Consumer Behavior and Demand

- Objective of consumer is to maximize utility given constraints:
  - Preferences or "utility function"
  - Income (M)
  - Price of the good
  - Prices of other goods
- Utility is the capacity of a good (or service) to satisfy a want
- "Utilitarianism" was formalized by Jeremy Bentham
  "Principles of Morals and Legislation," written in 1780 published 1789

Utility

- Utility is a subjective evaluation of value
- Utility cannot be observed or measured
- Individuals' behavioral patterns are influenced by their perceptions of utility
- Two approaches to analysis
  - Utility approach which is based on cardinal measurement
  - Indifference approach which only depends on ordinal measurement

Total and Marginal Utility

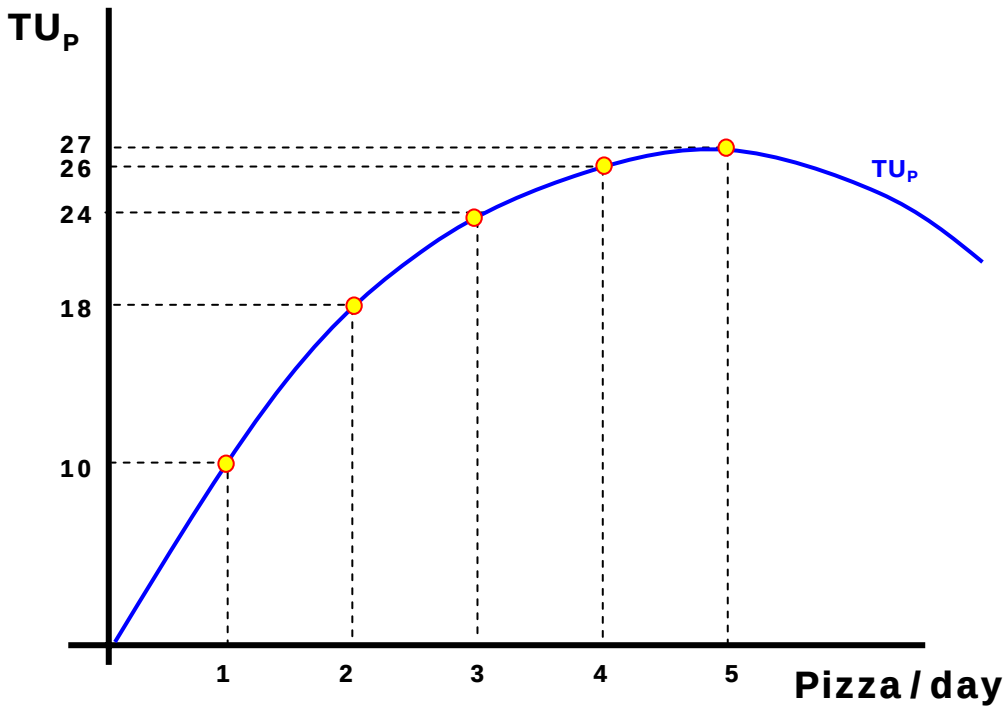
- Total utility (TU) is the amount of satisfaction or utility that an individual derives from a given amount of a good.

$$TU = f(Q, \text{preferences}, \ldots)$$

- Marginal utility (MU) is the change in TU that is caused by a change in the quantity consumed in a given time period.

$$MU = \frac{\Delta TU}{\Delta Q}$$

Total Utility (TU)



TU is a function of the individual's preferences and the quantity consumed.

In the illustration to the left, 10 units of utility are obtained by consuming 1 pizza/day.

The consumption of 2 pizzas/day results in a total of 18 units of satisfaction.

The maximum satisfaction that can be derived from the consumption of pizza is 27 units of satisfaction with 5 pizzas.

If the individual eats more than 5 pizzas per day, their total satisfaction will be reduced.

Marginal Utility (MU)

$$MU = \frac{\Delta TU}{\Delta Q}$$

MU is the rate of change in TU "caused" by a change in the quantity consumed

If 0 units of Q are consumed, TU = 0,

If 1 unit of Q is consumed TU = 10;

The MU of the first unit is 10.

If two units of Q are consumed,
TU = 18,

The "second unit" added 8 units of utility
(MU = 8)

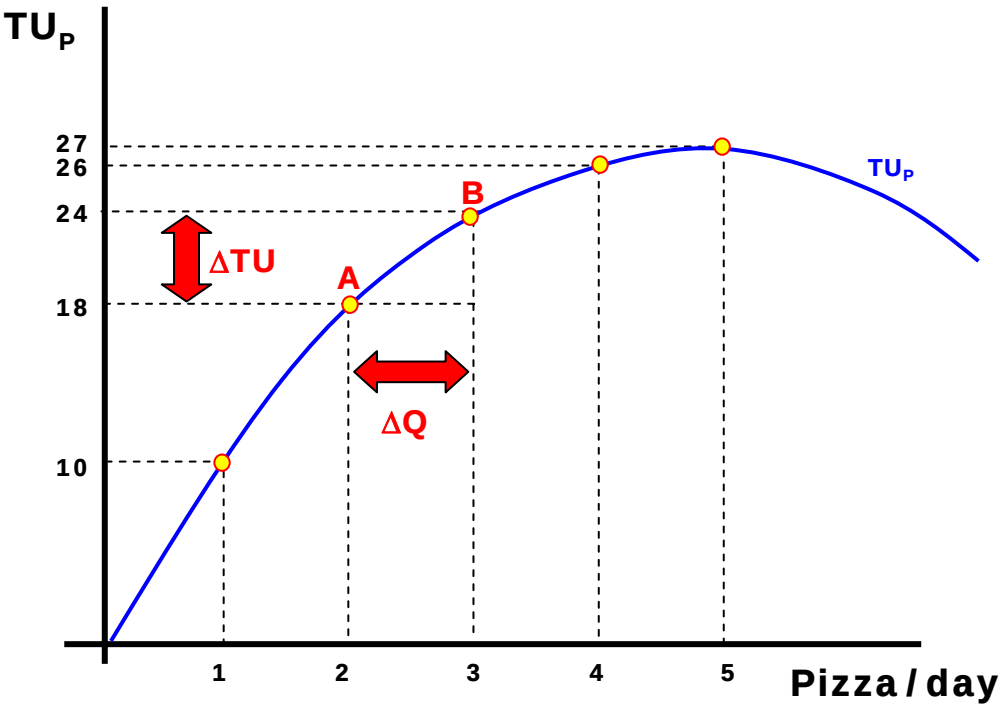
The third additional unit adds 6 units of utility so the TU of 3 units of Q is 24.

TOTAL & MARGINAL UTILITY

Quantity	TU	MU*
0	0	--
1	10	10
2	18	8
3	24	6
4	26	2
5	27	1
6	26	-1

MU* is "half a click" off, it is the change between the rows.

MU is the slope of TU



MU can be visualized as the slope of the TU between successive units of the good.

In the graph to the left, the MU of the third unit of Pizza is the slope of the TU between points A and B.

Think of the slope of a line as rise over run. ΔTU is the rise and ΔQ is the run.

In this example, the ΔQ is 1 (from the second to the third unit is 1).

The ΔTU is 6 (24-18). ∴ rise over run or the slope of TU between points A and B is 6.

MU and TU

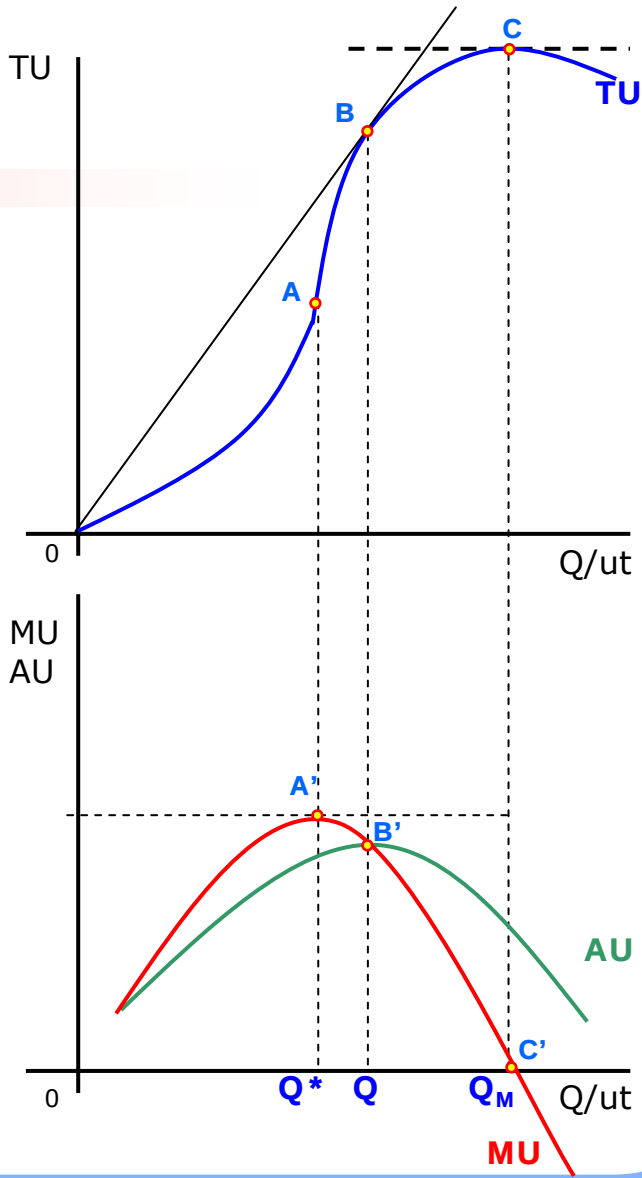
In the graph to the right, TU increases at an increasing rate from 0 to Q* units of the good.

At Q* there is an inflection point in TU at point A. This is consistent with the maximum of the MU (A').

Beyond Q* amount the TU increases at a decreasing rate. MU (the slope of TU) decreases. Q* is the "point of diminishing MU."

When MU > AU, AU is "pulled up." When MU < AU, AU is "pulled down." When MU=AU, AU is a maximum at point B'. (AU is unchanged, its slope is 0, ∴AU is a maximum)

At Q_M the TU is a maximum (Point C). At this output the slope of TU is 0. MU is the slope of TU ∴MU = 0 (at point C').



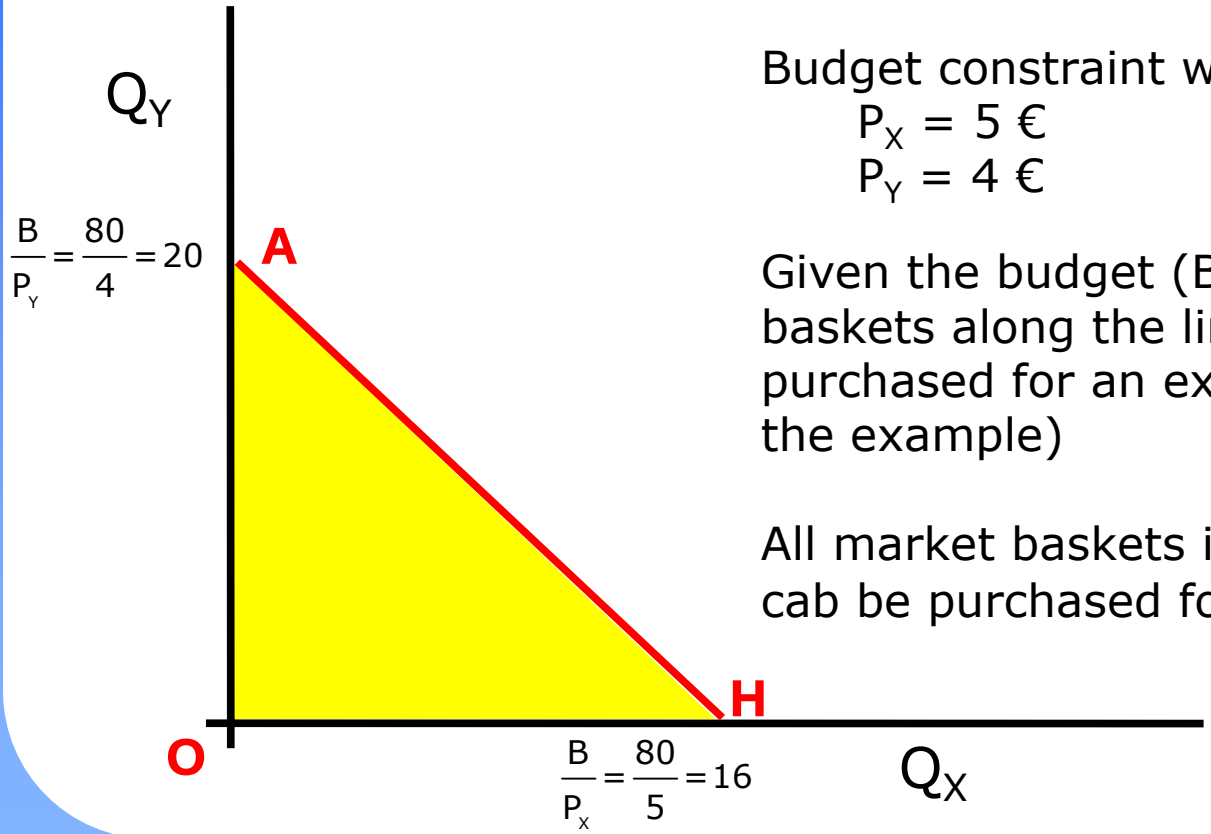
Budget Constraint

$$B \geq P_X Q_X + P_Y Q_Y + \ldots + P_N Q_N$$

Where B = budget

P_N = price of N^{th} good

Q_N = quantity of N^{th} good



Budget constraint when B = 80 €

P_X = 5 €

P_Y = 4 €

Given the budget (B), P_X and P_Y, all market baskets along the line segment AH can be purchased for an expenditure of B (80 € in the example)

All market baskets in the yellow triangle OHA cab be purchased for less than B (80 €).

Equimarginal Principle

To maximize utility given preferences, income (budget) and relative prices of goods, consumers should always spend the next dollar (or monetary unit) on the purchase that gives them the greatest amount of utility.

The good with the highest marginal utility per dollar spent should be purchased until the budget is spent.

If, $\frac{MU_X}{P_X} > \frac{MU_Y}{P_Y}$, Buy more of good X (less of good Y)

If, $\frac{MU_X}{P_X} < \frac{MU_Y}{P_Y}$, Buy more of good Y (less of good X)

Equimarginal Principle and Optimization

When $\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y}$, and

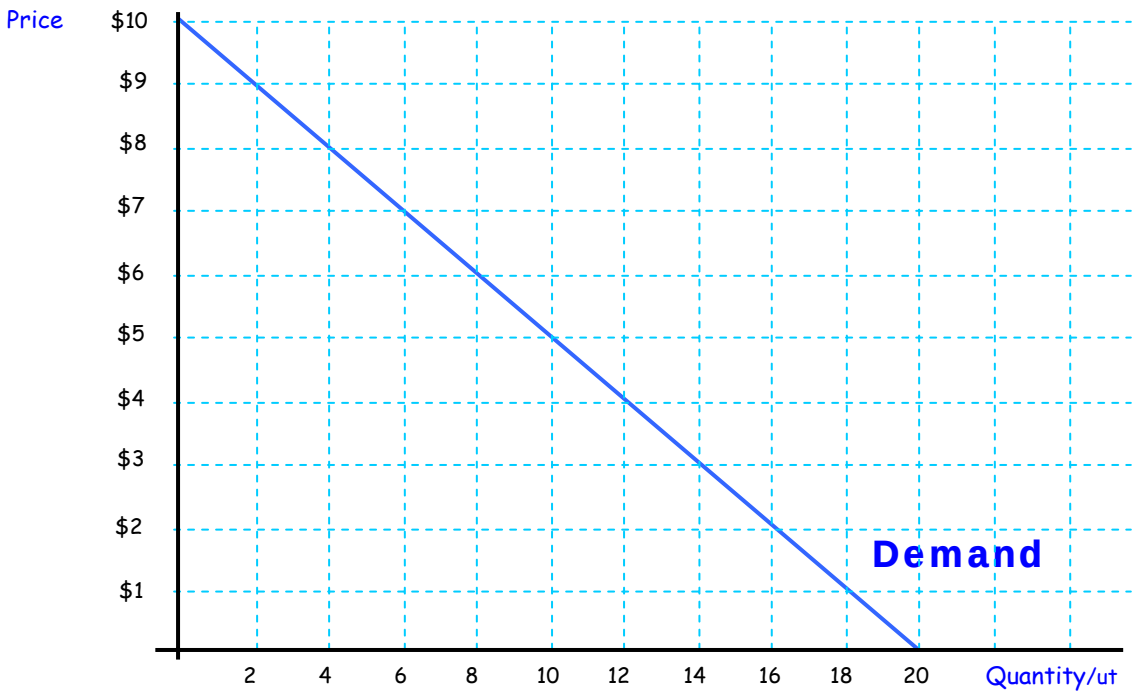
$$B = P_X Q_X + P_Y Q_Y$$

The conditions for maximum utility given constraints of preferences, income and price have been satisfied.

This is an equilibrium condition for the buyer and can be represented by a point on a demand function.

Individual Demand Function

The demand function is an inverse relationship because of the income and substitution effects.



Income Effect

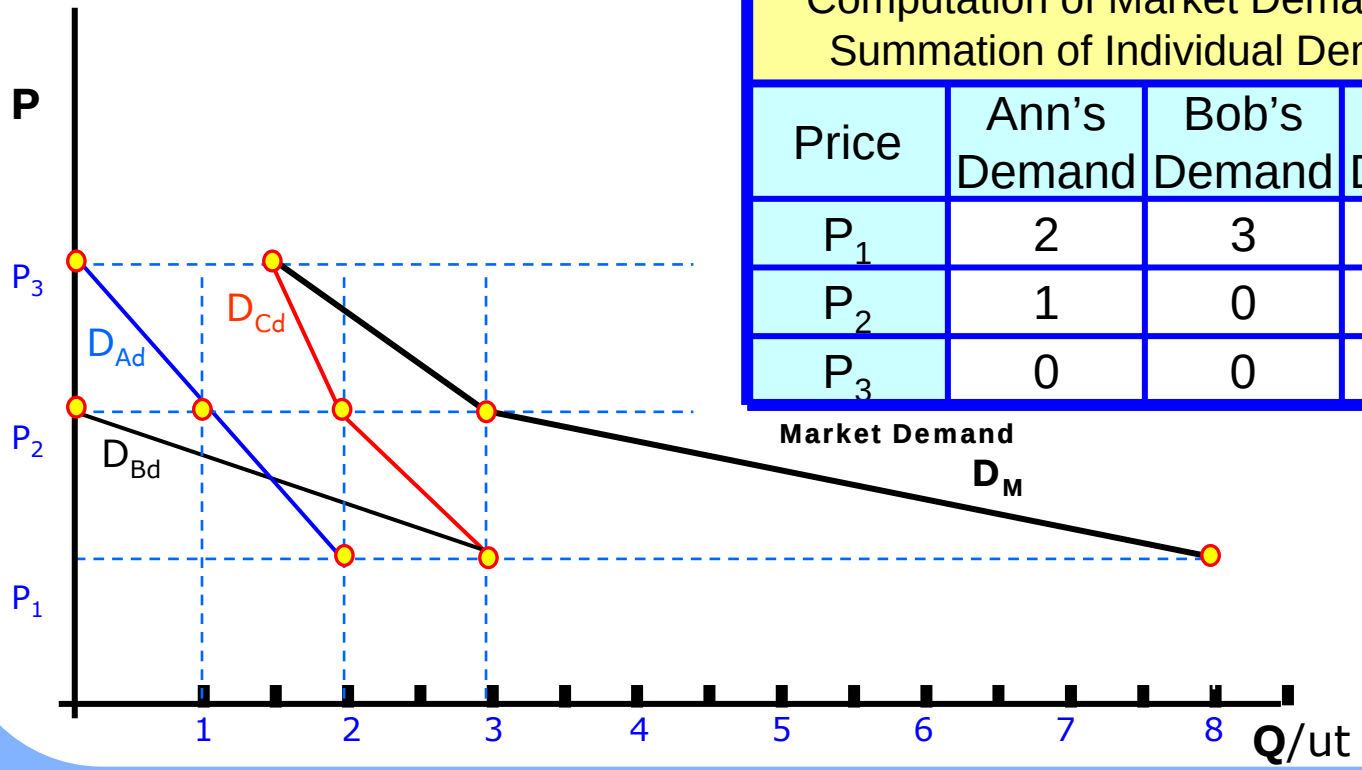
When the price of a good that is purchased goes down, the real income goes up and more can be purchased at every price. An increase in price reduces real income.

Substitution Effect

Individuals will attempt to substitute lower priced goods for relatively more expensive goods.

Market Demand Function

The market demand function for goods with "nonattenuated" property rights is the horizontal summation of all individual demand functions.

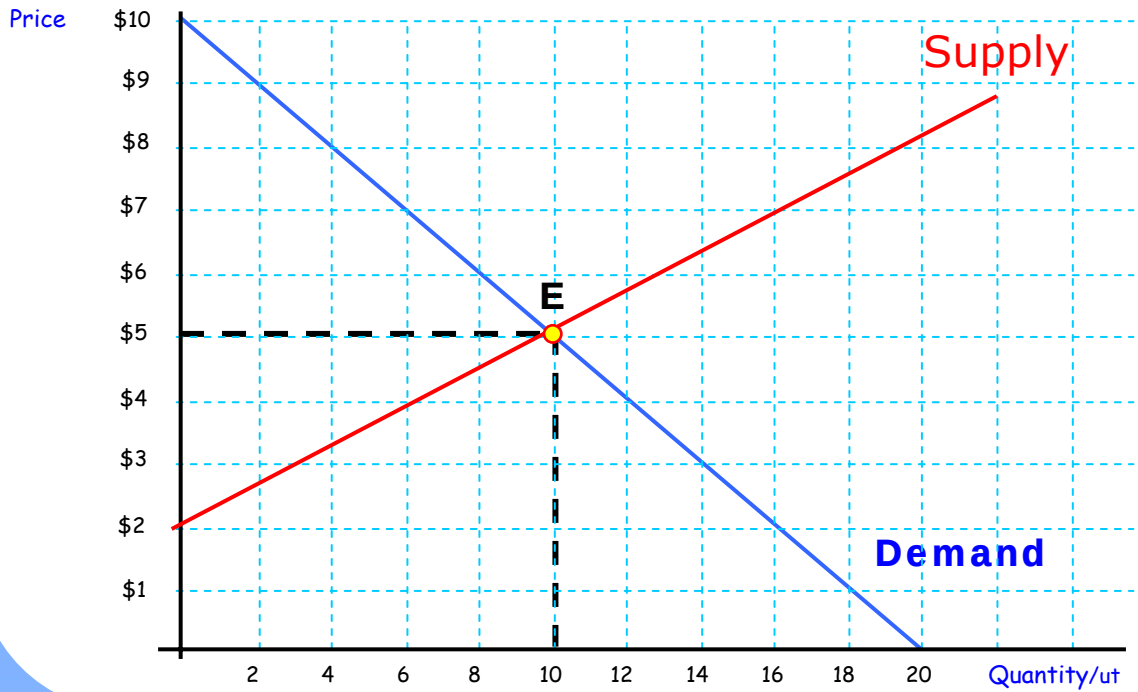


Computation of Market Demand By Horizontal Summation of Individual Demand Functions

Price	Ann's Demand	Bob's Demand	Cathy's Demand	Market Demand
P_1	2	3	3	8
P_2	1	0	2	3
P_3	0	0	1.5	1.5

Markets and Optimum Resource Allocation

Market equilibrium is established where the demand and supply functions intersect; the quantity demanded is equal to the quantity supplied.



In our example, equilibrium occurs at point E; Price (P) is $5 and Quantity (Q) is 10.

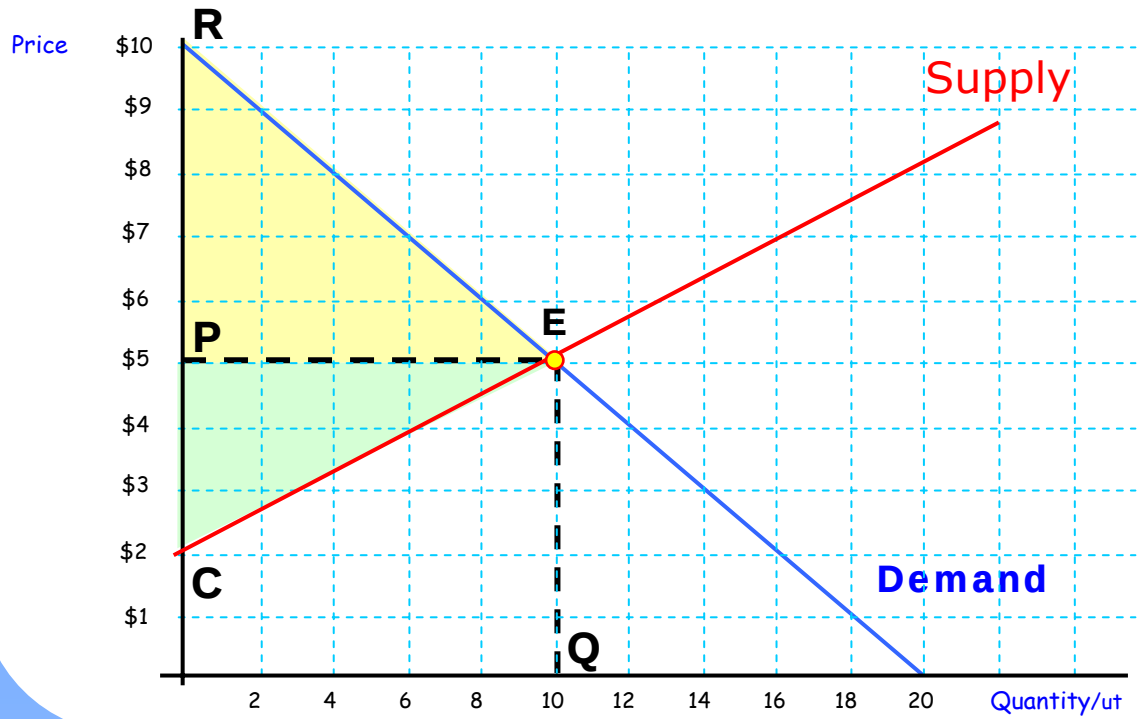
The first 10 units can all be produced and offered for sale for $5 or less.

Buyers are willing and able to purchase the first 10 units for $5 or more.

MB>MC for the all units less than 10, the 10th unit can be offered for sale for $5 and a buyer is willing and able to pay $5 for it.

Maximum Net Benefit to Buyers and Sellers

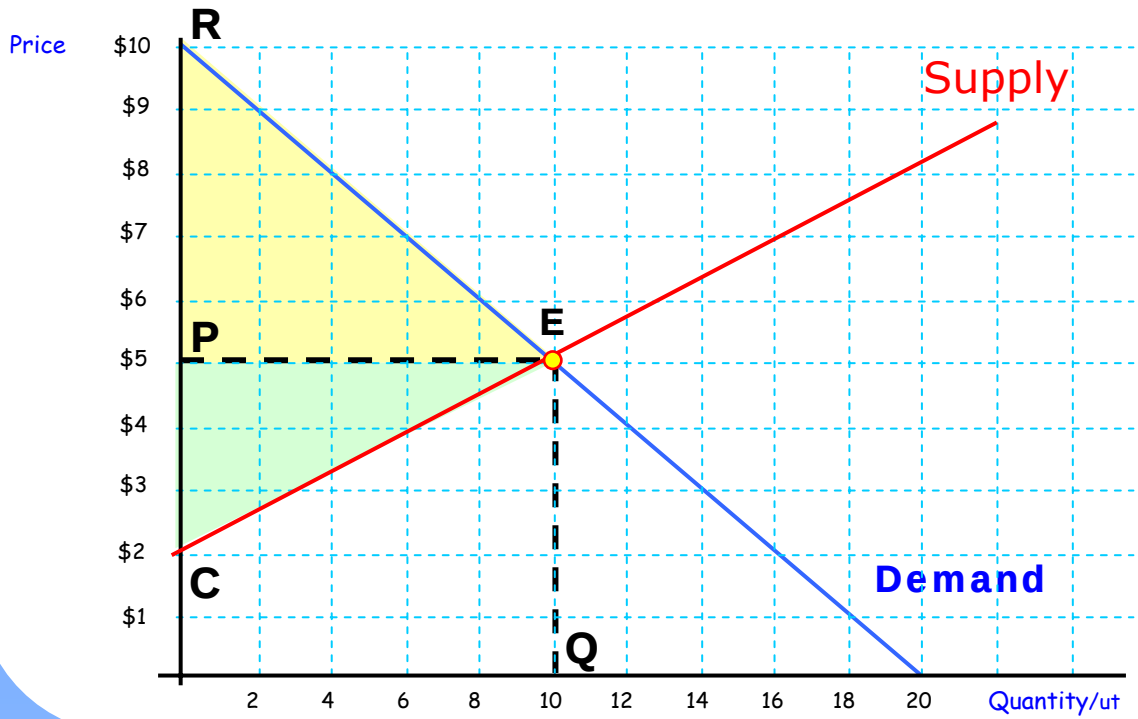
Some one is willing and able to pay $9 for the second unit of the good (even more for the first). A seller is willing to produce and offer the second unit for sale for about $2.80. The net benefit to society is the difference.



For the 10 units that are sold when the market is in equilibrium, the net benefit to society is the area above the supply (MC) and below the demand function; triangle CER.

Net Benefit to Buyers – Consumer Surplus

The buyers can buy 10 units for a market price of $5, they are willing to pay more. Their portion of the net benefit is **Consumer Surplus**, triangle PER.



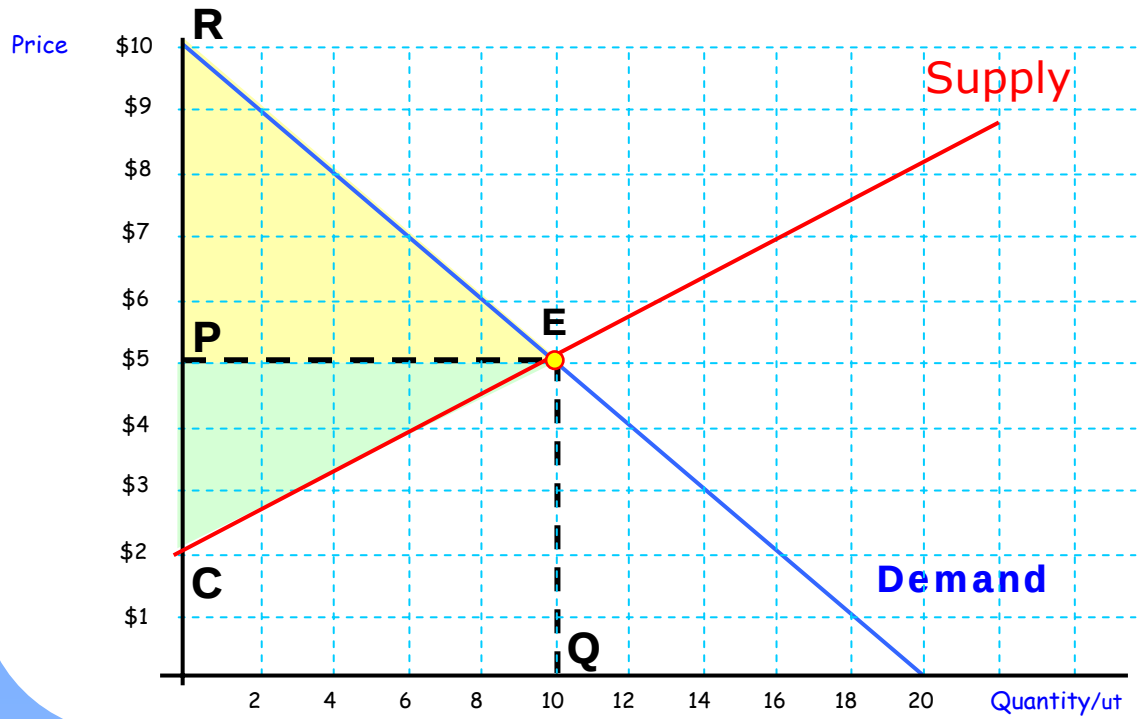
The demand function is a schedule of the maximum prices that buyers will pay for each unit of the good.

If buyers are "rational," they will only buy a good if the marginal benefit or utility (MB) is greater than the price.

If MB > P buy it, if MB < P, don't buy it. Where MB = P, the buyer has maximized their net benefit.

Net Benefit to Sellers – Producer Surplus

Sellers are willing to produce and offer for sale the first ten units for a price of $5 or less. The seller's share of the net benefit to society is the triangle CEP. This is called the "Producer Surplus."



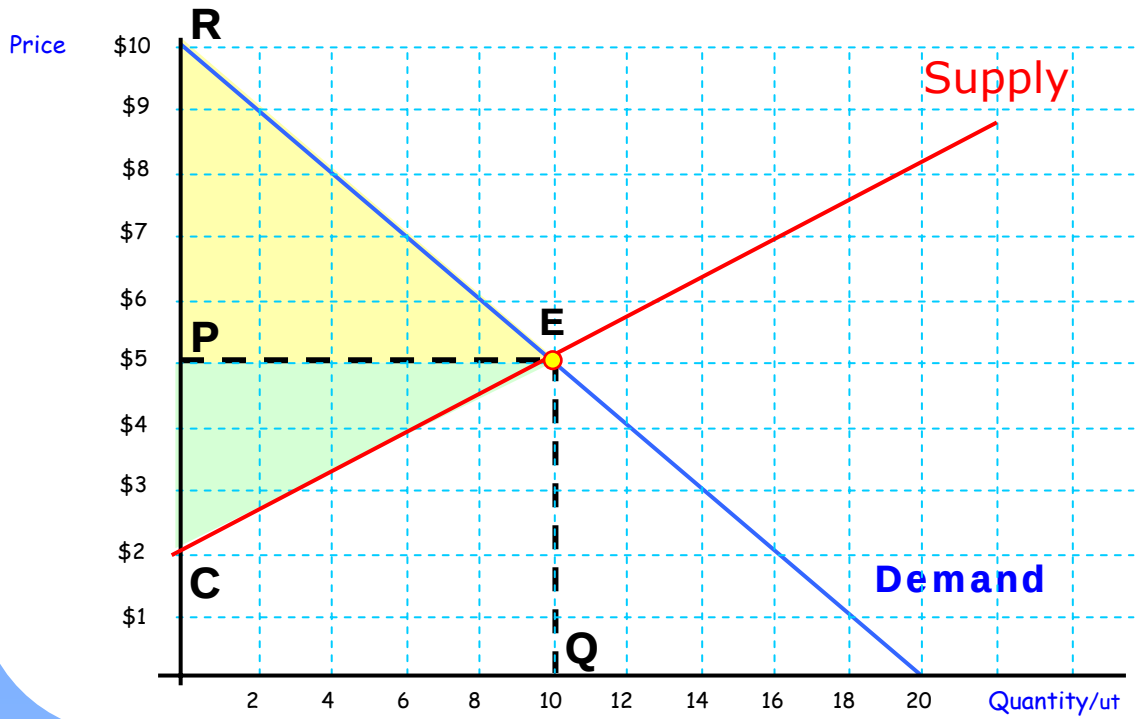
The sellers are willing to produce and sell units so long as the market price exceeds the opportunity cost or marginal cost (MC) of producing the good.

If P>MC, produce and sell.
If P<MC, don't produce.

When P = MC, the seller has captured the maximum producer surplus.

MB = P = MC

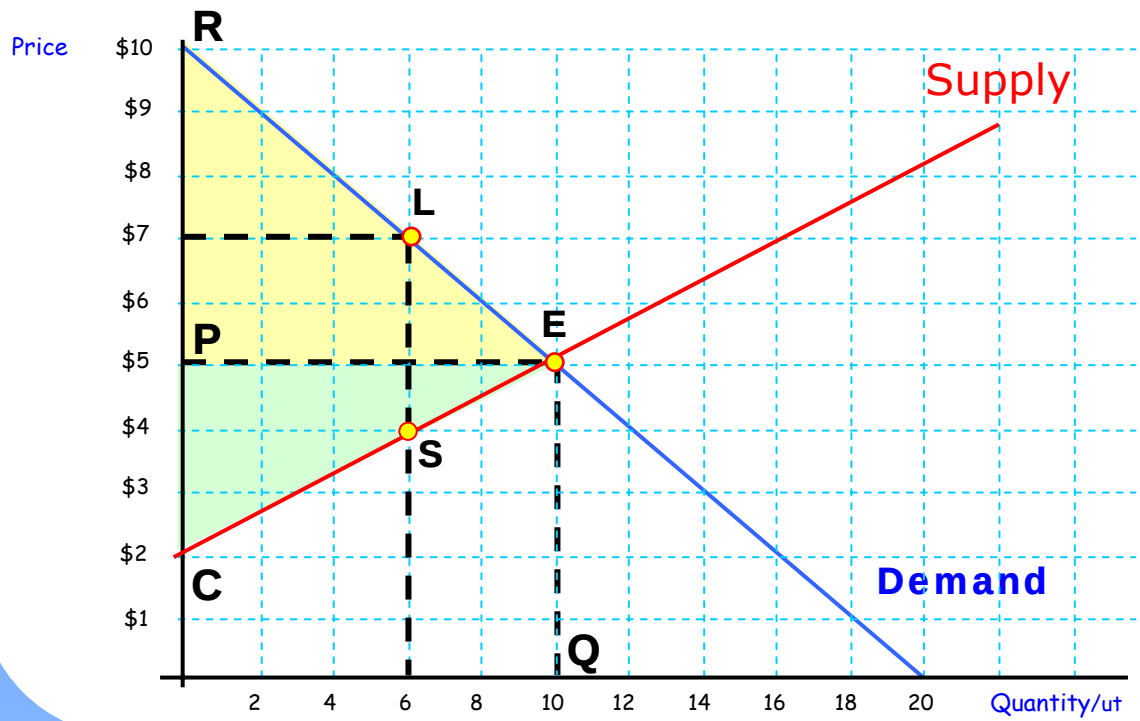
So long as the MB of buyers exceed the price (P), they will buy units of the good. Sellers will produce and offer units for sale so long as they can sell it for a Price (P) that exceeds the opportunity cost or MC.



When the quantity demanded is equal to the quantity supplied (the intersection of the demand and supply function, this is analogous to MB = P = MC.

Reduction in Net Benefit – "price is too high"

If the price were raised above equilibrium (by "market power" or regulation), the quantity purchased would decline. The units below equilibrium that are not sold all have a MB>MC.



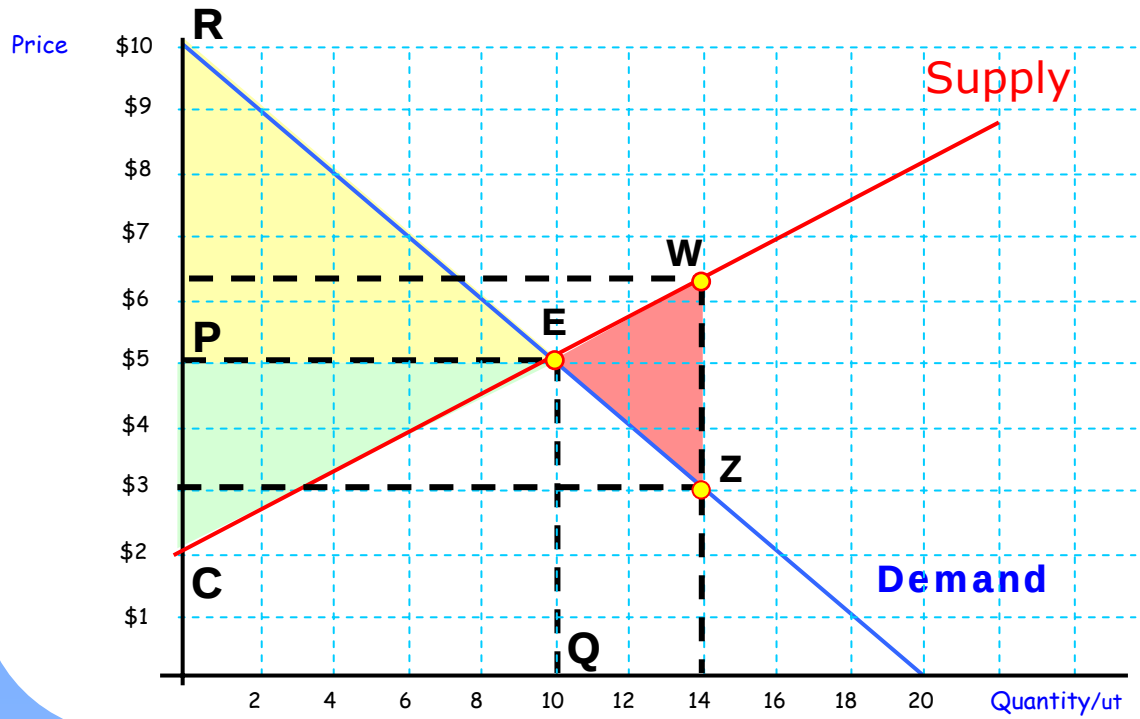
If the price were increased to $7 in our example, only 6 units would be purchased.

There are 4 units that buyers are willing to purchase at a price of $5 or more that are not sold. Sellers can produce this same four units for $5 or less.

The loss to society is the triangle LES. This is called the "dead weight loss."

Reduction in Net Benefit – "price is too low"

If the price were lowered below equilibrium, the quantity purchased would increase. The additional units above equilibrium that are sold all have a MB>MC.



If the price were decreased to $3 in our example, 14 units would be purchased.

At the price of $3, buyers would purchase the last 4 units that cost more to produce than the buyers are willing to pay.

The triangle EZW represents a net reduction in the net benefits to society and would be subtracted from the area CEP.