IB HIGHER LEVEL ECONOMICS

QUANTITATIVE ECONOMICS

THE COMPLETE TEACHING GUIDE
THE ANSWERS

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CONTENTS

Topic 1 – Linear Demand and Supply Functions and Equilibrium

DEMAND FUNCTIONS

Question 1

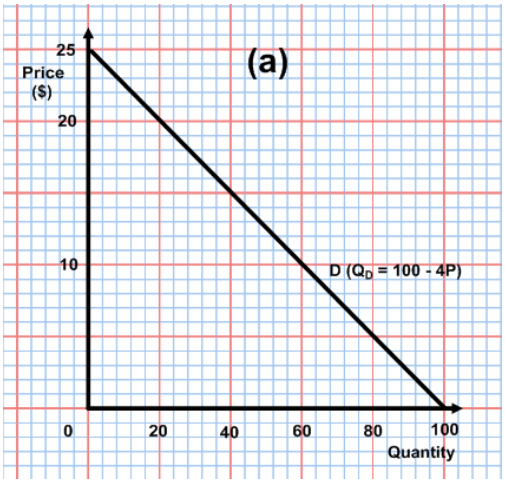
On the axes below, plot the following linear demand functions:

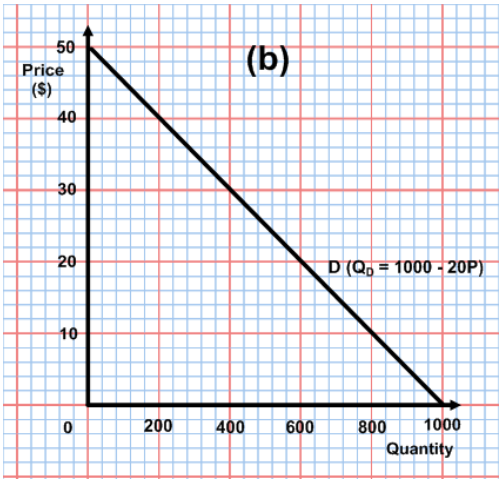
a. $Q_D = 100 – 4P$

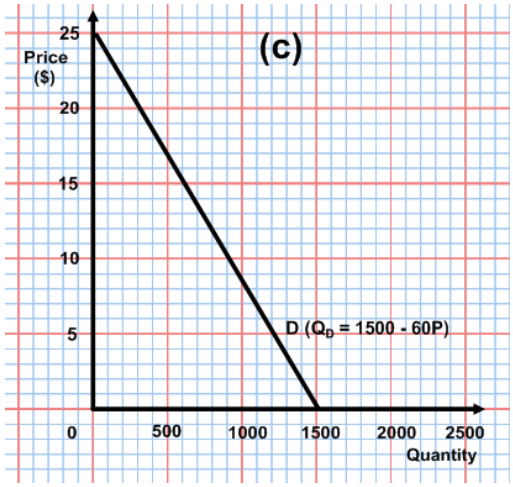
b. $Q_D = 1000 – 20P$

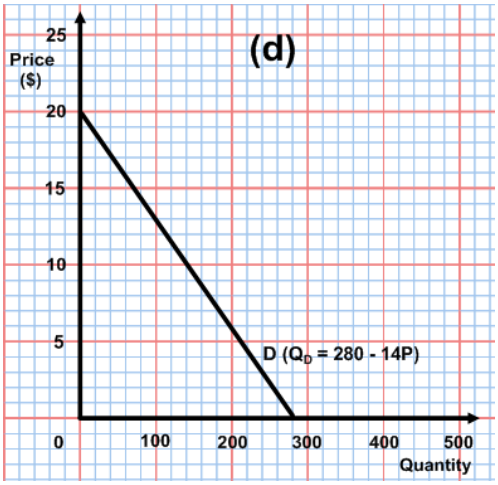
c. $Q_D = 1500 – 60P$

d. $Q_D = 280 – 14P$









SUPPLY FUNCTIONS

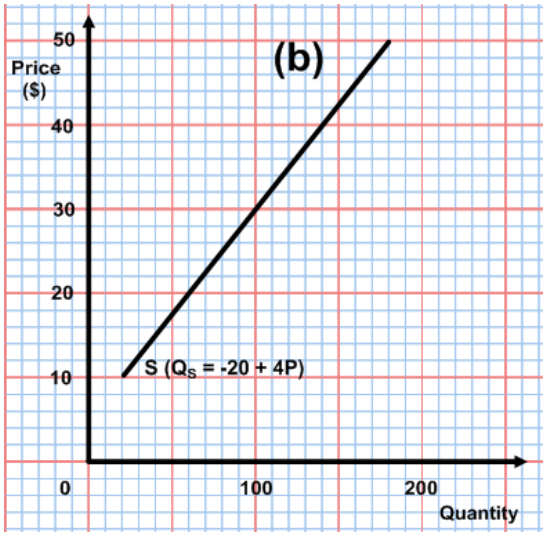
Question 1
On the axes below, plot the following linear supply functions:

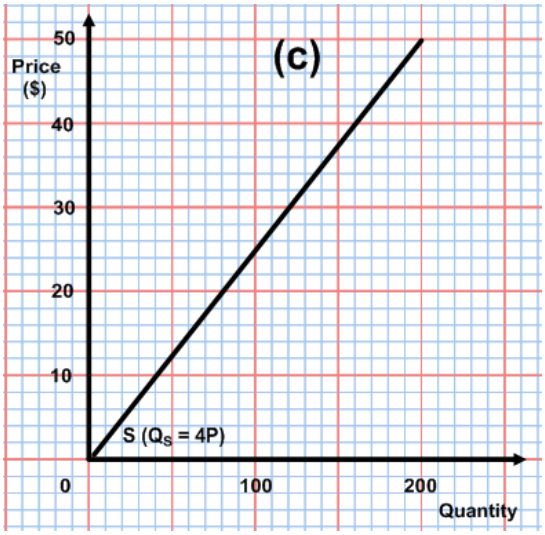
a. $Q_s = 20 + 4P$

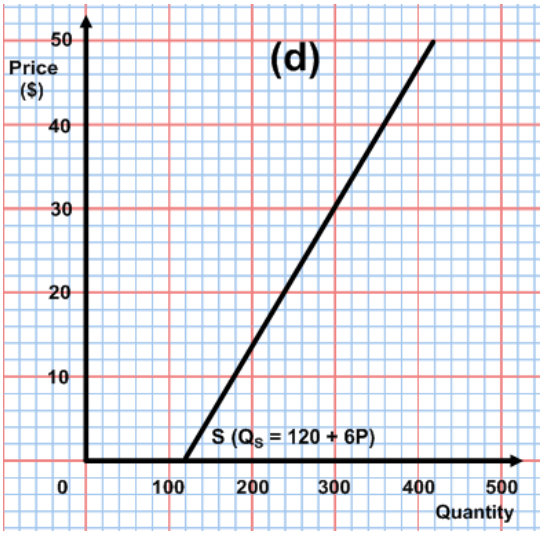
b. $Q_s = -20 + 4P$

c. $Q_s = 4P$

d. $Q_s = 120 + 6P$







EQUILIBRIUM PRICE AND QUANTITY

Question 1

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.

At equilibrium: $Q_D = Q_s$

$2000 – 200P = -400 + 400P$

$2400 = 600P$

P = $4 per tube of toothpaste

Substitute into demand function to get quantity (or supply function):

$Q_D = 2000 – (200 \times 4)$

$Q_D = 1{,}200$

Q_D = 1,200,000 tubes of toothpaste per month

Question 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. Calculate the equilibrium price and quantity.

At equilibrium, $Q_D = Q_s$

$900 – 100P = 200P$

$900 = 300P$

P = $3 per chocolate bar

Substitute into supply function to get quantity (or demand function):

$Q_S = (200 \times 3)$

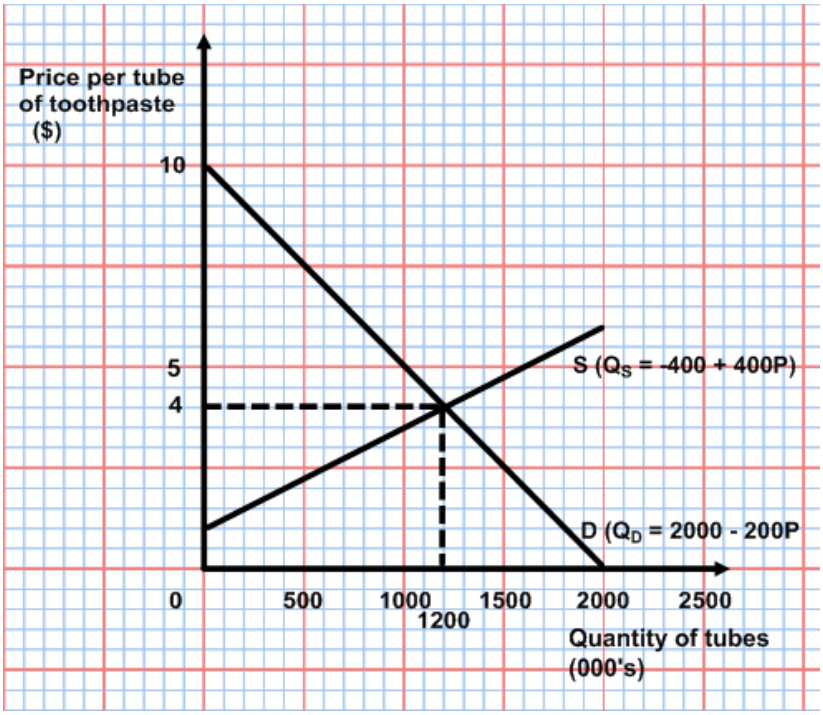
$Q_S = 600$

Q_S = 600,000 chocolate bars per month

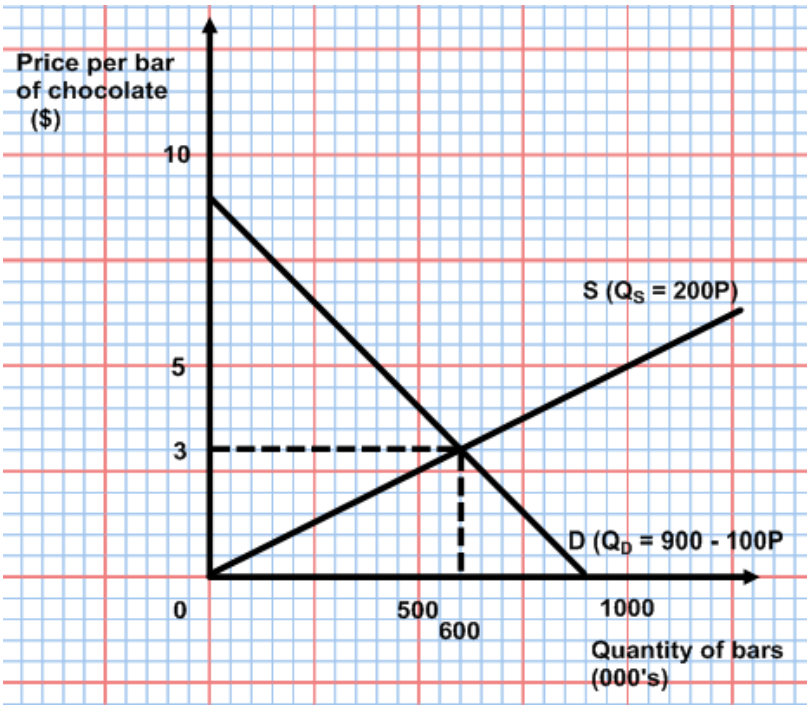
Question 3

On graphed paper, plot the curves in the two questions above and identify the equilibrium prices and quantities. Fully label the diagrams. (In the first question, the x-axis should be from 0 to 2,200 and the y-axis should be from 0 to 11. In the second question, the x-axis should be from 0 to 1,000 and the y-axis should be from 0 to 10)

Answer to Question 1:



Answer to Question 2:



Calculating Excess Demand or Supply

Question 1

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.

Substitute the price into the demand equation:

$Q_D = 2000 – (200 \times 3)$

$Q_D = 2000 – 600$

$Q_D = 1400$

$Q_D = 1{,}400{,}000$ tubes of toothpaste

Substitute the price into the supply equation:

$Q_S = -400 + (400 \times 3)$

$Q_S = -400 + 1200$

$Q_S = 800$

$Q_S = 800{,}000$ tubes of toothpaste

Subtract the supply from the demand:

Excess demand = 1,400,000 – 800,000 = 600,000 tubes of toothpaste

Question 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. Calculate the excess demand or supply at a price of $4 per tube.

Substitute the price into the demand equation:

$Q_D = 900 – (100 \times 4)$

$Q_D = 900 – 400$

$Q_D = 500$

$Q_D = 500{,}000$ bars of chocolate

Substitute the price into the supply equation:

$Q_S = (200 \times 4)$

$Q_S = 800$

$Q_S = 800{,}000$ bars of chocolate

Subtract the demand from the supply:

Excess supply = 800,000 – 500,000 = 300,000 bars of chocolate

Topic 2 – Elasticities

Price Elasticity of Demand (PED)

Question 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%.*

$$PED = \frac{\%\,\Delta\ in\ QD}{\%\,\Delta\ in\ Price} = \frac{-10}{+16} = -0.625$$

b. *If price increases from $7.00 to $7.70 and quantity demanded falls from 75 units to 60 units.*

$$PED = \frac{\%\,\Delta\ in\ QD}{\%\,\Delta\ in\ Price} = \frac{\frac{-15}{75}\ x\ 100}{\frac{+.7}{7}\ x\ 100} = \frac{-20\%}{+10\%} = -2$$

c. *If price falls from $6.50 to $5.20 and quantity demanded increases from 1,200 to 1,260 units.*

$$PED = \frac{\%\,\Delta\ in\ QD}{\%\,\Delta\ in\ Price} = \frac{\frac{+60}{1200}\ x\ 100}{\frac{-1.30}{6.50}\ x\ 100} = \frac{+5\%}{-20\%} = -0.25$$

Question2

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?*

$$PED = \frac{\%\,\Delta\ in\ QD}{\%\,\Delta\ in\ Price} = \frac{3}{4} = \frac{X}{+12\%}\ \therefore X = -9\%\ (3{:}4\ ratio)$$

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?*

$$PED = \frac{\%\,\Delta\ in\ QD}{\%\,\Delta\ in\ Price} = \frac{5}{4} = \frac{+20\%}{X}\ \therefore X = -16\%\ (5{:}4\ ratio)$$

Question 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?*

Because the PED for the good is elastic, the increase in QD will be relatively greater than the fall in price.

She was selling 400 units at $300 each = $120,000 total revenue

She lowers her price by $\frac{15}{300}\ x\ 100 = 5\%$ so the QD will increase by 8% (ratio $8{:}5$).

The QD will increase by 32 units (8% of 400), so she will now sell 432 units at $285 each = $123,120, an increase of $3,120.

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?*

The producer lowers the price by $\frac{-3}{20}\ x\ 100 = -15\%$.

If the producer gets $400 total revenue, from a price of $20, then she must be selling $\frac{400}{20} = 20\ units$.

The quantity demanded increases by $\frac{+4}{20}\ x\ 100 = +20\%$.

$$Therefore, PED = \frac{\%\ \Delta\ in\ QD}{\%\ \Delta\ in\ Price} = \frac{+20}{-15} = 1.33$$

Total revenue changes from $400 per week to 24 units x $17 = $408 per week.

An increase of $8!

Cross Elasticity of Demand (XED)

Question 1

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%.*

$$XED = \frac{\%\ \Delta\ in\ Demand\ for\ Good\ A}{\%\ \Delta\ in\ Price\ of\ Good\ B} = \frac{-10}{+16} = -0.625$$

The goods are complements.

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.*

$$XED = \frac{\%\ \Delta\ in\ Demand\ for\ \ Good\ A}{\%\ \Delta\ in\ Price\ of\ Good\ B} = \frac{\frac{-15}{75}\ x\ 100}{\frac{+.7}{7}\ x\ 100} = \frac{-20\%}{+10\%} = -2$$

The goods are complements

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.*

$$XED = \frac{\%\ \Delta\ in\ Demand\ for\ \ Good\ A}{\%\ \Delta\ in\ Price\ of\ Good\ B} = \frac{\frac{-60}{1200}\ x\ 100}{\frac{-1.30}{6.50}\ x\ 100} = \frac{-5\%}{-20\%} = +0.25$$

The goods are substitutes

Income Elasticity of Demand (YED)

Question 1

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%.*

$$YED = \frac{\%\,\Delta\ in\ Demand}{\%\,\Delta\ in\ Income} = \frac{-10}{+16} = -0.625$$

The good is an inferior good.

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.*

$$YED = \frac{\%\,\Delta\ in\ Demand}{\%\,\Delta\ in\ Income} = \frac{\frac{+12}{80}\ x\ 100}{\frac{+2500}{25000}\ x\ 100} = \frac{+15\%}{+10\%} = +1.5$$

The good is a normal (superior) good.

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.*

$$YED = \frac{\%\,\Delta\ in\ Demand}{\%\,\Delta\ in\ Income} = \frac{\frac{-3.5}{70}\ x\ 100}{\frac{+1250}{25000}\ x\ 100} = \frac{-5\%}{+5\%} = -1$$

The good is an inferior good.

Price Elasticity of Supply (PES)

Question 1

Calculate the PES for the following changes:

a. *If the price of a good increases by 16% and the quantity supplied increases by 10%.*

$$PES = \frac{\%\,\Delta\ in\ QS}{\%\,\Delta\ in\ Price} = \frac{+10}{+16} = 0.625$$

b. If price increases from $7.00 to $7.70 and quantity supplied increases from 75 units to 90 units.

$$PES = \frac{\%\,\Delta\ in\ QS}{\%\,\Delta\ in\ Price} = \frac{\frac{+15}{75}\ x\ 100}{\frac{+.7}{7}\ x\ 100} = \frac{+20\%}{+10\%} = 2$$

c. If price falls from \$6.50 to \$5.20 and quantity supplied falls from 1,200 to 1,140 units.

$$PES = \frac{\%\,\Delta\ in\ QS}{\%\,\Delta\ in\ Price} = \frac{\frac{-60}{1200}\ x\ 100}{\frac{-1.30}{6.50}\ x\ 100} = \frac{-5\%}{-20\%} = 0.25$$

Question2

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?

$$PES = \frac{\%\,\Delta\ in\ QS}{\%\,\Delta\ in\ Price} = \frac{3}{4} = \frac{X}{+12\%}\ \therefore X = +9\%\ (3{:}4\ ratio)$$

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?

$$PES = \frac{\%\,\Delta\ in\ QS}{\%\,\Delta\ in\ Price} = \frac{5}{4} = \frac{-20\%}{X}\ \therefore X = -16\%\ (5{:}4\ ratio)$$

Topic 3 – Specific Taxes and Subsidies

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).

Question 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. (The x-axis should be from 0 to 1,000 and the y-axis should be from 0 to 10.)

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

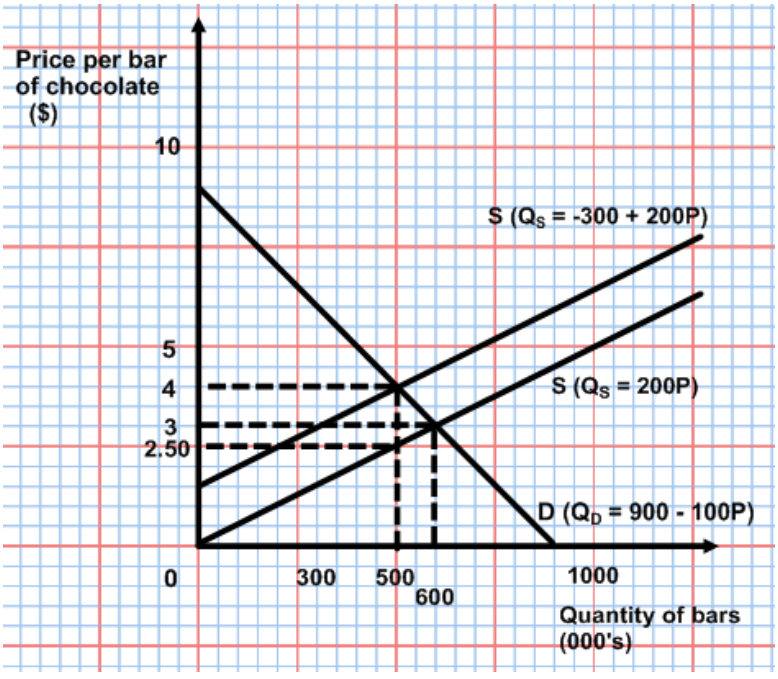
ii. Calculate the new supply function, after the tax, draw it on the diagram and indicate the new equilibrium price and quantity.

The new supply function is:

$Q_S = 200(P – 1.5)$

$Q_S = 200P – 300 = -300 + 200P$

The diagram for (i) and (ii) is shown below:



iii. Calculate the change in consumer expenditure.

Original consumer expenditure = 600,000 x $3 = $1,800,000

New consumer expenditure = 500,000 x $4 = $2,000,000

There is an increase in expenditure of $200,000.

iv. Calculate the change in producer revenue.

Original producer revenue = 600,000 x $3 = $1,800,000

New producer revenue = 500,000 x $2.50 = $1,250,000

There is a decrease in revenue of $550,000.

v. Calculate the government tax revenue.

Government revenue = 500,000 x $1.50 = $750,000.

vi. Calculate the loss of consumer surplus.

The loss of consumer surplus is (500,000 x $1) + (½ x $1 x 100,000) = $500,000 + $50,000 = $550,000.

vii. Calculate the loss of producer surplus.

The loss of producer surplus is (500,000 x $0.50) + (½ x $0.50 x 100,000) = $250,000 + 25,000 = $275,000.

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).

Question 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.

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

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

At equilibrium, $Q_D = Q_s$

$900 – 100P = 200P$

$900 = 300P$

$P = \$3$ per chocolate bar

Substitute into supply function to get quantity (or demand function):

$Q_S = (200 \times 3)$

$Q_S = 600$

$Q_S = 600{,}000$ chocolate bars per month

ii. The new supply function, after the tax.

The new supply function is:

$Q_S = 200(P – 1.5)$

$Q_S = 200P – 300 = -300 + 200P$

iii. The new equilibrium price and quantity.

At equilibrium, $Q_D = Q_s$

$900 – 100P = -300 + 200P$

$1200 = 300P$

$P = \$4$ per chocolate bar

Substitute into supply function to get quantity (or demand function):

$Q_S = -300 + (200 \times 4)$

$Q_S = 500$

$Q_S = 500{,}000$ chocolate bars per month

iv. The change in consumer expenditure.

Original consumer expenditure = 600,000 x \$3 = \$1,800,000

New consumer expenditure = 500,000 x \$4 = \$2,000,000

There is an increase in expenditure of \$200,000.

v. The change in producer revenue.

Original producer revenue = 600,000 x \$3 = \$1,800,000

New producer revenue = 500,000 x \$2.50 = \$1,250,000

There is a decrease in revenue of \$550,000.

vi. The government tax revenue.

Government revenue = 500,000 x \$1.50 = \$750,000.

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).

Question 1

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. (The x-axis should be from 0 to 1,000 and the y-axis should be from 0 to 11.)

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

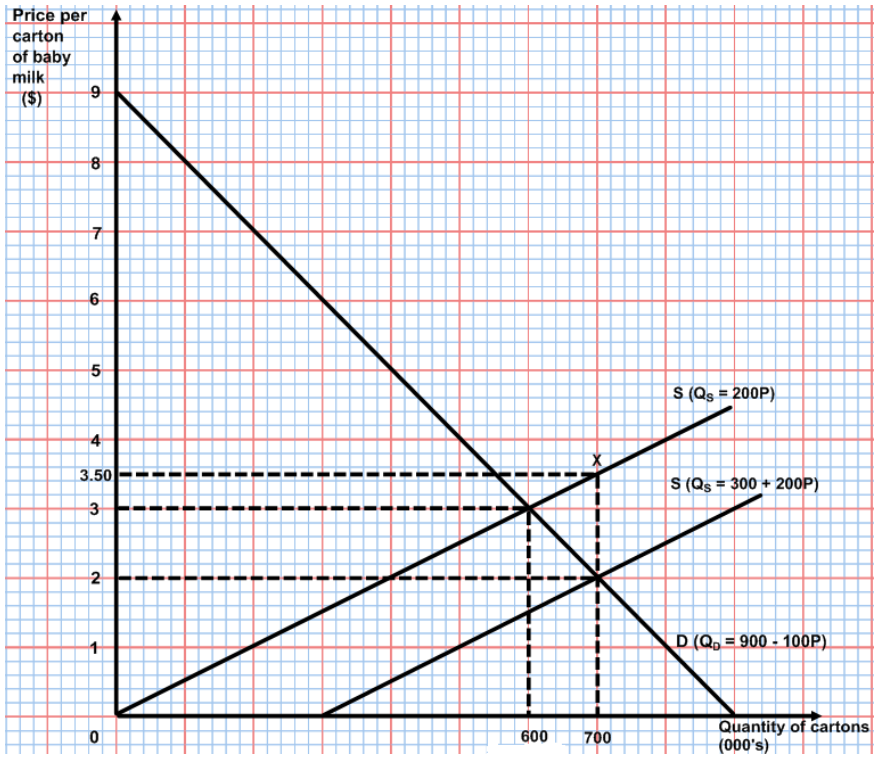
ii. Calculate the new supply function, after the subsidy, draw it on the diagram and indicate the new equilibrium price and quantity.

The new supply function is:

$Q_S = 200(P + 1.5)$

$Q_S = 200P + 300 = 300 + 200P$

The diagram for (i) and (ii) is shown below:



iii. Calculate the change in consumer expenditure.

Original consumer expenditure = 600,000 x $3 = $1,800,000

New consumer expenditure = 700,000 x $2 = $1,400,000

There is a decrease in expenditure of $400,000.

iv. *Calculate the change in producer revenue.*
Original producer revenue = 600,000 x $3 = $1,800,000

New producer revenue = 700,000 x ($2.00 + $1.50) = $2,450,000

There is an increase in revenue of $650,000.

v. *Calculate the government subsidy costs.*
The government spend 700,000 x $1.50 = $1,050,000

vi. *Calculate the increase in consumer surplus.*
The increase in consumer surplus is (600,000 x $1) + (½ x $1 x 100,000) = $600,000 + $50,000 = $650,000.

vii. *Calculate the increase in producer surplus.*
The increase in producer surplus is (600,000 x $0.50) + (½ x $0.50 x 100,000) = $300,000 + $25,000 = $325,000.

Another method:
Original producer surplus = (½ x 600,000 x $3) = $900,000

New producer surplus equals area of the triangle 0, 3.50, X = (½ x 700,000 x $3.50) = $1,225,000.

Therefore the increase = $1,225,000 - $900,000 = $325,000.

viii. *Calculate the dead-weight loss arising from the subsidy. [Extra credit]*
The community surplus (consumer surplus + producer surplus) increases by $650,000 + $325,000 = $975,000.

The cost of the subsidy to the government is $1,050,000 (see *Question v* above).

So it follows that the subsidy created a dead-weight loss of $1,050,000 - $975,000 = $75,000. This occurs because the extra 100,000 cartons would not have been produced in a free market.

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).

Question 1
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.*
At equilibrium, $Q_D = Q_s$

$900 – 100P = 200P$

$900 = 300P$

P = $3 per carton of baby milk

Substitute into supply function to get quantity (or demand function):

$Q_S = (200 \times 3)$

$Q_S = 600$

$Q_S = 600{,}000$ cartons of baby milk per month

ii. *The new supply function, after the subsidy.*
The new supply function is:

$Q_S = 200(P + 1.5)$

$Q_S = 200P + 300 = 300 + 200P$

iii. *The new equilibrium price and quantity.*
At equilibrium, $Q_D = Q_s$

$900 – 100P = 300 + 200P$

$600 = 300P$

P = $2 per carton of baby milk

Substitute into supply function to get quantity (or demand function):

$Q_S = 300 + (200 \times 2) = 300 + 400$

$Q_S = 700$

$Q_S = 700{,}000$ cartons of baby milk per month

iv. *The change in consumer expenditure.*
Original consumer expenditure = 600,000 x $3 = $1,800,000

New consumer expenditure = 700,000 x $2 = $1,400,000

Consumer expenditure falls by $1,800,000 - $1,400,000 = $400,000.

v. *The change in producer revenue.*
Original producer revenue = 600,000 x $3 = $1,800,000

New producer revenue = 700,000 x ($2 + $1.50) = $2,450,000

Producer revenue increases by $2,450,000 - $1,800,000 = $650,000.

vi. *The government cost of the subsidy.*
Cost of the subsidy is 700,000 x $1.50 = $1,050,000.

Topic 4 – Price ceilings and price floors

PRICE CEILINGS

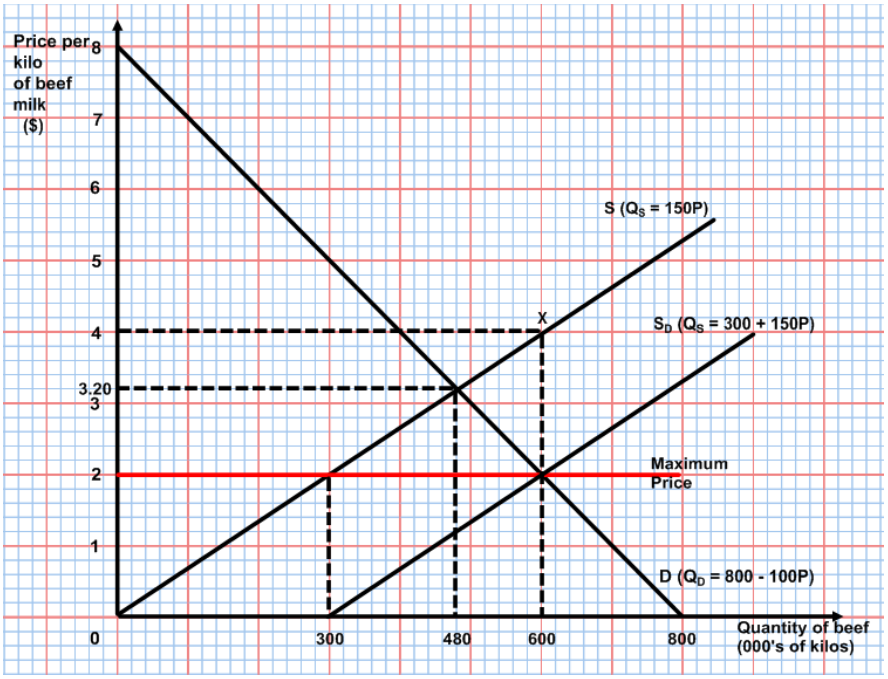
Calculate possible effects from the price ceiling (maximum price) diagram, including the resulting shortage, change in expenditure and total expenditure.

Question 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. (The x-axis should be from 0 to 900 and the y-axis should be from 0 to 9.)

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

ii. *On the graph, show the maximum price and indicate the quantities demanded and supplied at that price.*



iii. *From the graph, calculate the excess demand created.*
The excess demand is 600,000 – 300,000 = 300,000 kilos of beef.

iv. *From the graph, calculate the change in consumer expenditure.*
Consumers were originally spending 480,000 x $3.20 = $1,536,000.
After the maximum price, they spend $300,000 x $2 = $600,000.
There is a fall in expenditure of $936,000.

v. *Give the supply function, following a subsidy, which would eliminate the excess demand.*
The government needs to shift the supply curve to the right by 300,000 units to eliminate the excess demand, and so the supply function changes from QS = 150P to $Q_S = 300 + 150P$.

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.*
Producers are now producing at the equilibrium, where 600,000 kilos of beef are demanded and supplied at a price of $2. We can see from the original supply curve, without the subsidy that in order to supply 600,000 kilos, the producers need to receive $4 per kilo, so the subsidy per unit needs to be $4 - $2 = $2.

vii. *Calculate the total subsidy payment that the government would have to make.*
The government will have to pay $2 x 600,000 = $1,200,000.

viii. *Not using the graph, calculate the shortage at the maximum price. [Extra credit]*
At the maximum price of $2:
$Q_D = 800 – (100x2) = 600$ and $Q_S = (150 \times 2) = 300$.
Therefore the shortage is 600 – 300 = 300,000 kilos of beef.

ix. *Not using the graph, calculate the amount of the subsidy necessary to eliminate the shortage. [Extra credit]*
To get rid of the shortage when the price is $2, supply ($Q_S = 150P$) would have to shift to the right by 300,000 kilos at all prices. So, the new supply curve would be:
$Q_S = 150P + 300 = 300 + 150P$

If $2 is put into the new supply function, the quantity supplied is 300 + (150 x 2) = 600,000 kilos of beef.

The price that producers would be prepared to supply 600,000 kilos of beef without a subsidy can be got from the original supply function:
$Q_S = 150P$
$600 = 150P$
$P = \$4$.

The subsidy needed is thus the difference between the two prices, $4 - $2 = $2.

PRICE FLOORS

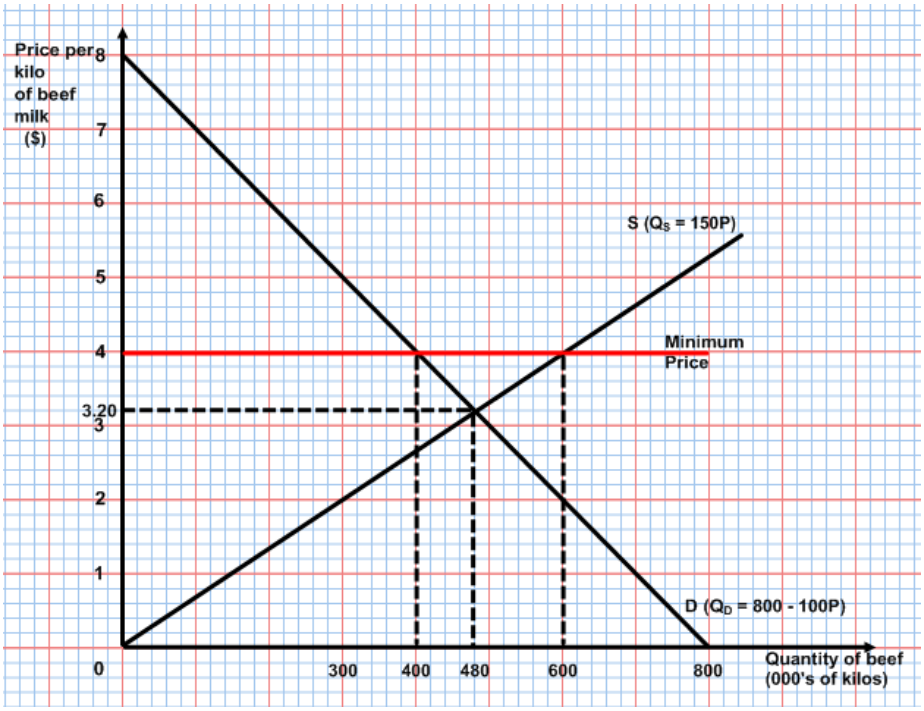
Calculate possible effects from the price floor (minimum price) diagram, including the resulting surplus, change in expenditure and total expenditure.

Question 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 minimum price of $4 per kilo in order to protect the farmers. (The x-axis should be from 0 to 900 and the y-axis should be from 0 to 9.)

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.*
The excess supply is 600 – 400 = 200,000 kilos of beef.

iv. *Calculate the amount the government will have to pay to buy up the surplus.*
The government would have to pay $4 x 200,000 = $800,000.

v. *Calculate the total revenue received by the farmers, if the government buys up the surplus.*
If the government buys up the surplus, total revenue will be $4 x 600,000 = $2,400,000.

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

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

Number of Variable Factors (V)	Total Product (TP) (Output)	Average Product (AP)	Marginal Product (MP)
0	0	0	0
1	5	**5**	**5**
2	**12**	6	7
3	21	**7**	9
4	32	**8**	**11**
5	**45**	9	**13**
6	56	**9.3**	11
7	**63**	9	**7**
8	**68**	8.5	**5**
9	**72**	8	4
10	75	**7.5**	**3**

Question 1
In the table above, 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.

Workers	Output	TFC	TVC	TC	AFC	AVC	ATC	MC
0	0	**400**	**0**	**400**	**-**	**-**	**-**	**-**
1	10	**400**	**200**	**600**	**40.00**	**20.00**	**60.00**	**20.00**
2	25	**400**	**400**	**800**	**16.00**	**16.00**	**32.00**	**13.33**
3	45	**400**	**600**	**1000**	**8.88**	**13.33**	**22.22**	**10.00**
4	70	400	800	1200	5.71	11.43	17.14	8.00
5	90	**400**	**1000**	**1400**	**4.44**	**11.11**	**15.55**	**10.00**
6	105	**400**	**1200**	**1600**	**3.81**	**11.43**	**15.24**	**13.33**
7	115	**400**	**1400**	**1800**	**3.48**	**12.17**	**15.65**	**20.00**
8	120	**400**	**1600**	**2000**	**3.33**	**13.33**	**16.66**	**40.00**

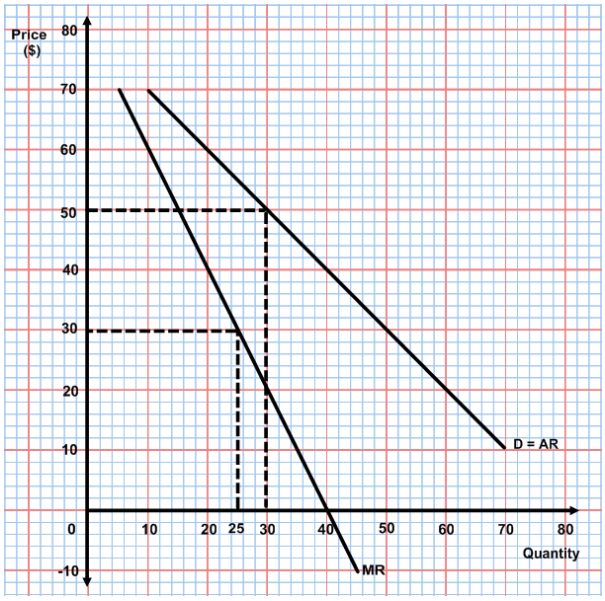
Question 1
In the table above, calculate and fill in all of the missing cost values.

Calculate total revenue, average revenue and marginal revenue from a set of data.

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

Question 1
In the table above, calculate and fill in all of the missing revenue values.

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



Question 1

From the above diagram, find:

a) the total revenue when sales are 50 units
Total revenue = price x quantity = $20 x 60 units = $1,200

b) the total revenue when the price is $40
c) Total revenue = price x quantity = $40 x 40 units = $1,600

d) the average revenue when sales are 60 units
AR = P = $20

e) the average revenue when the price is $20
AR = P = $20

f) the marginal revenue when sales increase from 10 units to 20 units
Total revenue at 10 units = 10 x $70 = $700.
Total revenue at 20 units = 20 x $60 = $1,200.

$$MR = \frac{\Delta TR}{\Delta q} = \frac{500}{10} = \$50$$

g) the marginal revenue when sales increase from 40 to 50 units
Total revenue at 40 units = 40 x $40 = $1,600.
Total revenue at 50 units = 50 x $30 = $1,500.

$$MR = \frac{\Delta TR}{\Delta q} = \frac{-100}{10} = -\$10$$

Question 2 (extra credit)

Calculate the price elasticity of demand from the figures on the diagram above when:

a) price increases from $20 to $30

QD falls from 60 units to 50 units.

$$PED = \frac{\%\Delta\ in\ QD}{\%\Delta in\ P} = \frac{\frac{60-50}{60}\ x\ 100}{\frac{30-20}{20}\ x\ 100} = \frac{-16.67\%}{50\%} = -0.33$$

b) price increases from $50 to $60

QD falls from 30 units to 20 units.

$$PED = \frac{\%\Delta\ in\ QD}{\%\Delta\ in\ P} = \frac{\frac{30-20}{30}\ x\ 100}{\frac{60-50}{50}\ x\ 100} = \frac{-33.33\%}{20\%} = -1.67$$

c) explain why the values above, in a) and b), are different

As we travel down a demand curve, the price falls and so we care less about changes in it. Thus, it is logical to assume that we will react less strongly to price changes lower down the demand curve and so PED will be more inelastic for changes in price at lower price levels. In this case, the PED value falls from -1.67 to -0.33 as we move from a high point on the demand curve to a low one.

Calculate different profit levels from a set of data.

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

Output	Price per unit	ATC	Profit per unit
100	$25	**$17 ($25 - $8)**	$8
200	$19	$15	$4
300	**$12 ($12 - $12 = 0**	$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	**$800 ($2500 - $1700)**
200	$3800	$3000	$800
300	$3600	**$3600 ($3600 - $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.

Question 1

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

Calculate different profit levels from diagrams.

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 = $30 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 = $13 x 250 units = $3,250.

Question 1

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

a) 50 units
Profit per unit = Price at 50 units – unit cost at 50 units =$40 - $18 = $22
Total profit = Profit per unit at 50 units x 50 units = $22 x 50 = $1,100

b) 100 units
Profit per unit = Price at 100 units – unit cost at 100 units =$35 - $15 = $20
Total profit = Profit per unit at 100 units x 100 units = $20 x 100 = $2,000

c) 150 units
Profit per unit = Price at 150 units – unit cost at 150 units =$30 - $13 = $17
Total profit = Profit per unit at 150 units x 150 units = $22 x 50 = $2,550

d) 200 units
Profit per unit = Price at 200 units – unit cost at 200 units =$25 - $12 = $13
Total profit = Profit per unit at 200 units x 200 units = $13 x 200 = $2,600

e) 300 units
Profit per unit = Price at 300 units – unit cost at 300 units =$15 - $15 = $0
Total profit = Profit per unit at 300 units x 300 units = $0 x 300 = $0

f) 350 units
Profit per unit = Price at 350 units – unit cost at 350 units =$10 - $18 = -$8
Total profit = Profit per unit at 350 units x 350 units = -$8 x 350 = -$2,800

Calculate the short run shut-down price and the break-even price from a set of data.

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

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

Question 1

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*

i. Is the firm making profits? No, they are making a loss of $2 per unit ($20 - $22).
ii. Will the firm close down in the short run? No, because the price is greater than the variable costs. They make a contribution to fixed costs of $2 per unit.
iii. Will the firm close down in the long run? Yes, because they cannot cover total costs in the long run.

b) Firm B

Quantity	*Price*	*AVC*	*ATC*
300	*$30*	*$24*	*$28*

i. Is the firm making profits? Yes, they are making an abnormal profit of $2 per unit ($30 - $28).
ii. Will the firm close down in the short run? No, because the price is greater than the variable costs. They make a contribution to fixed costs of $6 per unit.
iii. Will the firm close down in the long run? No, because they are covering their total costs in the long run.

c) Firm C

Quantity	*Price*	*AVC*	*ATC*
250	*$20*	*$22*	*$25*

i. Is the firm making profits? No, they are making a loss of $5 per unit ($20 - $25).
ii. Will the firm close down in the short run? Yes, because the price is less than the variable costs. They will lose less by not producing. They lose their fixed costs of $3 per unit, rather than $5 per unit.
iii. Will the firm close down in the long run? Yes, because they cannot cover total costs in the long run.

d) Firm D

Quantity	*Price*	*AVC*	*ATC*
200	*$20*	*$18*	*$20*

i. Is the firm making profits? No, they are making normal (zero) profits ($20 - $20).
ii. Will the firm close down in the short run? No, they are covering their variable costs.
iii. Will the firm close down in the long run? No, because they are covering their total costs in the long run.

Calculate from a set of data and/or diagrams the revenue maximizing level of output.

Question1

Quantity sold (q)	Price (p)($)	Average revenue (AR)	Total revenue (TR)	Marginal revenue (MR)
0	-	-		-
				140
100	140	140	14,000	
				100
200	120	120	24,000	
				60
300	100	100	30,000	
				20
400	80	80	32,000	
				-20
500	60	60	30,000	
				-60
600	40	40	24,000	
				-100
700	20	20	14,000	
				-140
800	-	-	-	

Using the figures from the table above:

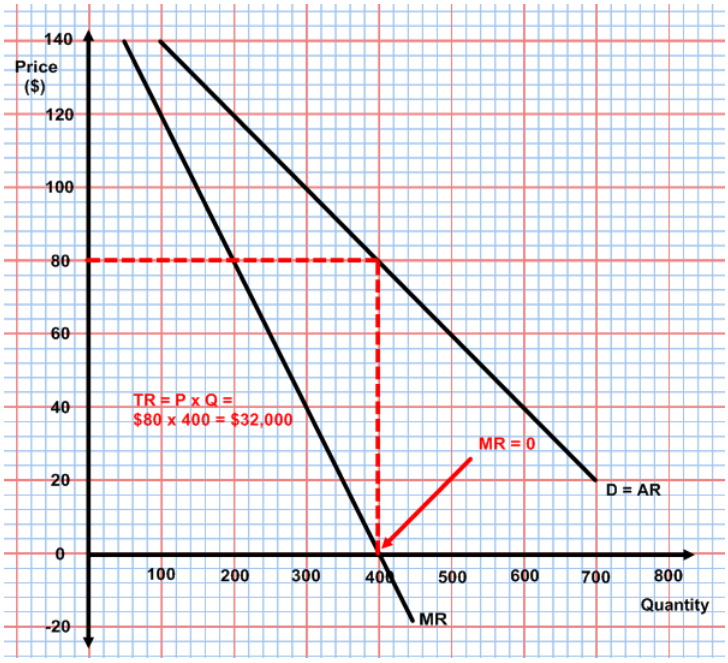
a) Complete the columns for AR, TR, and MR.
See above.

b) Identify the revenue maximising level of output.
Highlighted above.

c) Plot the AR and MR curves on a piece of graph paper.
See below.

d) On the graph, identify the revenue maximising level of output.
See below.

e) On the graph, calculate the revenue maximising level of output.



Question 2 (Extra credit)

a) *From the graph above, calculate the PED when price goes from $100 to $120.*
Price rises from $100 units to $120 units.

$$PED = \frac{\%\Delta\ in\ QD}{\%\Delta in\ P} = \frac{\frac{300-200}{300}\ x\ 100}{\frac{120-100}{100}\ x\ 100} = \frac{-33.33\%}{20\%} = -1.67$$

b) *From the graph above, calculate the PED when price goes from $40 to $60.*
Price rises from $40 units to $60 units.

$$PED = \frac{\%\Delta\ in\ QD}{\%\Delta in\ P} = \frac{\frac{600-500}{600}\ x\ 100}{\frac{60-40}{40}\ x\ 100} = \frac{-16.67\%}{50\%} = -3$$

Topic 6 – Calculating National Income

Calculating nominal GDP from sets of national income data, using the expenditure approach.

Expenditure Type	***Expenditure ($ Billions) Year 1***	***Expenditure ($ Billions) Year 2***	***Expenditure ($ Billions) Year 3***
Consumption	*42.42*	*44.46*	*45.62*
Investment	*6.94*	*7.01*	*6.95*
Government spending	*20.46*	*22.31*	*22.40*
Export revenue	*11.24*	*11.68*	*11.55*
Import expenditure	*13.42*	*12.96*	*12.85*
Income earned abroad	*2.1*	*2.2*	*2.2*
Income paid abroad	*1.6*	*1.6*	*1.7*

Calculate GNP/GNI from data.

Question1
In the table above, calculate:

a) GDP for Year 2
Nominal GDP = C+I+G+[X–M] = 44.46 + 7.01 + 22.31 + [11.68 – 12.96] = $72.64 billion

b) GNP for Year 2
Nominal GNP/GNI = Nominal GDP + Net property income from abroad
= 72.64 + [2.2 – 1.6] = $73.24 billion

c) GDP for Year 3
Nominal GDP = C+I+G+[X–M] = 45.62 + 6.95 + 22.40 + [11.55 – 12.85] = $73.67 billion

d) GNP for Year 3
Nominal GNP/GNI = Nominal GDP + Net property income from abroad
= 73.67 + [2.2 – 1.7] = $74.17 billion

Calculate real GDP, using a price deflator.

Year	***Nominal GDP ($ billions)***	***Price Index (Base year = 2009)***	$\textbf{Real GDP} = \frac{\textbf{Nominal GDP}}{\textbf{Price index for the year}} \textbf{ x 100}$
2007	*67.64*	*95.2*	$\frac{67.64}{95.2} \text{ x } 100 = 71.05$
2008	*73.40*	*98.4*	$\frac{73.40}{98.4} \text{ x } 100 = 74.59$
2009	*77.62*	*100*	$\frac{77.62}{100} \text{ x } 100 = 77.62$
2010	*83.97*	*102.3*	$\frac{83.97}{102.3} \text{ x } 100 = 82.08$
2011	*89.45*	*106.4*	$\frac{89.45}{106.4} \text{ x } 100 = 84.07$
2012	*95.23*	*109.0*	$\frac{95.23}{109.0} \text{ x } 100 = 87.37$
2013	*101.62*	*112.6*	$\frac{101.62}{112.6} \text{ x } 100 = 90.25$

Question 1

Using the figures from, the table above:

a) *Calculate the real GDP for all years.*
   See the answers in column four above.

b) *Explain why it is necessary to express GDP in real terms.*
   If GDP is not expressed in real terms, then inflation is not being taken into account. This means that the GDP would appear larger, simply because the goods produced had a higher price/value, because of inflation: not because more goods had been produced.

   It would be possible for an economy to have an increase in nominal GDP, if fewer goods were produced, but inflation was very high. In this case, if expressed in real terms, the real GDP would actually fall, even though the nominal GDP had risen

Topic 7 – Calculating the Multiplier (k)

Question 1

a. *Calculate the value of the multiplier if the marginal propensity to consume is 0.8.*

$$\mathrm{k} = \frac{1}{(1 - \mathrm{mpc})} = \frac{1}{0.2} = 5$$

b. *Calculate the increase in GDP which will occur, if the government increases their government spending by $600 million.*

G increases by $600 million, so GDP increases by $600 million x 5 = $3,000 million

Question 2

a. *Calculate the value of the multiplier if MPS = 0.1, MPT = 0.4, and MPM = 0.25.*

$$\mathrm{k} = \frac{1}{(\mathrm{mps} + \mathrm{mpt} + \mathrm{mpm})} = \frac{1}{(0.1 + 0.4 + 0.25)} = \frac{1}{0.75} = 1.33$$

b. *Calculate the increase in GDP which will occur, if investment is increased by $300 million.*

I increases by $300 million, so GDP increases by $300 million x 1.33 = $399.99 million

Question 3

In a country, the marginal propensity to save is 0.1, the marginal rate of taxation is 0.3, and the marginal propensity to import is 0.1. Calculate the change in the value of the multiplier, if the government reduces taxes, so that the marginal rate of taxation falls to 0.25.

$$\text{Original multiplier} = \frac{1}{\mathrm{mpw}} = \frac{1}{0.1 + 0.3 + 0.1} = \frac{1}{0.5} = 2$$

$$\text{New multiplier} = \frac{1}{\mathrm{mpw}} = \frac{1}{0.1 + 0.25 + 0.1} = \frac{1}{0.45} = 2.22$$

Question 4

Calculate how much a government will need to increase its spending if it wishes to eliminate a deflationary gap of $600 million, when the marginal propensity to save is 0.08, the marginal tax rate is 20%, and the marginal propensity to import is 0.12.

$$\text{Multiplier} = \frac{1}{\mathrm{mpw}} = \frac{1}{0.08 + 0.2 + 0.12} = \frac{1}{0.4} = 2.5$$

In order to eliminate the deflationary gap of $600 million, the government will need to increase its spending by $\frac{\$600\text{ million}}{2.5} = \$240\text{ million}$

Question 5

If an increase in government spending in an economy of $450 million leads to an increase in GDP of $1,350 million, calculate the value of the marginal propensity to consume.

$$\text{Multiplier} = \frac{\Delta Y}{\Delta J} = \frac{1350}{450} = 3$$

$$\text{Multiplier} = \frac{1}{(1 - \text{mpc})}$$

$$\therefore 3 = \frac{1}{(1 - \text{mpc})}$$

$$3(1 - \text{mpc}) = 1$$

$$1 - \text{mpc} = \frac{1}{3}$$

$$\text{mpc} = 1 - \frac{1}{3} = \frac{2}{3}$$

Question 6

Calculate the value of the multiplier if:

- *GDP increases by $216 million, when government spending increases by $72 million.*

$$k = \frac{\Delta Y}{\Delta J} = \frac{216}{72} = 3$$

- *GDP falls by $56 million, when investment falls by $14 million.*

$$k = \frac{\Delta Y}{\Delta J} = \frac{-56}{-14} = 4$$

- *GDP increases by $165 million, when export revenue increases by $41.25 million.*

$$k = \frac{\Delta Y}{\Delta J} = \frac{165}{41.25} = 4$$

Topic 8 – Calculating the unemployment rate

Calculating the unemployment rate from a set of data.

Question 1

Demographics	***Country A Number of people (millions)***	***Country B Number of people (millions)***	***Country C Number of people (millions)***	***Country D Number of people (millions)***
Total population	*58.2*	*22.3*	*123.7*	*88.9*
Number of employed	*26.1*	*12.2*	*68.3*	*52.6*
Number of unemployed	*2.9*	*0.6*	*14.2*	*2.4*
Population of working age	*38.6*	*15.1*	*95.2*	*69.9*

Using the figures from the table above:

a) Calculate the unemployment rate for each of the countries.

For Country A, the unemployment rate is $\frac{2.9}{26.1+2.9}\ x\ 100 = 10\%$

For Country B, the unemployment rate is $\frac{0.6}{12.2+0.6}\ x\ 100 = 4.69\%$

For Country C, the unemployment rate is $\frac{14.2}{68.3+14.2}\ x\ 100 = 17.21\%$

For Country D, the unemployment rate is $\frac{2.4}{52.6+2.4}\ x\ 100 = 4.36\%$

Topic 9 – Weighted indices and the inflation rate

Question 1

a. Construct a weighted price index for 2010, 2011, and 2012, using the price information from the table below, and assuming that a typical household buys one coffee machine, 20 books, and 50 bottle of wine.

Year	*Price of a coffee machine*	*Price of a book*	*Price of a bottle of wine*
2010	*€200.00*	*€10.00*	*€5.00*
2011	*€205.00*	*€11.00*	*€5.25*
2012	*€215.00*	*€12.50*	*€6.00*

Year	Calculation	Cost of basket
2010	Machine : (1 x €200) = €200 Books: (20 x €10) = €200 Wine: (50 x €5) = €250	€650.00
2011	Machine : (1 x €205) = €205 Books: (20 x €11) = €220 Wine: (50 x €5.25) = €262.50	€687.50
2012	Machine : (1 x €215) = €215 Books: (20 x €12.50) = €250 Wine: (50 x €6) = €300	€765.00

Year		Weighted Price Index
2010	$\frac{650.00}{650.00} \times 100$ This is the base year	100.00
2011	$\frac{687.50}{650.00} \times 100$	105.77
2012	$\frac{765.00}{650.00} \times 100$	117.69

b. Calculate the rate of inflation for 2011 and 2012.

Year	Inflation rate
2010	Base year
2011	$\frac{105.77 - 100.00}{100.00} \times 100 = 5.7\%$
2012	$\frac{117.69 - 105.77}{105.77} \times 100 = 11.27\%$

Question 2

a. Construct a weighted price index for 2010, 2011, and 2012, using the price information from the table below, and assuming that a typical household buys two table lamps, 40 lottery tickets, and 100 bottles of beer.

Year	*Price of a Table lamp*	*Price of a lottery ticket*	*Price of a bottle of beer*
2010	*€80.00*	*€5.00*	*€1.50*
2011	*€83.00*	*€5.40*	*€1.75*
2012	*€85.00*	*€5.50*	*€2.25*

Year	Calculation	Cost of basket
2010	Lamp : (2 x €80) = €160 Lottery: (40 x €5) = €200 Beer: (100 x €1.50) = €150	€510.00
2011	Lamp : (2 x €83) = €166 Lottery: (40 x €5.40) = €216 Beer: (100 x €1.75) = €175	€557.00
2012	Lamp : (2 x €85) = €160 Lottery: (40 x €5.50) = €220 Beer: (100 x €2.25) = €225	€605.00

Year		Weighted Price Index
2010	$\frac{510.00}{510.00} \times 100$ This is the base year	100.00
2011	$\frac{557.00}{510.00} \times 100$	109.22
2012	$\frac{605.00}{510.00} \times 100$	118.63

b. Calculate the rate of inflation for 2011 and 2012.

Year	Inflation rate
2010	Base year
2011	$\frac{109.22 - 100.00}{100.00} \times 100 = 9.22\%$
2012	$\frac{118.63 - 109.22}{109.22} \times 100 = 8.62\%$

Topic 10 – Economic growth

Calculating the rate of economic growth from a set of data

$$Growth\ rate = \frac{Real\ GDP\ in\ year\ 2 - Real\ GDP\ in\ Year\ 1}{Real\ GDP\ in\ Year\ 1}\ x\ 100$$

Year	Real GDP ($ billions)	Growth rate (%)
2007	256.42	N/A
2008	260.38	$\frac{260.38 - 256.52}{256.52}\ x\ 100 = 1.50\%$
2009	259.34	$\frac{259.34 - 260.38}{260.38}\ x\ 100 = -0.40\%$
2010	260.24	$\frac{260.24 - 259.34}{259.34}\ x\ 100 = 0.35\%$
2011	262.12	$\frac{262.12 - 260.24}{260.24}\ x\ 100 = 0.72\%$
2012	263.12	$\frac{263.12 - 262.12}{262.12}\ x\ 100 = 0.38\%$
2013	265.36	$\frac{265.36 - 263.12}{263.12}\ x\ 100 = 0.85\%$

Question 1

Using the figures in the table above:

a) Calculate the growth rates for all years.
See column 3 in the table above.

b) Explain the economic situation in 2009.
In 2009, the growth rate for the year is negative. If there were two or more consecutive quarters of economic growth in the year, then the economy was in recession.

Topic 11 – Tax rates

Calculating the marginal rate of tax and the average rate of tax from a set of data

Individual	Annual Income (Year 1)	Annual Income (Year 2)	Tax paid	Average tax rate	Marginal tax rate (Year 2)
A	$15,000	$18,000	Year 1 (5,000 x 0%) + (10,000 x 20%) = 0 + 2,000 = $2,000 Year 2 (5,000 x 0%) + (13,000 x 20%) = 0 + 2,600 = $2,600	Year 1 13.3% Year 2 14.4%	20%
B	$18,000	$21,000	Year 1 (5,000 x 0%) + (13,000 x 20%) = 0 + 2,600 = $2,600 Year 2 (5,000 x 0%) + (15,000 x 20%) + (1,000 x 40%) = 0 + 3,000 + 400 = $3,400	Year 1 14.4% Year 2 16.19%	26.67%
C	$22,000	$26,000	Year 1 (5,000 x 0%) + (15,000 x 20%) + (2,000 x 40%) = 0 + 3,000 + 800 = $3,800 Year 2 (5,000 x 0%) + (15,000 x 20%) + (6,000 x 40%) = 0 + 3,000 + 2,400 = $5,400	Year 1 17.27% Year 2 20.77%	40%
D	$38,000	$43,000	Year 1 (5,000 x 0%) + (15,000 x 20%) + (18,000 x 40%) = 0 + 3,000 + 7,200 = $10,200 Year 2 (5,000 x 0%) + (15,000 x 20%) + (20,000 x 40%) + (3,000 x 50%) = 0 + 3,000 + 8,000 + 1,500 = $12,500	Year 1 26.84% Year 2 29.07%	46%
E	$44,000	$48,000	Year 1 (5,000 x 0%) + (15,000 x 20%) + (20,000 x 40%) + (4,000 x 50%) = 0 + 3,000 + 8,000 + 2,000 = $13,000 Year 2 (5,000 x 0%) + (15,000 x 20%) + (20,000 x 40%) + (8,000 x 50%) = 0 + 3,000 + 8,000 + 4,000 = $15,000	Year 1 29.55% Year 2 31.25%	50%
F	$75,000	$85,000	Year 1 (5,000 x 0%) + (15,000 x 20%) + (20,000 x 40%) + (35,000 x 50%) = 0 + 3,000 + 8,000 + 17,500 = $28,500 Year 2 (5,000 x 0%) + (15,000 x 20%) + (20,000 x 40%) + (45,000 x 50%) = 0 + 3,000 + 8,000 + 22,500 = $33,500	Year 1 38% Year 2 39.41%	50%

Question 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.

SEE TABLE ABOVE FOR ALL ANSWERS.

Topic 12 – Comparative Advantage

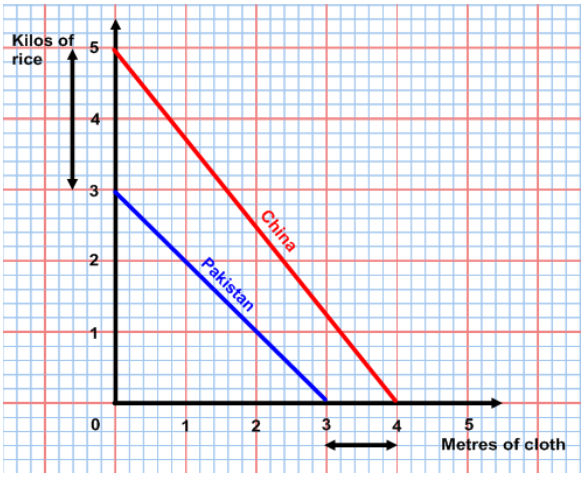
Calculating opportunity costs from a set of data in order to identify comparative advantage.

Drawing a diagram to illustrate comparative advantage from a set of data

Question 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*	4/5 metre of cloth	*4*	5/4 kilos of rice
Pakistan	*3*	1 metre of cloth	*3*	1 kilo of rice

a. *Calculate the opportunity costs for the table.*
See table above.
b. *Draw a diagram to illustrate the information in the table.*



c. *Should trade take place between China and Pakistan? Why?*
Yes, because the opportunity cost ratios are not the same.

d. *In which product should each country specialize? Why?*
China should specialise in the production of rice, since they only give up 4/5 of a metre of cloth to produce 1 kilo of rice, whereas Pakistan gives up 1 metre of cloth. China has the comparative advantage – the lowest opportunity cost.

Pakistan should specialise in the production of cloth, since they only give up 1 kilo of rice to produce 1 metre of cloth, whereas Pakistan gives up 5/4 kilo of rice. Pakistan has the comparative advantage – the lowest opportunity cost.

Topic 13 – Tariffs, quotas, and subsidies

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

Question 1

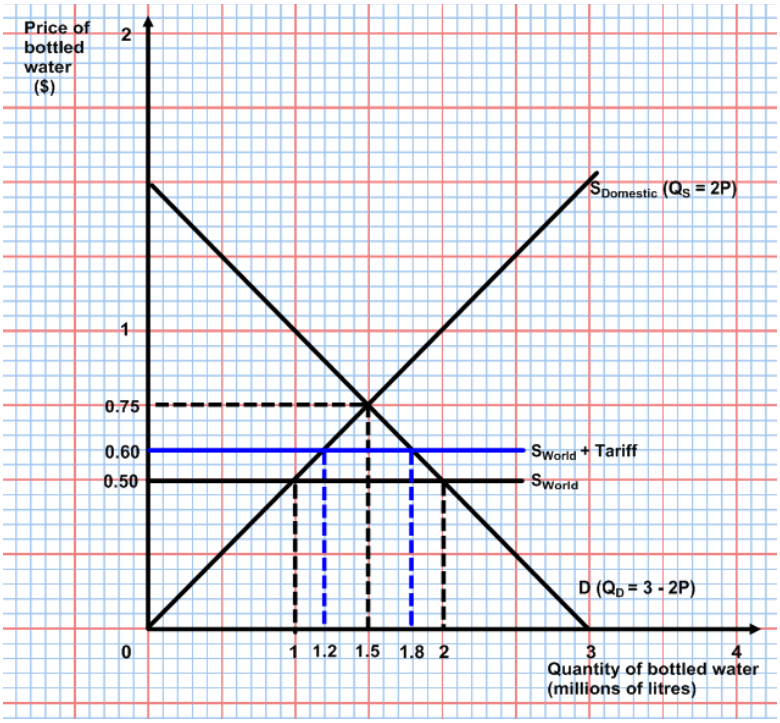
In the market for bottled water, the demand function is $Q_D = 3 – 2P$ and the supply function is $Q_S = 2P$, where price is given in $ per litre of water and quantity is given in millions of bottles per month. (The x-axis should be from 0 to 4 and the y-axis should be from 0 to 2.)

i. Plot the curves from the functions above. 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 cooking oil.



v. Identify the level of domestic production before the tariff and after.
Before the tariff, the level of domestic output is 1 million bottles. After the tariff, it increases to 1.2 million bottles.

vi. Calculate the amount of revenue for domestic producers before the tariff and after.
Domestic revenue before the tariff is 1 million x $0.50 = $500,000.
Domestic revenue after the tariff is 1.2 million x $0.60 = $720,000.

vii. Identify the level of imports before the tariff and after.
The level of imports before the tariff was 2 million – 1 million = 1 million bottles.
The level of imports after the tariff was 1.8 million – 1.2 million = 600,000 bottles.

viii. Calculate the amount of revenue for foreign producers before the tariff and after.
Foreign revenue before the tariff is 1 million x $0.50 = $500,000.
Foreign revenue after the tariff is 600,000 x $0.50 = $300,000.

ix. *Calculate the amount of government revenue from the tariff.*
Government revenue = 600,000 x $0.10 = $60,000.

x. *Calculate the fall in consumer surplus resulting from the imposition of the tariff.*
The fall in consumer surplus is (1.8 million x $0.10) + (½ x 200,000 x $0.10) = $180,000 + $10,000 = $190,000.

xi. *Calculate the dead-weight losses suffered as a result of imposing the tariff.*
The dead-weight loss of consumer surplus is (½ x 200,000 x $0.10) = $10,000.

The dead-weight loss of world efficiency is (½ x 200,000 x $0.10) = $10,000.

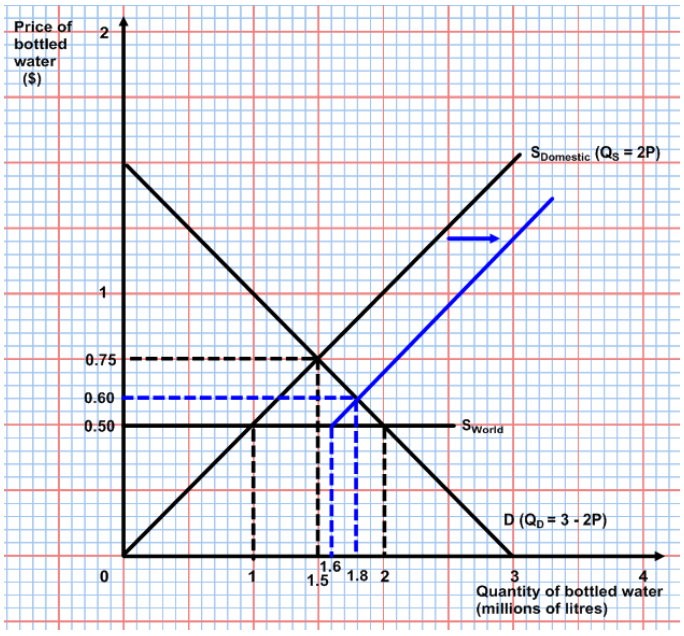
Calculating from diagrams the effects of setting a quota on foreign producers on different stakeholders, including domestic producers, foreign producers, consumers and the government.

Question 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. Fully label the axes.*
ii. *Identify the equilibrium price and quantity.*
Price is $0.75 and quantity is 1.5 million bottles.

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.*
Domestic production before the quota was 1 million bottles.

Domestic production after the quota is 1 million bottles + 200,000 bottles (1.8 – 1.6) = 1.2 million bottles.
vi. *Calculate the amount of revenue for domestic producers before the quota and after.*

Before the quota, domestic producer revenue was 1 million x \$0.50 = \$500,000.
After the quota, domestic producer revenue was 1.2 million x \$0.60 = \$720,000.

vii. *Identify the level of imports before the quota and after.*
Before the quota, imports were 1 million bottles. After the quota, they are 600,000 bottles.

viii. *Calculate the amount of revenue for foreign producers before the quota and after.*
Before the quota, foreign producer revenue was 1 million x \$0.50 = \$500,000.
After the quota, foreign producer revenue was 600,000 x \$0.60 = \$360,000.

ix. *Calculate the fall in consumer surplus resulting from the imposition of the quota.*
The fall in consumer surplus is (1.8 million x \$0.10) + (½ x 200,000 x \$0.10) = \$180,000 + \$10,000 = \$190,000.

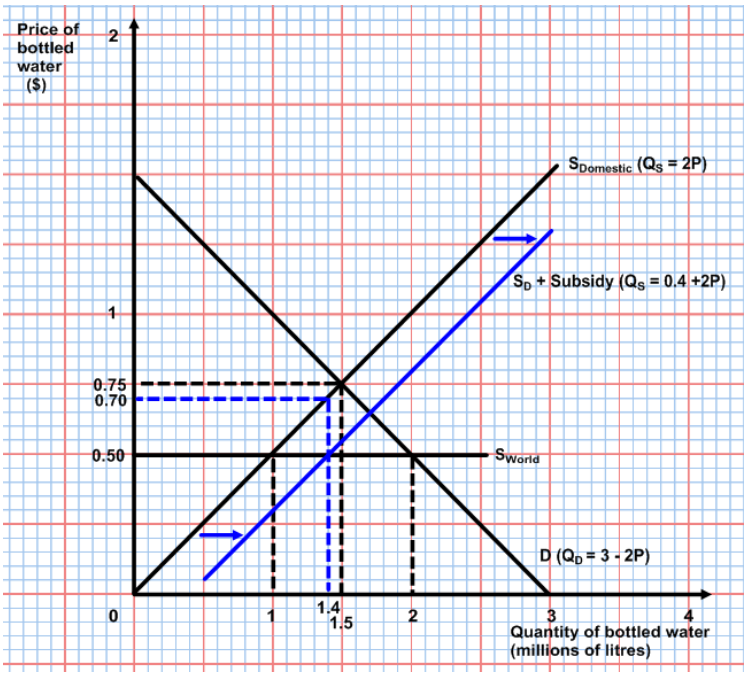
x. *Calculate the dead-weight losses suffered as a result of imposing the quota.*
The dead-weight loss of consumer surplus is (½ x 200,000 x \$0.10) = \$10,000.
The dead-weight loss of world efficiency is (½ x 200,000 x \$0.10) = \$10,000.

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

Question 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. 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.*
Domestic production before the subsidy was 1 million bottles.
Domestic production after the subsidy is 1.4 million bottles.

vi. *Calculate the amount of revenue for domestic producers before the subsidy and after.*
Before the subsidy, domestic producer revenue was 1 million x $0.50 = $500,000.
After the subsidy, domestic producer revenue was 1.4 million x $0.70 = $980,000.
[The payment per unit is $0.50 price + $0.20 subsidy.]

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

viii. Before the subsidy, imports were 1 million bottles. After the subsidy, they are 600,000 bottles.

ix. *Calculate the amount of revenue for foreign producers before the subsidy and after.*
Before the subsidy, foreign producer revenue was 1 million x $0.50 = $500,000.
After the subsidy, foreign producer revenue was 600,000 x $0.50 = $300,000.

x. *Calculate the amount of government expenditure on the subsidy.*
The government expenditure on the subsidy is 1.4 million x $0.20 = $280,000.

xi. *Calculate the dead-weight losses suffered as a result of granting the subsidy.*
The dead-weight loss of world efficiency is (½ x 400,000 x $0.20) = $40,000.

Topic 14 – Exchange rates

Calculating the value of one currency in terms of another currency.

Question 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 = €0.78**
British Pound	*€1 = 0.81GBP*	**1 GBP = €1.23**
Australian Dollar	*€1 = 1.27 AUD*	**1 AUD = €0.79**
Canadian Dollar	*€1 = 1.26 CAD*	**1 CAD = €0.79**
Emirati Dirham	*€1 = 4.75 AED*	**1 AED = €0.21**

Plotting demand and supply curves for a currency from linear functions and identifying the equilibrium exchange rate.

Question 1

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.

Exchange rate ($)	Quantity demanded	Quantity supplied
0	3,200	-400
1	2,800	0
2	2,400	400
3	2,000	800
4	1,600	1,200
5	1,200	1,600

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

See diagram below (page 43).

iii. Illustrate the exchange rate.

See diagram below (page 43).

iv. Using simultaneous equations, calculate the exchange rate.

At equilibrium, $Q_D = Q_s$

$3200 - 400E = -400 + 400E$

$3600 = 800E$

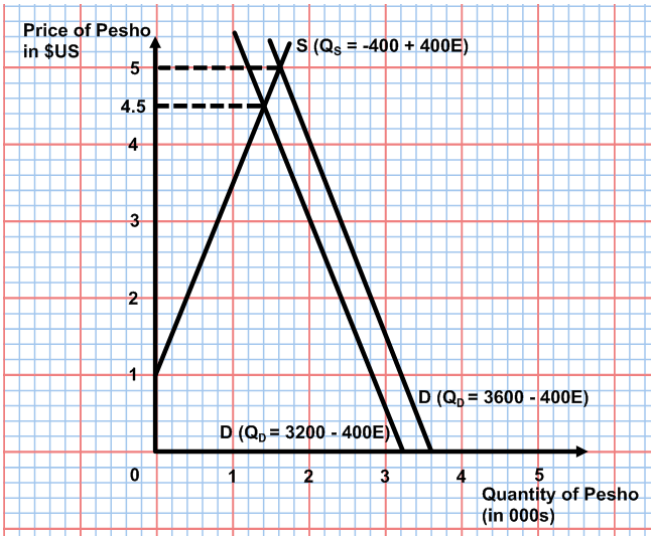
$E = \$4$

v. *Explain **two** factors that might have caused the change in the demand function.*
It could have been caused by an increase in the demand for country X's goods and services, an increase in portfolio investment in country X, an increase in FDI in country X, an increase in foreign saving in country X's financial institutions, and speculators believing that the value of the pesho is going to rise.

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.*

Exchange rate ($)	Quantity demanded
0	**3,600**
1	**3,200**
2	**2,800**
3	**2,400**
4	**2,000**
5	**1,600**

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



viii. *Illustrate the new equilibrium exchange rate.*
See diagram above

ix. *Explain the likely effect that the change in the exchange rate will have upon the demand for exports and imports in Country X.*
A stronger exchange rate will make the price of the exports from country X more expensive for foreigners, thus the quantity demanded will fall. The effect on export revenue will depend upon the elasticity of demand for the exports.

A stronger exchange rate will make the price of imports into country X cheaper for domestic consumers, thus the quantity demanded will increase. The effect on import expenditure will depend upon the elasticity of demand for the exports.

Calculating the price of a good in different currencies, using exchange rates.

Question 1

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

	Price of Euro in foreign currency	**Cost of a large beer in foreign currency**
US Dollar	*€1 = 1.29 USD*	**5.16 USD**
British Pound	*€1 = 0.81GBP*	**3.24 GBP**
Australian Dollar	*€1 = 1.27 AUD*	**5.08 AUD**
Canadian Dollar	*€1 = 1.26 CAD*	**5.04 CAD**
Emirati Dirham	*€1 = 4.75 AED*	**19 AED**

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

Question 2

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

	Price of Euro - January	**Cost phone card**	*Price of Euro - July*	**Cost phone card**	**Stronger/ Weaker**
US Dollar	*€1 = 1.29 USD*	**32.25 USD**	*€1 = 1.35 USD*	**33.75 USD**	**Stronger**
British Pound	*€1 = 0.81GBP*	**20.25 GBP**	*€1 = 0.95 GBP*	**23.75 GBP**	**Stronger**
Australian Dollar	*€1 = 1.27 AUD*	**31.75 AUD**	*€1 = 1.15 AUD*	**28.75 AUD**	**Weaker**
Canadian Dollar	*€1 = 1.26 CAD*	**31.5 CAD**	*€1 = 1.10 CAD*	**27.5 CAD**	**Weaker**
Emirati Dirham	*€1 = 4.75 AED*	**118.75 AED**	*€1 = 4.15 AED*	**103.75 AED**	**Weaker**

For each of the currencies above:

i. *Calculate the cost of a €25 phone card in each time period – January and July.*
See columns 3 and 5 in table above.

ii. *Using figures, explain whether the Euro has got weaker or stronger against the currency.*
See column 6 in table above.

Topic 15 – Balance of payments

Calculating elements of the balance of payments from a set of data.

Question 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***	**-273,400***
4	*Exports of services*	*162,800*
5	*Imports of services*	**122,400***
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)*	**33,100***
10	***Current transfers, net***	*-38,500*
11	***Net income flows***	*-5,400*
12	***Current Account Balance***	**-238,400***
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*	*21,185*
19	*Errors and omissions*	*26,500*
20	***Capital and Financial Account Balance***	**238,400***

*** Working is shown below.**

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

Balance of trade in Goods = Exports of goods – imports of goods = 387,800 – 661,200 = -273,400.

Balance of trade in Services = Exports of services – imports of services = 162,800 – ? = +40,400. Therefore ? = 162,800 – 40,400 = 122,400.

Net income receipts = Income receipts – income payments = 276,500 – 243,400 = 33,100.

Current account balance = Balance of trade in goods + balance of trade in services + net income flows = -273,400 + 40,400 – 5,400 = 238,400

Current account balance = Capital and financial account balance = 238,400

Capital and financial account balance = Capital account + net direct investment + net portfolio investment + reserve assets funding + errors and omissions.
238,400 = 130 + 105,885 + ? + 21,185 + 26,500. So, ? = 84,700

Topic 16 – Terms of Trade

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

Year	Index of Average Export Prices	Index of Average Import Prices	Calculation	Terms of Trade
1	100	100	$\frac{100}{100} \; x\ 100$	**100.00**
2	102	100	$\frac{102}{100} \; x\ 100$	**102.00**
3	106	104	$\frac{106}{104} \; x\ 100$	101.92
4	110	110	$\frac{110}{110} \; x\ 100$	**100.00**
5	108	106	$\frac{108}{106} \; x\ 100$	**101.89**
6	106	108	$\frac{106}{108} \; x\ 100$	**98.15**

Question 1

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

ii. *Describe the change in the terms of trade between years 4 and 5. What does this mean about the buying power of exports?*
The Terms of Trade have improved, because the value of the equation has got larger. It means that the buying power of exports has increased. An average unit of exports will now buy more imports or, another way, it will take fewer exports to buy the same quantity of imports. (However, this does not mean that the balance of payments will improve. That will depend upon the relative elasticities of demand for exports and imports.)

iii. *How does the buying power of the country's exports in Year 6 compare with Year 1?*
Over the six years, the terms of trade have deteriorated. Thus, exports will, on average, buy fewer imports in Year 6 than they did in Year 1.