500,000 x 50c = $125,000.
   So, the total loss of consumer surplus is $1,125,000.

8. Calculate the dead-weight losses suffered as a result of imposing the tariff.
   The dead-weight losses are represented by areas B and E.
   Area B is the extra cost to "the world" of the output that is now produced by inefficient domestic producers, instead of efficient foreign producers = ½ x 500,000 x 50c = $125,000.
   Area E is the loss of consumer surplus from products that are no longer consumed and was calculated above to also be $125,000.

Calculating from diagrams the effects of setting a quota on foreign producers on different stakeholders, including domestic producers, foreign producers, consumers and the government.

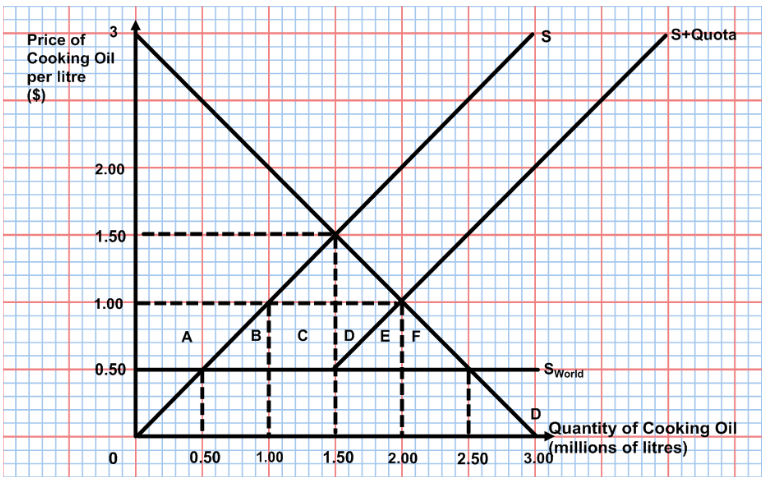
Once a diagram has been given or drawn, you may be asked to include world supply curves and quotas and to calculate different effects of the quota.

E.g. Using the diagram on page 56:

1. Add the world supply curve if foreign producers are prepared to supply cooking oil at $0.50. Then show the effect on the diagram of the government imposing a quota on imports of 1 million units.

   This is simple. Domestic producers supply 500,000 units and then the foreign producers are now allowed to supply 1 million more and no more. So, the domestic supply curve above 50c and an output of 500,000 litres, shifts to the right.

   The price now rises to $1 and total quantity demanded and supplied falls to 2 million litres.



2. Identify the level of domestic production before the quota and after.
   Before the quota, domestic production is where the domestic supply curve meets the world supply curve, i.e. 500,000 litres.
   After the quota, domestic production is the supply at $1, which is now the market price, which is 1 million litres.

3. Calculate the amount of revenue for domestic producers before the quota and after.
   Before the quota, domestic producers received 500,000 x 50c = $250,000.
   After the quota, domestic producers received 1 million x $1 = $1 million.

4. Identify the level of imports before the quota and after.
   Before the quota, imports start at the level of output where the domestic supply curve meets the world supply curve, i.e. 500,000 litres, and finish where the world supply curve equals demand, i.e. at 2.5 million litres. Thus the level of imports is 2.5 million – 500,00 = 2 million litres.

   After the quota, imports start at the level of output where the domestic supply curve meets the world supply curve, i.e. 500,000 litres, and is limited to 1 million litres by the quota. Thus the level of imports is 1 million litres.

5. Calculate the amount of revenue for foreign producers before the quota and after.
   Before the quota, foreign producers received 2 million x 50c = $1 million.
   After the quota, foreign producers received 1 million x $1 = $1 million.

6. Calculate the fall in consumer surplus resulting from the imposition of the quota.
   The consumer surplus will fall by a total of the areas A+B+C+D+E+F.
   A+B+C+D+E = 2 million x 50c = $1 million. F = ½ x 500,000 x 50c = $125,000.
   So, the total loss of consumer surplus is $1,125,000.

7. Calculate the dead-weight losses suffered as a result of imposing the quota.
   The dead-weight losses are represented by areas E and F.
   Area E is the extra cost to "the world" of the output that is now produced by inefficient domestic producers, instead of efficient foreign producers = ½ x 500,000 x 50c = $125,000.
   Area F is the loss of consumer surplus from products that are no longer consumed and was calculated above to also be $125,000.

Calculating from diagrams the effects of giving a subsidy to domestic producers on different stakeholders, including domestic producers, foreign producers, consumers and the government.

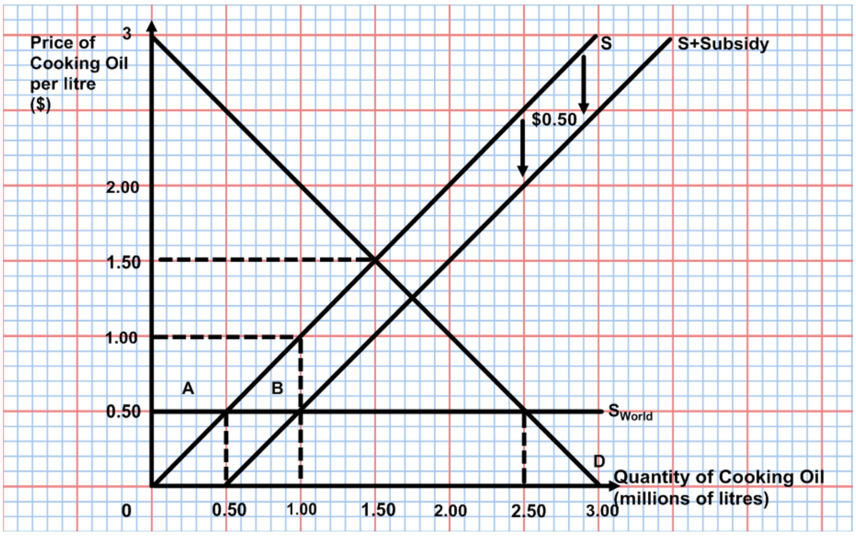
Once a diagram has been given or drawn, you may be asked to include world supply curves and subsidies and to calculate different effects of the subsidy.

E.g. Using the diagram on page 56:

1. Add the world supply curve if foreign producers are prepared to supply cooking oil at $0.50. Then show the effect on the diagram of the government giving a subsidy of $0.50 per unit on all domestic production of cooking oil.

   This is simple and you just have to add a perfectly elastic supply curve to the diagram, at a price of $0.50. and label it S_{World}.

   Then you shift the domestic supply curve downwards by 50c at all levels of output and label it S + Subsidy.



2. Identify the level of domestic production before the subsidy and after.
   Before the subsidy, domestic production is where the domestic supply curve meets the world supply curve, i.e. 500,000 litres.
   After the subsidy, domestic production is where the new domestic supply curve, S + Subsidy meets the world supply curve, i.e. 1 million litres.

3. Calculate the amount of revenue for domestic producers before the subsidy and after.
   Before the subsidy, domestic producers received 500,000 x 50c = $250,000.
   After the subsidy, domestic producers received 1 million x $1 (price of 50c and 50c per unit subsidy from the government) = $1 million.

4. Identify the level of imports before the subsidy and after.
   Before the subsidy, imports start at the level of output where the domestic supply curve meets the world supply curve, i.e. 500,000 litres, and finish where the world supply curve equals demand, i.e. at 2.5 million litres. Thus the level of imports is 2.5 million – 500,00 = 2 million litres.

   After the subsidy, imports start at the level of output where the new domestic supply curve, S + Subsidy, meets the world supply curve, i.e. 1 million litres, and finishes where the world supply curve equals demand, i.e. at 2.5 million litres. Thus the level of imports is 2.5 million – 1 million = 1.5 million litres.

5. Calculate the amount of revenue for foreign producers before the subsidy and after.
   Before the subsidy, foreign producers received 2 million x 50c = $1 million.
   After the subsidy, foreign producers received 1.5 million x 50c = $750,000.

6. Calculate the amount of government expenditure on the subsidy.
   The government will pay 50c on each litre of oil that is produced domestically = 1 million x 50c = $500,000. The area A + B in the diagram.

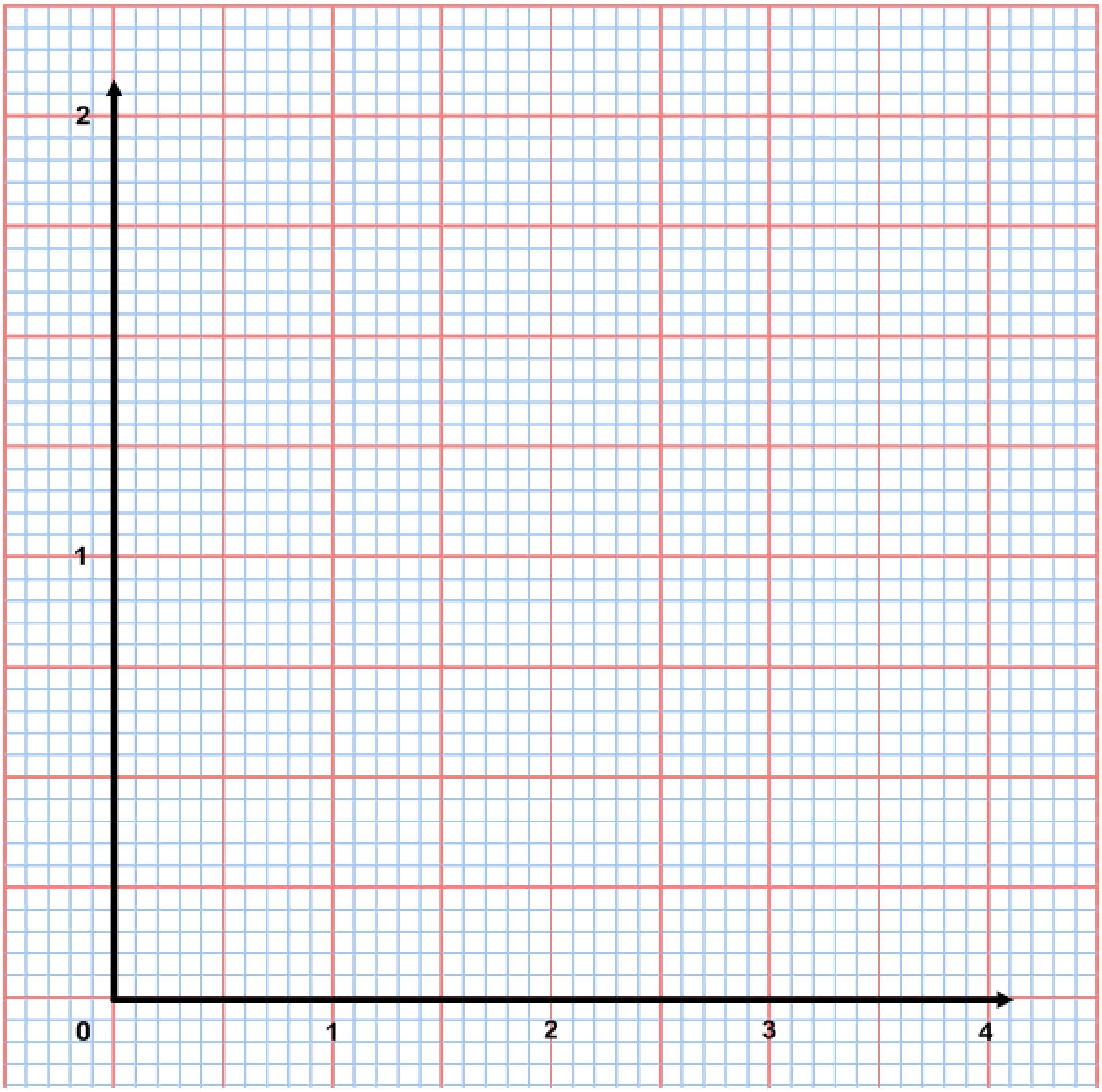
7. Calculate the dead-weight losses suffered as a result of granting the subsidy.
   The dead-weight loss is represented by the area B.
   Area B is the extra cost to “the world” of the output that is now produced by inefficient domestic producers, instead of efficient foreign producers = ½ x 500,000 x 50c = $125,000.

Now you have a go!!

Question 13.1

In the market for bottled water, the demand function is $Q_D = 3 – 2P$ and the supply function is $Q_S = 2P$, where price is given in $ per litre of water and quantity is given in millions of bottles per month.

i. Plot the curves from the functions above on the graph below. Fully label the axes.

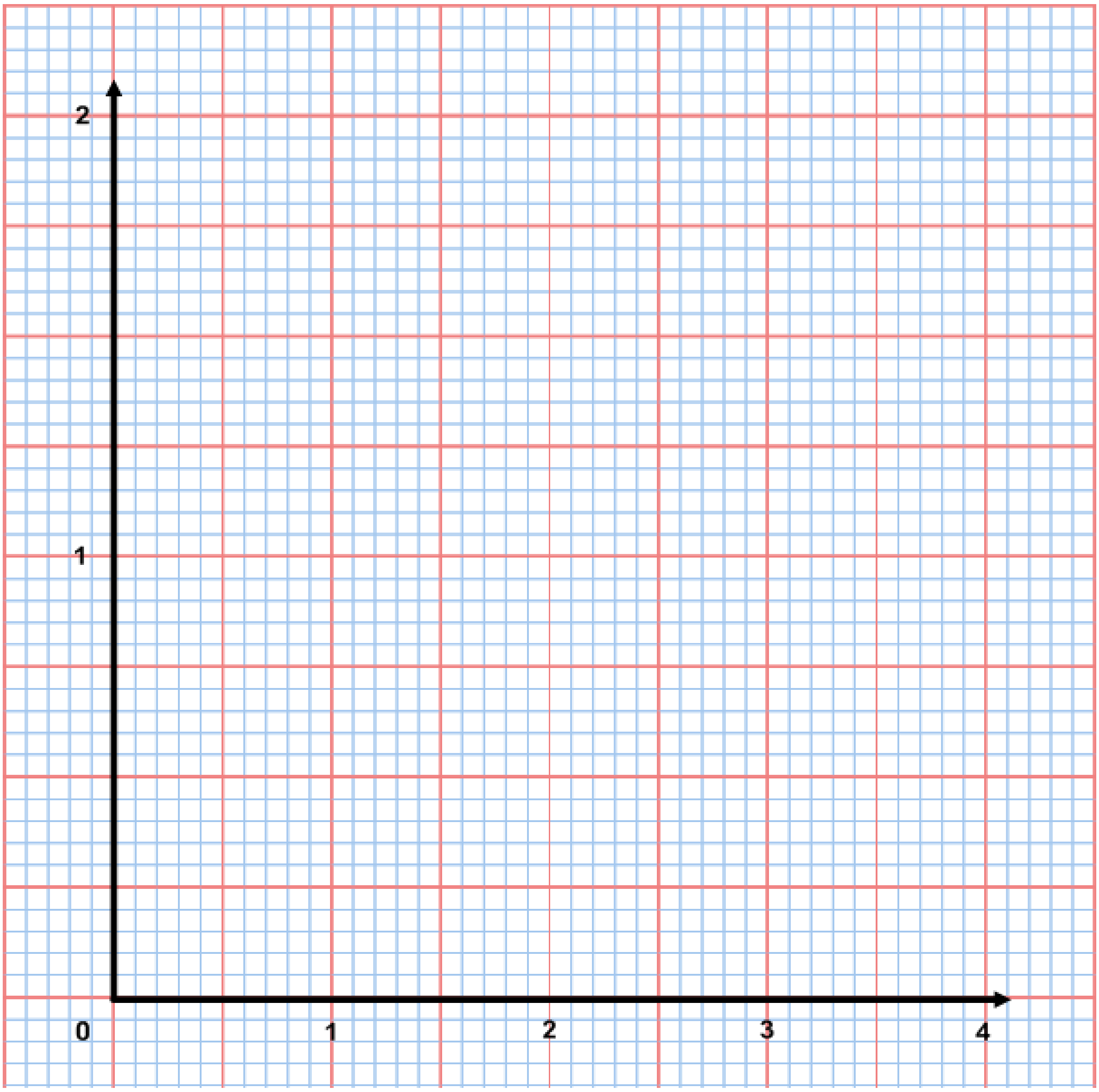


ii. Identify the equilibrium prices and quantities.
iii. Add the world supply curve if foreign producers are prepared to supply bottled water at $0.50.
iv. Show the effect on the diagram of the government putting a tariff of $0.10 on all imports of bottled water.
v. Identify the level of domestic production before the tariff and after.
vi. Calculate the amount of revenue for domestic producers before the tariff and after.
vii. Identify the level of imports before the tariff and after.
viii. Calculate the amount of revenue for foreign producers before the tariff and after.
ix. Calculate the amount of government revenue from the tariff.
x. Calculate the fall in consumer surplus resulting from the imposition of the tariff.
xi. Calculate the dead-weight losses suffered as a result of imposing the tariff.

Question 13.2

In the market for bottled water, the demand function is $Q_D = 3 - 2P$ and the supply function is $Q_S = 2P$, where price is given in $ per litre of water and quantity is given in millions of bottles per month. *(The x-axis should be from 0 to 4 and the y-axis should be from 0 to 2.)*

i. Plot the curves from the functions above on the graph below. Fully label the axes.



ii. Identify the equilibrium prices and quantities.

iii. Add the world supply curve if foreign producers are prepared to supply bottled water at $0.50.

iv. Show the effect on the diagram of the government putting a quota on imports of 600,000 litres of bottled water.

v. Identify the level of domestic production before the quota and after.

vi. Calculate the amount of revenue for domestic producers before the quota and after.

vii. Identify the level of imports before the quota and after.

viii. Calculate the amount of revenue for foreign producers before the quota and after.

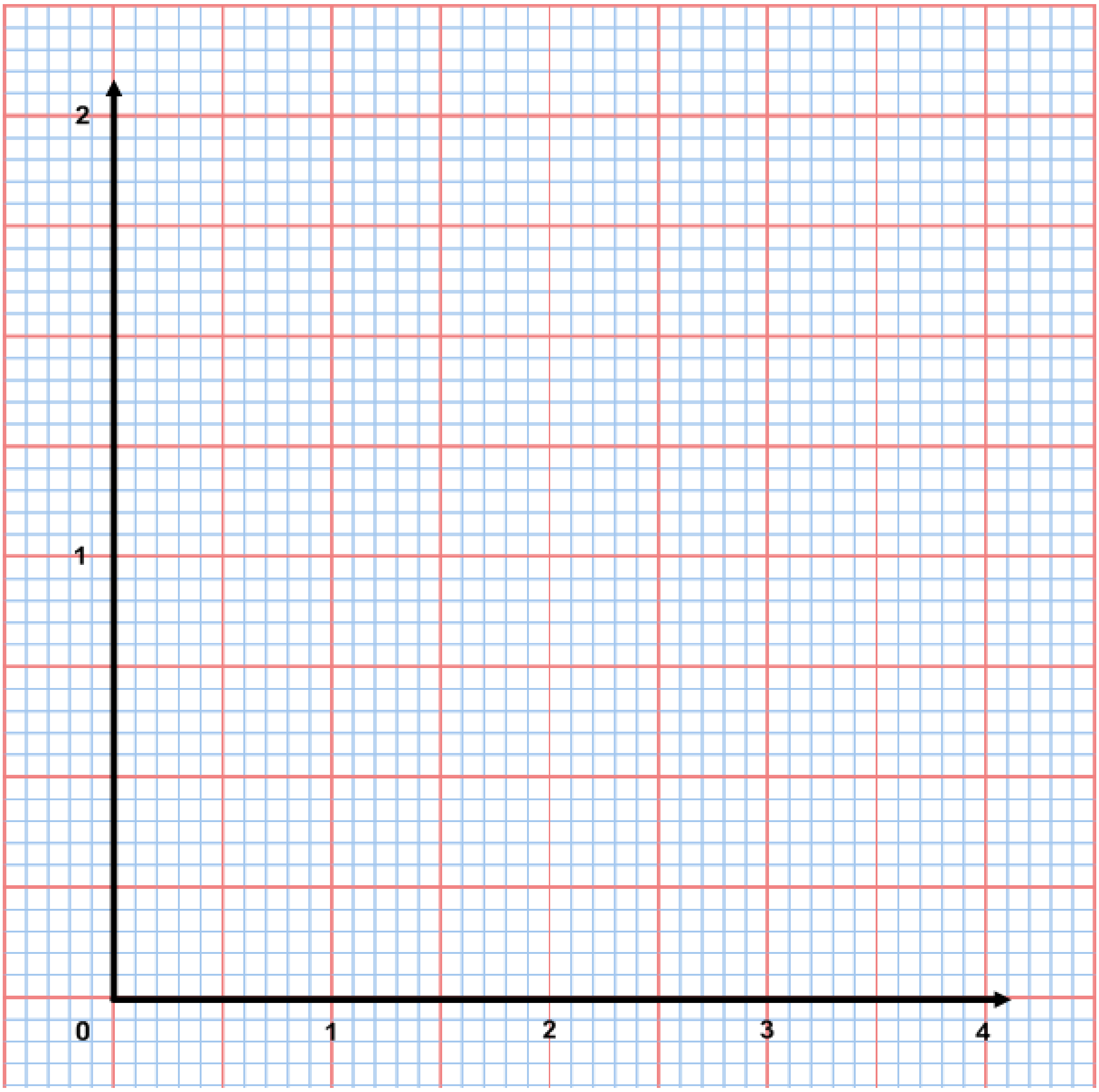
ix. Calculate the fall in consumer surplus resulting from the imposition of the quota.

x. Calculate the dead-weight losses suffered as a result of imposing the quota.

Question 13.3

In the market for bottled water, the demand function is $Q_D = 3 - 2P$ and the supply function is $Q_S = 2P$, where price is given in $ per litre of water and quantity is given in millions of bottles per month. *(The x-axis should be from 0 to 4 and the y-axis should be from 0 to 2.)*

i. Plot the curves from the functions above on the graph below. Fully label the axes.



ii. Identify the equilibrium prices and quantities.

iii. Add the world supply curve if foreign producers are prepared to supply bottled water at $0.50.

iv. Show the effect on the diagram of the government grants a subsidy of $0.20 on all domestic production of bottled water.

v. Identify the level of domestic production before the subsidy and after.

vi. Calculate the amount of revenue for domestic producers before the subsidy and after.

vii. Identify the level of imports before the subsidy and after.

viii. Calculate the amount of revenue for foreign producers before the subsidy and after.

ix. Calculate the amount of government expenditure on the subsidy.

x. Calculate the dead-weight losses suffered as a result of granting the subsidy.

Topic 14 – Exchange rates

You need to be able to:

- Calculate the value of one currency in terms of another currency.
- Plot demand and supply curves for a currency from linear functions and identify the equilibrium exchange rate.
- Using exchange rates, calculate the price of a good in different currencies.

Calculating the value of one currency in terms of another currency.
You may be asked to make various calculations relating to exchange rates and changes in exchange rates:

E.g.

1. The US dollar is currently trading against the Euro at a rate of US$1 = €0.8. What is the rate for €1 in US$?
   To change an exchange rate around, we simply take the reciprocal of the existing rate.
   So, if US$1 = €0.8, then €1 = $\frac{1}{0.8}$ = US$1.25

Now you have a go!!

Question 14.1
The table below shows the value of the Euro against five other currencies. Fill in column 3 to express the value of one unit of each of the currencies in Euros.

	Price of Euro in foreign currency	Price of foreign currency in Euros
US Dollar	€1 = 1.29 USD	1 USD =
British Pound	€1 = 0.81GBP	1 GBP =
Australian Dollar	€1 = 1.27 AUD	1 AUD =
Canadian Dollar	€1 = 1.26 CAD	1 CAD =
Emirati Dirham	€1 = 4.75 AED	1 AED =

Plotting demand and supply curves for a currency from linear functions and identifying the equilibrium exchange rate.
You may be asked to identify the equilibrium exchange rate using linear demand and supply functions. This is no different from finding the equilibrium price in a demand and supply question, so go to pages 3 to 7 to check the method.

Now you have a go!!

Question 14.2
Country X has a currency know as the 'Pesho'. The country is involved in international trade and the Pesho is a fully convertible currency that is allowed to float freely on the foreign exchange markets.

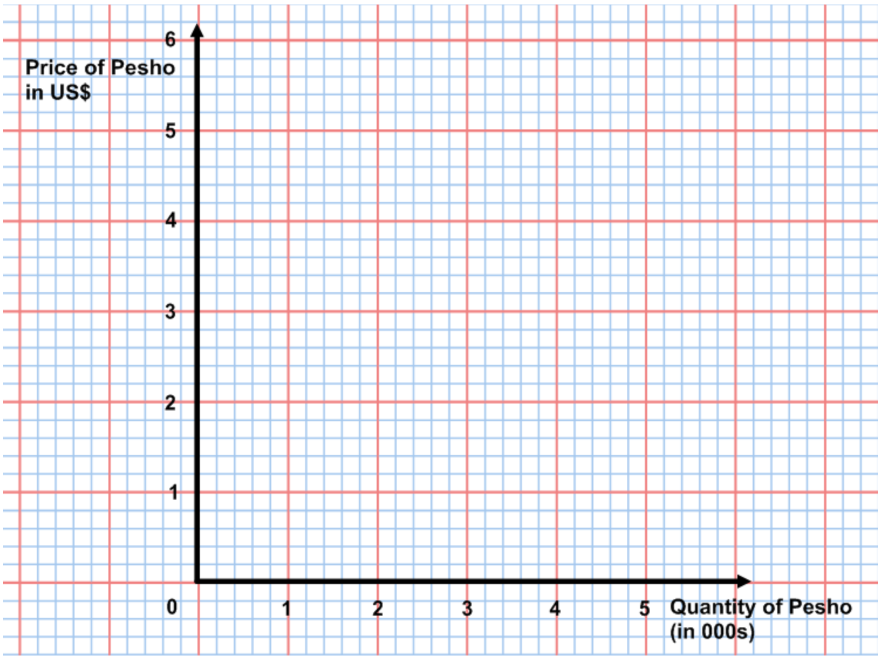
The demand and supply functions for the Pesho are given below:

$Q_D = 3200 – 400E$

$Q_S = -400 + 400E$

Where E is the exchange rate of the Pesho against the US dollar.

i. Make a table to show the demand schedule and supply schedule for the Pesho, when exchange rates are \$0, \$1, \$2, \$3, \$4 and \$5.



Using the axes above:

ii. Draw a diagram to show the demand curve and supply curves that represent the demand and supply schedules that you have made.

iii. Illustrate the exchange rate.

iv. Using simultaneous equations, calculate the exchange rate.

Now let us assume that the demand function for the Pesho changes to:

$Q_D = 3\,600 - 400P$

v. Explain **two** factors that might have caused the change in the demand function.

vi. Make a new table to show the demand schedule for the new demand function, when exchange rates are \$0, \$1, \$2, \$3, \$4 and \$5.

vii. Add the demand curve that represents the new schedule to the diagram that you drew in 2.

viii. Illustrate the new equilibrium exchange rate.

ix. Explain the likely effect that the change in the exchange rate will have upon the demand for exports and imports in Country X.

Calculating the price of a good in different currencies, using exchange rates.
You may be asked to make various calculations relating to exchange rates and the prices of goods in different countries:

E.g.

i. If US$1 = €0.8, what would be the cost in Euros of a good that was selling for US$75?

   If a good is selling for US$75, then its cost in Euros will be 75 x €0.8 = €60.

ii. If the exchange rate changes from US$1 = €0.8 to US$1 = €0.9, explain what would happen to the Euro price of an American-manufactured dress shirt that was being exported to Europe from the USA at a cost of US$150.

   With the original exchange rate of US$1 = €0.8, the dress shirt would cost €120 (150 x €0.8). With the new exchange rate, the value of the Euro has depreciated. It now costs more Euros to buy the same amount of dollars, and so the price of the dress shirt increases to €135 (150 x €0.9).

Now you have a go!!

Question 14.3
The table below shows the exchange rate between the Euro and five other currencies:

	Price of Euro in foreign currency
US Dollar	€1 = 1.29 USD
British Pound	€1 = 0.81GBP
Australian Dollar	€1 = 1.27 AUD
Canadian Dollar	€1 = 1.26 CAD
Emirati Dirham	€1 = 4.75 AED

If a large beer costs €4 in Vienna, then what would be the cost in each of the currencies above?

Question 14.4
The table below shows the exchange rate between the Euro and five other currencies at an interval of 6 months:

	Price of Euro in foreign currency - January	Price of Euro in foreign currency - July
US Dollar	€1 = 1.29 USD	€1 = 1.35 USD
British Pound	€1 = 0.81GBP	€1 = 0.95 GBP
Australian Dollar	€1 = 1.27 AUD	€1 = 1.15 AUD
Canadian Dollar	€1 = 1.26 CAD	€1 = 1.10 CAD
Emirati Dirham	€1 = 4.75 AED	€1 = 4.15 AED

For each of the currencies above:

i. Calculate the cost of a €25 phone card in each time period – January and July.
ii. Using figures, explain whether the Euro has got weaker or stronger against the currency.

Topic 15 – Balance of payments

You need to be able to:

- Calculate elements of the balance of payments from a set of data.

Calculating elements of the balance of payments from a set of data.
You may be asked to calculate figures to fill in the gaps in the IB approved version of the Balance of Payments table.

E.g.
An extract from the balance of payments figures for Country X is shown below:

Line	Balance of Payments figures for Country X	
	[millions of dollars]	
	(Credits +; debits -)	**2011**
	Current account	
1	Exports of goods	?
2	Imports of goods	-661,200
3	**Balance of Trade in goods**	-273,400
4	Exports of services	162,800
5	Imports of services	-122,400
6	**Balance of Trade in services**	?
7	Income receipts (*investment income)*	276,500
8	Income payments (*investment income)*	-243,400
9	**Net income receipts** (*net investment income)*	33,100
10	**Current transfers, net**	-38,500
11	**Net income flows**	?
12	**Current Account Balance**	**?**
13	**Capital Account**	
14	Capital account transactions, net	130
15	**Financial Account**	
16	Direct investment, net	105,885
17	Portfolio investment, net	84,700
18	Reserve assets funding	?
19	Errors and omissions	26,500
20	**Capital and Financial Account Balance**	**?**

1. Fill in the six missing values in the table, indicating whether they are credits (+) or debits (-) to the accounts.

   This is easily done, by considering whether the values are money coming into the country or going out.
   Exports of goods are money coming in, but the overall Balance of Trade in goods is negative, so the Export of goods must be less than the imports of goods (money going out).
   Exports of goods must be 661,200 – 273,400 = + $387,800 million.

Balance of Trade in services will be exports of services – imports of services = 162,800 – 122,400 = + $40,400 million.

Net income flows are the total of net income flows and net transfers, so they are 33,100 – 38,500 = - $5,400 million.

Current Account Balance is the balance of Trade in goods + Balance of Trade in Services + Net Income Flows = -273,400 + 40,400 – 5,400 = - $238,400 million

Reserve assets funding is, in effect, the balancing item in the Capital and Financial Account. If the Capital and Financial Account needs to sum together to be + $238,400 million (see below), then the Reserve asset funding will be x in the equation below:

130 + 105,885 + 84,700 + x + 26,500 = + $238,400 million

So Reserve Asset Funding (x) = + $21,185 million.

Capital and Financial Account Balance – the total of the Current Account and the Capital and Financial Account should sum to zero. So, if the Current Account balance is - $238,400 million, then the Capital and Financial Account balance should be the opposite, i.e. + $238,400 million.

The structure of the balance of payments for IBDP economics students is as below:

Current account

- Balance of trade in goods
- Balance of trade in services
- Income
- Current transfers

Capital account

- Capital transfers
- Transactions in non-produced, non-financial assets

Financial account

- Direct investment
- Portfolio investment
- Reserve assets

Current account = capital account + financial account + errors and omissions

Now you have a go!!

Question 15.1
An extract from the balance of payments figures for Country Y is shown below:

Line	Balance of Payments figures for Country Y	
	[millions of dollars]	
	(Credits +; debits -)	**2011**
	Current account	
1	Exports of goods	+387,800
2	Imports of goods	-661,200
3	**Balance of Trade in goods**	**?**
4	Exports of services	162,800
5	Imports of services	**?**
6	**Balance of Trade in services**	+40,400
7	Income receipts (*investment income)*	276,500
8	Income payments (*investment income)*	-243,400
9	**Net income receipts** (*net investment income)*	**?**
10	**Current transfers, net**	-38,500
11	**Net income flows**	-5,400
12	**Current Account Balance**	**?**
13	**Capital Account**	
14	Capital account transactions, net	130
15	**Financial Account**	
16	Direct investment, net	105,885
17	Portfolio investment, net	**?**
18	Reserve assets funding	21,185
19	Errors and omissions	26,500
20	**Capital and Financial Account Balance**	**?**

i. Showing your working, fill in the six missing values in the table, indicating whether they are credits (+) or debits (-) to the accounts.

Topic 16 – Terms of Trade

You need to be able to:

- Calculate the terms of trade using the equation: $\frac{\text{Index of average export prices}}{\text{Index of average import prices}}\ x\ 100$

Calculating the terms of trade using the equation: $\frac{\textbf{Index of average export prices}}{\textbf{Index of average import prices}}\ \boldsymbol{x}\ \mathbf{100}$

The terms of trade is an index that shows the value of a country's average export prices relative to their average import prices. If you are asked to calculate the terms of trade, you simply place the figures you are given in the equation for the terms of trade shown above.

E.g. You may be asked to find the Terms of Trade for Year 3. In that case, you use the equation as below, dividing the index of average export prices by the index of average import prices and multiplying by 100.

Year	Index of Average Export Prices	Index of Average Import Prices	Calculation	Terms of Trade
1	100	100	$\frac{100}{100}\ x\ 100$	100
2	102	100		
3	106	104	$\frac{106}{104}\ x100$	101.92
4	110	110		
5	108	106		
6	106	108		

Now you have a go!!

Question 16.1

i. Using the data in the table above, calculate the terms of trade for years 2, 4, 5 and 6.

ii. Describe the change in the terms of trade between years 4 and 5. What does this mean about the buying power of exports?

iii. How does the buying power of the country's exports in Year 6 compare with Year 1?