Indifference Curve Analysis

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- Marginal Rate of Substitution
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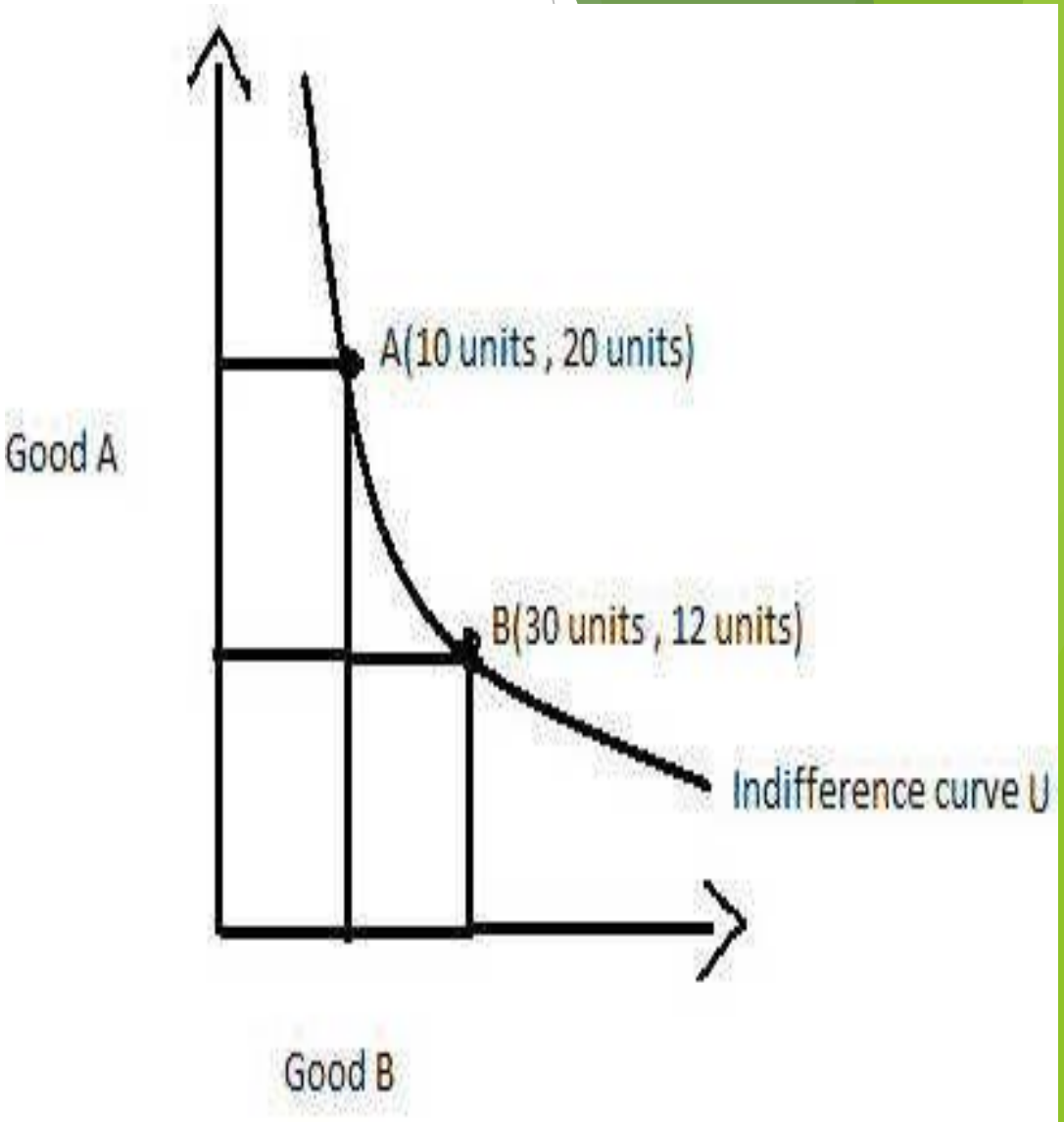
An Indifference curve is a graphical representation of a combined products that gives similar kind of satisfaction to a consumer thereby making them indifferent.

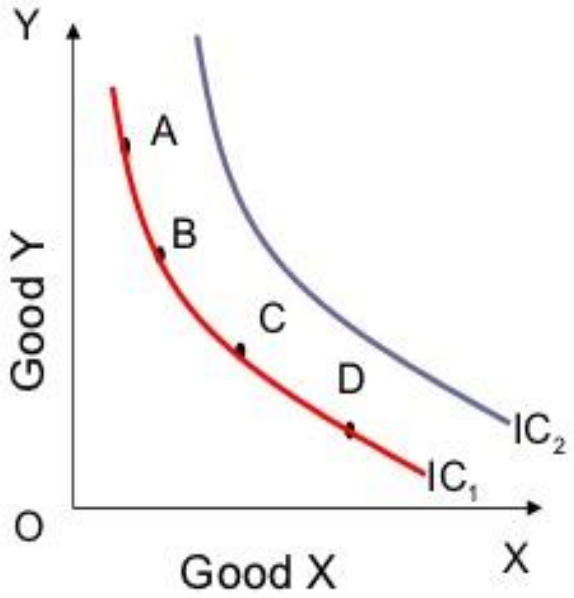
Each individual axis indicates a single type of economic goods. If the graph is on the curve or line, then it means that the consumer has no preference for any goods, because all the good has the same level of satisfaction or utility to the consumer.

- **The above diagram shows the U indifference curve showing bundles of goods A and B.**
- **To the consumer, bundle A and B are the same as both of them give him the equal satisfaction.**
- **In other words, point A (10 UNITS OF Good B, 20 UNITS OF GOOD A) gives as much utility as point B (30 UNITS OF GOOD B, 12 UNITS OF GOOD A) to the individual.**
- **The consumer will be satisfied at any point along the curve assuming that other things are constant.**



Properties of Indifference Curves

- Indifference curves are downward sloping.
  - This is because of the assumption of non-satiation.
- Higher indifference curve represents higher utility.
- Indifference curves can never intersect.
- Indifference curves are convex to the origin.
  - This is because two goods cannot be perfect substitutes of each other.



Properties of Indifference Curve

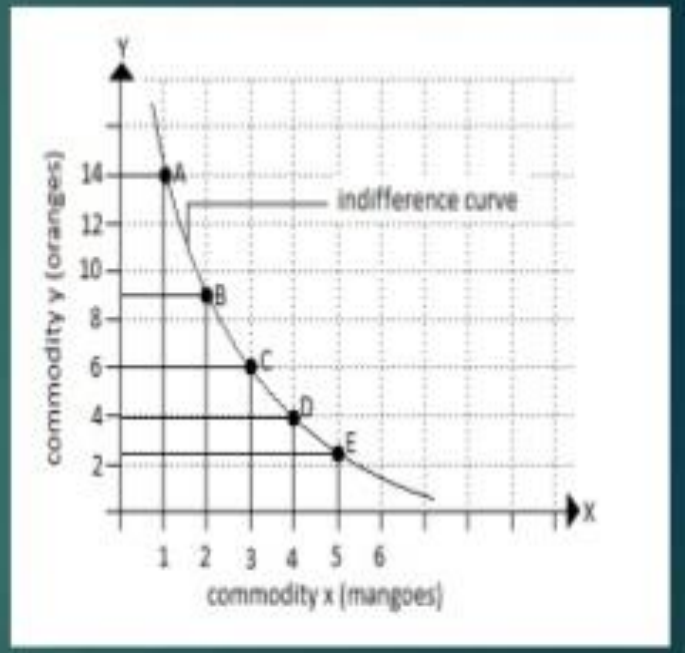
There are 4 basic properties of an indifference curve. These are -

1. **Indifference Curve Slope Downwards to Right:**

- An indifference curve can neither be horizontal line nor an upward sloping curve. This is very important.

When a consumer wants to have more of a commodity, he/she will have to give up some of the other commodity, given that the consumer remains on the same level of utility at constant income.

As a result, the indifference curve slopes downward form left to right.



2. Indifference Curve is Convex to the Origin:

- This is an important property of indifference curves. They are convex to the origin (bowed inward). This is equivalent to saying that as the consumer substitutes commodity X for commodity Y, the marginal rate of substitution diminishes of X for Y along an indifference curve.
- In this figure (3.6) as the consumer moves from A to B to C to D, the willingness to substitute good X for good Y diminishes. This means that as the amount of good X is increased by equal amounts, that of good Y diminishes by smaller amounts. The marginal rate of substitution of X for Y is the quantity of Y good that the consumer is willing to give up to gain a marginal unit of good X. The slope of IC is negative. It is convex to the origin.

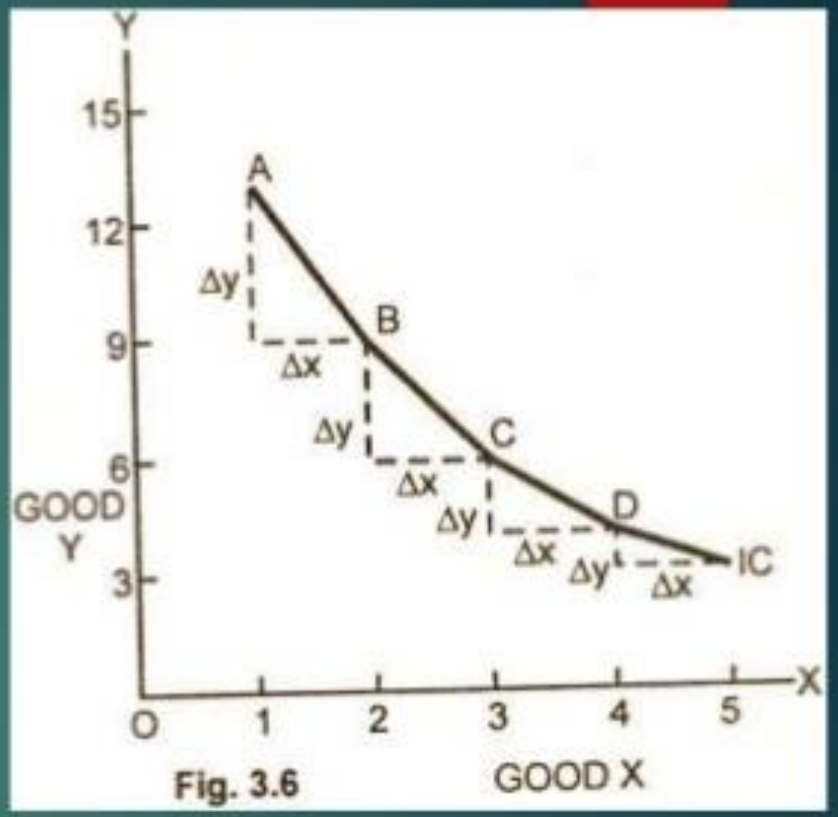


Fig. 3.6

MARGINAL RATE OF SUBSTITUTION

Marginal Rate of Substitution refers to the rate at which the consumer is willing to sacrifice one good to obtain one more unit of the other good keeping his satisfaction level unchanged.

$$MRT = \frac{\Delta Y}{\Delta X} = \frac{\text{Amount of goody sacrificed}}{\text{Amount of good x gained}}$$

Production Possibilities	Good X	Good Y	MRT = "ΔY"/"ΔX"
1	0	30	-
2	1	27	**-3**
3	2	21	**-6**
4	3	12	**-9**
5	4	0	**-12**

In the beginning, at the production point II, where 1 unit of Good X and 27 units of Good Y are produced. To produce an additional unit of Good X, 3 units of Good Y must be sacrificed

Here, the marginal rate of transformation (MRT) is

MRT = "ΔY"/"ΔX" = "Amount of good Y sacrificed"/"Amount of good X gained" = $\frac{27-30}{2-1} = -3$

Thus, MRT or the opportunity cost of getting an additional unit of Good X is 3 units of Good Y.

Four Properties of Indifference Curves

3. Indifference curves cannot cross.

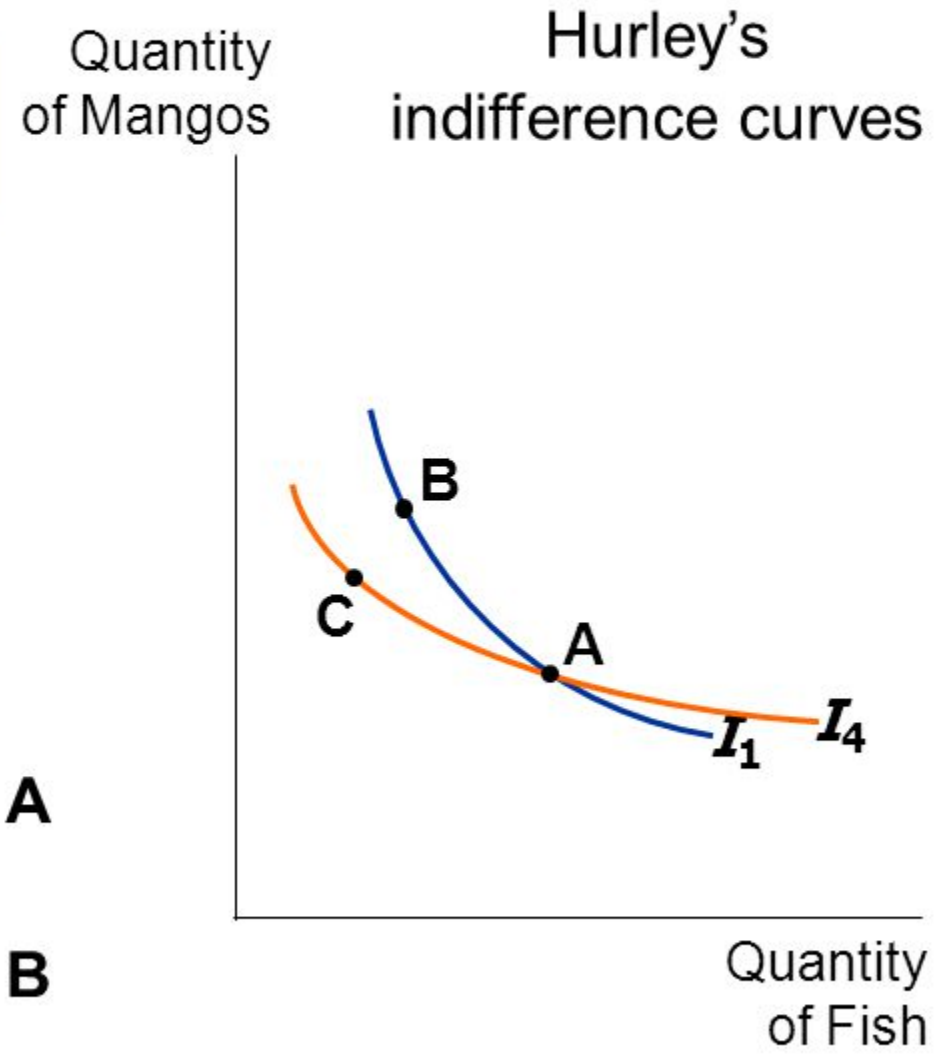
Suppose they did.

Hurley should prefer **B** to **C**, since **B** has more of both goods.

Yet, Hurley is indifferent between **B** and **C**:

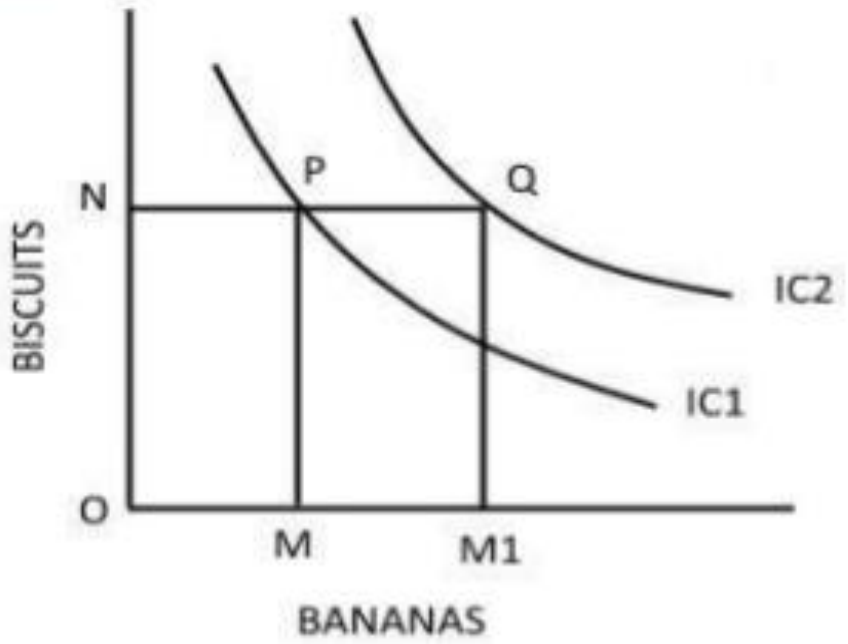
He likes **C** as much as **A** (both are on I_4).

He likes **A** as much as **B** (both are on I_1).



3.) HIGHER INDIFFERENCE CURVE REPRESENT A HIGHER LEVEL OF SATISFACTION :-

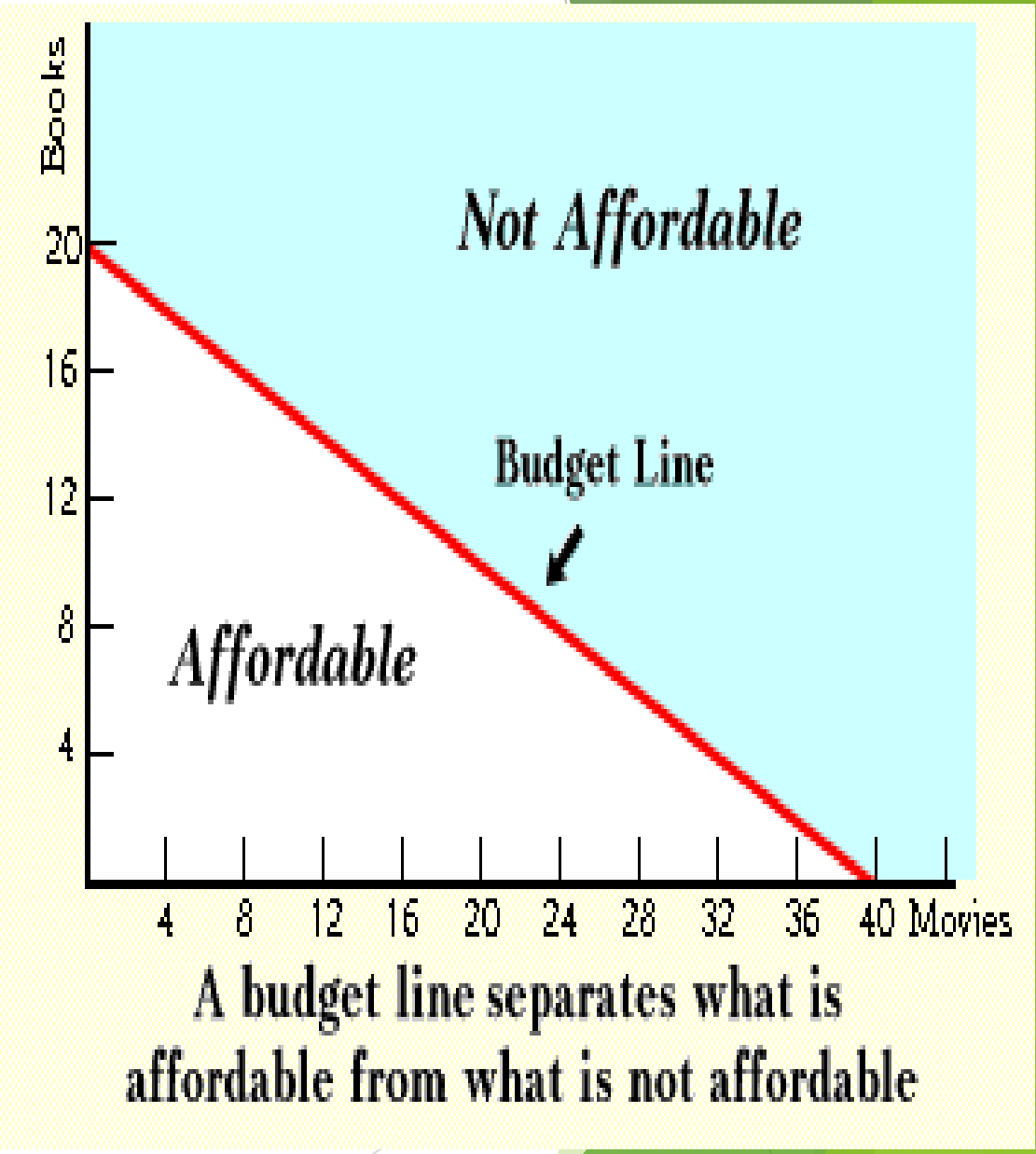
This is because combinations lying on a higher IC contain more of either one or both goods and more goods are preferred to less of them.



(a) INDIFFERENCE CURVE ALWAYS SLOPES DOWNWARDS FROM LEFT TO RIGHT	• An indifference curve has a negative slope, i.e. it slopes downward from left to right. • **Reason**: If a consumer decides to have one more unit of a commodity (say apples), quantity of another good (say oranges) must fall so that the total satisfaction (utility) remains same.
(a) INDIFFERENCE CURVE IS ALWAYS CONVEX TO THE ORIGIN	• IC is strictly Convex to origin i.e. MRSxy is always diminishing • **Reason:** Due to the law of diminishing marginal utility a consumer is always willing to sacrifice lesser units of a commodity for every additional unit of another good.
(c) HIGHER INDIFFERENCE CURVE REPRESENTS HIGHER LEVEL OF SATISFACTION	• Higher indifference curve represents larger bundles of goods i.e. bundles which contain more of both or more of at least one. • It is assumed that consumer's preferences are monotonic i.e. he always prefers larger bundle as it gives him higher satisfaction.

Budget line:

The budget line is a graphical delineation of all feasible combinations of two commodities that can be bought with provided income and cost so that the price of each of these combinations is equivalent to the monetary earnings of the customer.

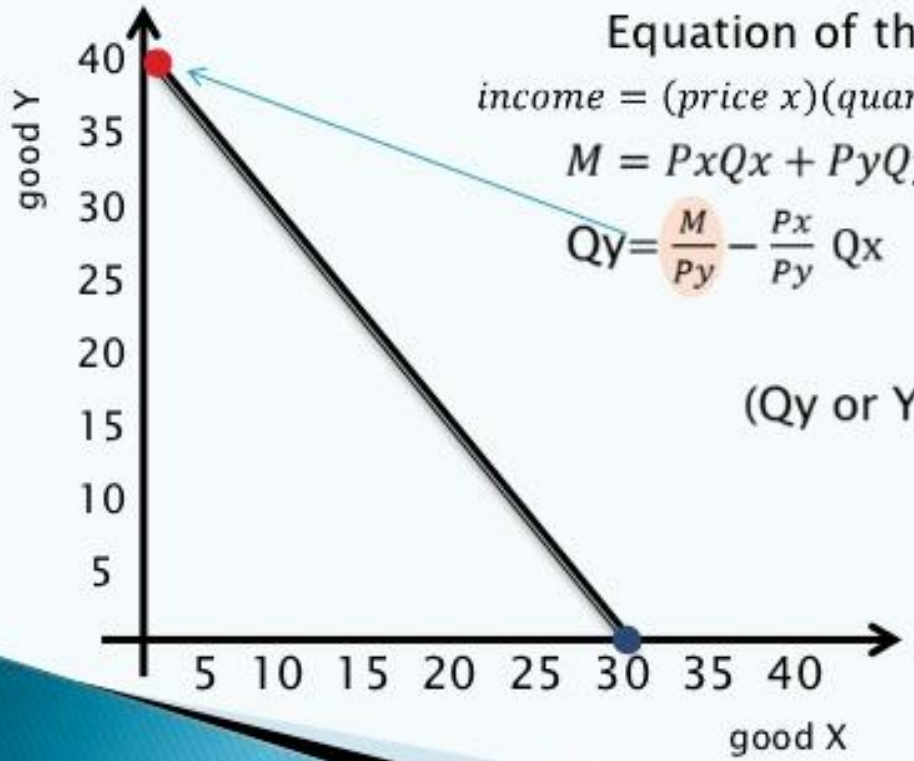


How to Calculate the Budget Line

Income: $1,200

Price of X= $40 $\$1200 \div \$40 = \$30$

Price of Y= $30 $\$1200 \div \$30 = \$40$



Equation of the budget line

$$income = (price\ x)(quantity\ of\ x) + (price\ y)(quatity\ of\ y)$$

$$M = PxQx + PyQy$$

$$Qy = \frac{M}{Py} - \frac{Px}{Py}\ Qx$$

$$(Qy \text{ or } Y) = 40 - \frac{\$40}{\$30}(Qx\ or\ X)$$

Let the following be the initial budget line

$$P_1x_1 + P_2x_2 = M$$

Differentiating with respect to x_1

$$P_1\frac{\Delta x_1}{\Delta x_1} + P_2\frac{\Delta x_2}{\Delta x_1} = 0$$

$$\text{or, } P_1 = -P_2\frac{\Delta x_2}{\Delta x_1}$$

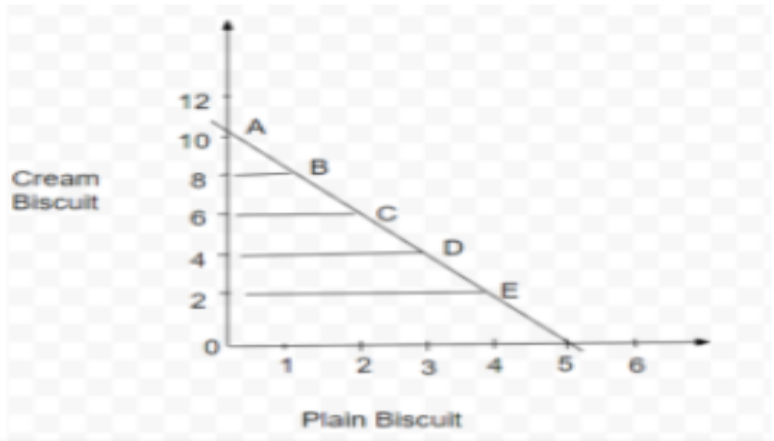
$$\text{or, } -\frac{P_1}{P_2} = \frac{\Delta x_2}{\Delta x_1} = \text{Slope of Budget Line}$$

Budget Line Example

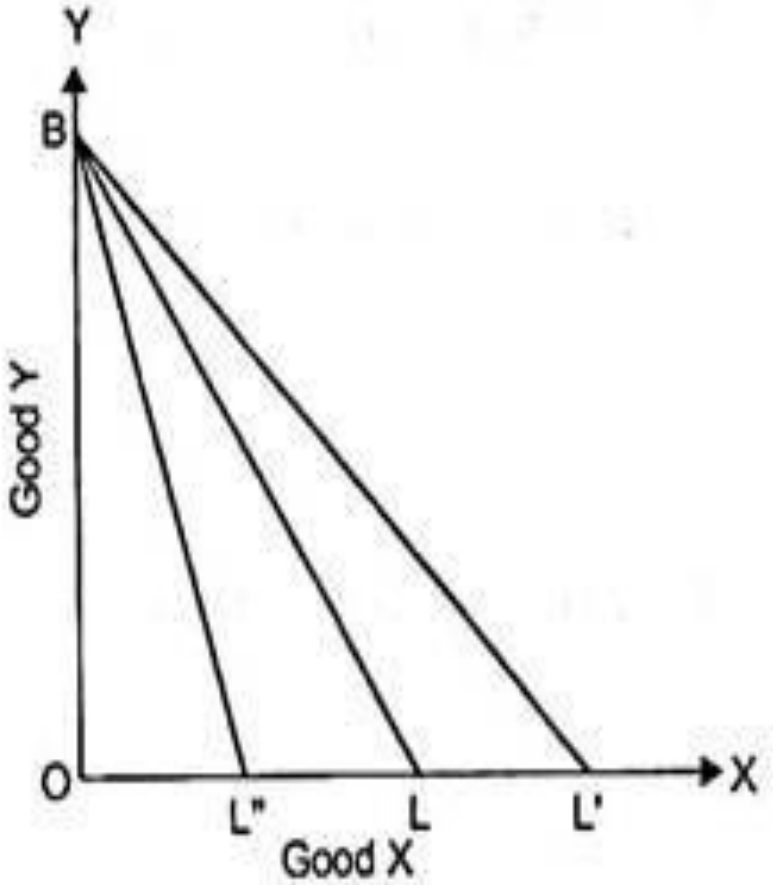
Radha has ₹ 50 to buy a biscuit. She has few options to allocate her income so that she receives maximum utility from a limited salary.

Budget Schedule			
Combination	Cream biscuit (@ Rs. 10 per packet)	Palin biscuit (@ Rs. 5 per packet)	Budget Allocation
A	0	10	10X0 + 5X10=50
B	1	8	10X1 + 5X8=50
C	2	6	10X2 + 5X6=50
D	3	4	10X3 + 5X4=50
E	4	2	10X4 + 5X2=50
F	5	0	10X5+ 5X0=50

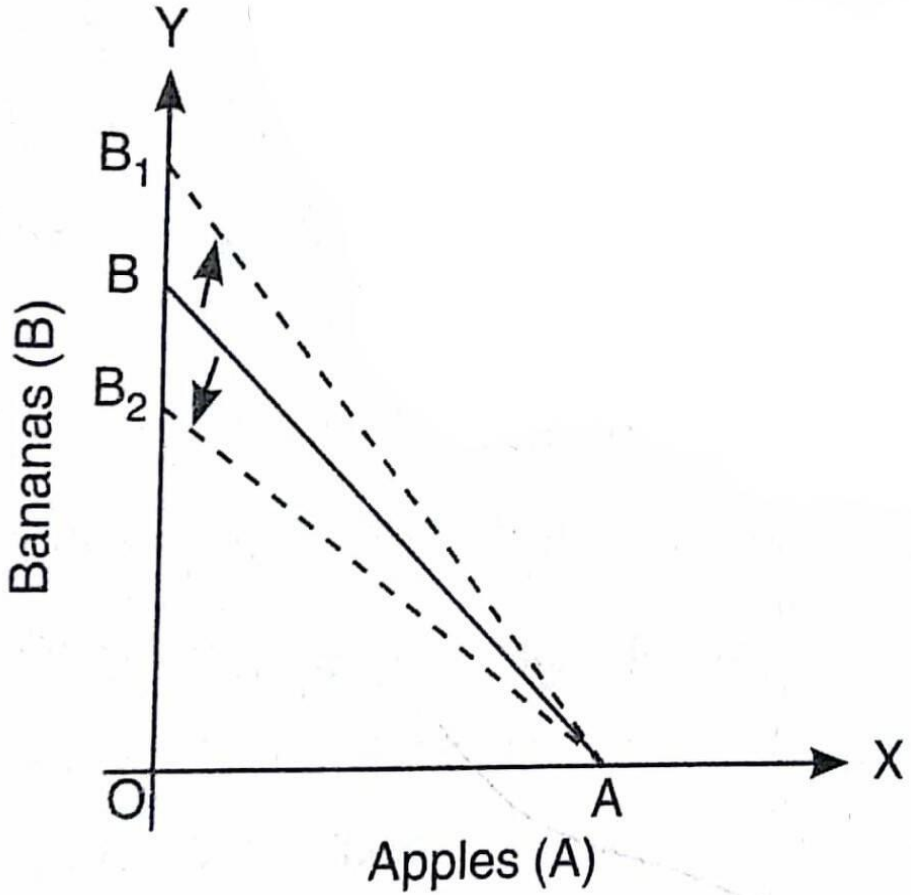
To get an appropriate budget line, the above budget schedule can be outlined on a graph.



Change of Budget Line as a Result of Change in Price

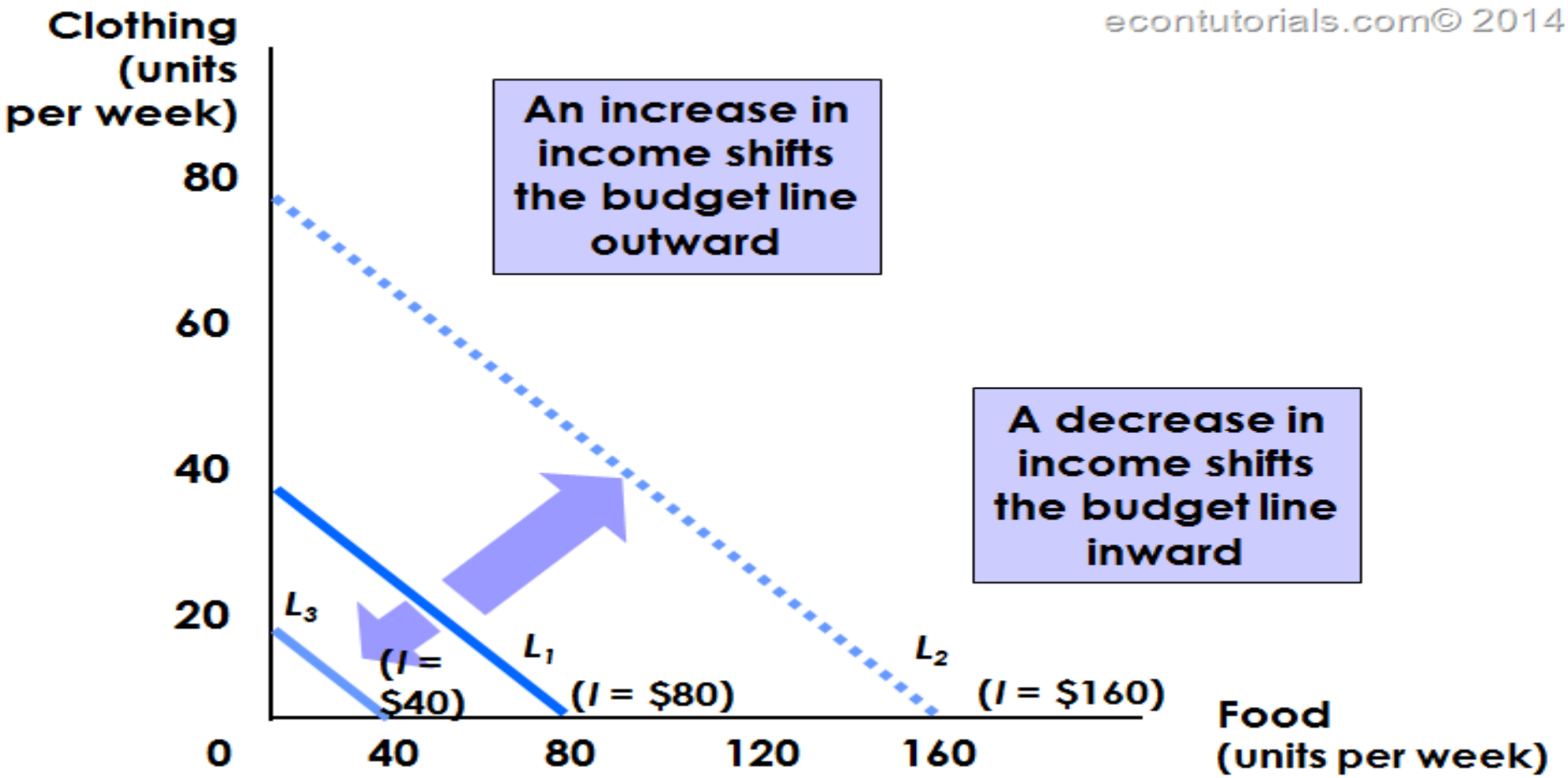


An increase in price of commodity in x axis results in rotation of budget line inwards where as a decrease in price of commodity in x axis results in rotation of budget line outwards.



An increase in price of commodity in y axis results in rotation of budget line inwards where as a decrease in price of commodity in y axis results in rotation of budget line outwards.

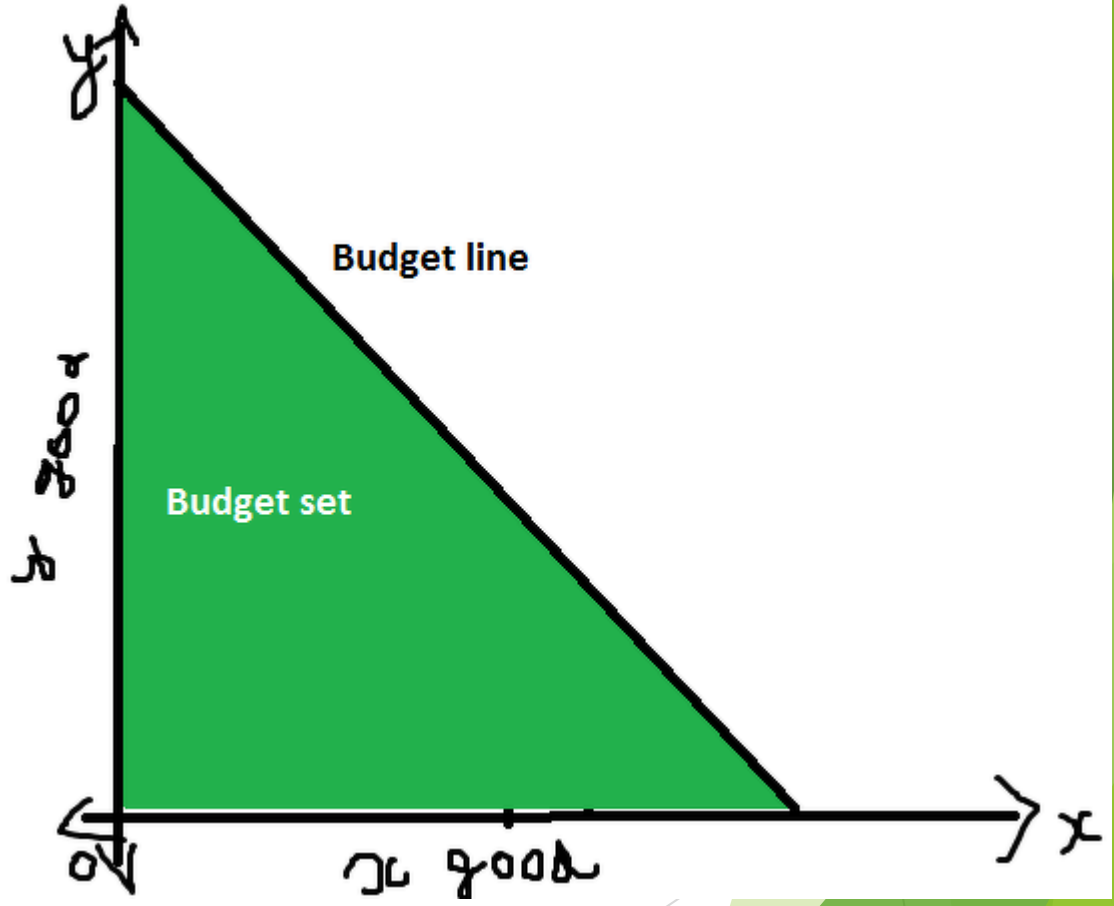
Shifting of Budget Line due to change in Income



BUDGET SET

A budget set or a set of opportunities incorporates all feasible utilization bundles that someone can manage provided the cost of commodities and the person's earning degree. The budget set is always bounded above by the budget line. Graphically, all the utilization bundles that lie inside the budget restriction and on the budget restriction form the budget set or set of opportunities.

$P1.X1 + P2.X2 <= M$



Budget Set:

- The set of baskets that are affordable

Budget Line:

- The set of baskets that one can purchase when spending all available income.

Utility

1. Utility is the power or capacity of a commodity to satisfy human wants. Alternatively, utility of a commodity means the amount of satisfaction that a person gets from consumption of a good or service.

2. There are two types of Utility:

1. **Cardinal Utility Approach (Marginal Utility Analysis or Marshall Utility Analysis):**
   - It states that the satisfaction the consumer derives by consuming goods and services can be measured with a number.
   - Cardinal utility is measured in terms of utils (the units on a scale of utility or satisfaction).
   - According to cardinal utility the goods and services that are able to derive a higher level of satisfaction to a consumer will be assigned higher utils and goods that result in a lower level of satisfaction will be assigned lower utils.
   - Cardinal utility is a quantitative method that is used to measure consumption satisfaction.

2. **Ordinal utility Approach (Indifference Curve Analysis or J.R. Hicks analysis):**
   - It states that the satisfaction the consumer derives from the consumption of goods and services cannot be measured in numbers.
   - Rather, ordinal utility uses a ranking system in which a rank is provided to the satisfaction that is derived from consumption.
   - According to ordinal utility, the goods and services that offer a customer a higher level of satisfaction will be assigned higher ranks and the goods and services that offer a lower level of satisfaction will be assigned lower ranks.
   - Ordinal utility is a qualitative method that is used to measure consumption satisfaction.

Cardinal Utility

Ordinal Utility

Cardinal Utility

Pizza gives me more satisfaction as I get 60 Utils after eating it in comparison to burger which gives me 40 utils

60 Utils

40 Utils

*Util = Util is the imaginary unit by which we measure utility

Ordinal Utility

My first preference is Pizza which gives me more satisfaction than burger thus my second preference is burger

First Preference

Second Preference

Difference Between Cardinal Utility and Ordinal Utility

Total and Marginal Utilities

Quantity	Marginal Utility	Total Utility
1	10	10
2	8	18
3	6	24
4	4	28
5	2	30
6	0	30
7	-2	28

- **Total Utility:** Total utility means the total satisfaction attained by the consumer from all the units of a commodity taken together in the consumption of a certain thing at a time.
- **Marginal Utility:** Marginal utility is the additional utility obtains from an additional unit of any commodity consumed or acquired. It is measured the difference between the utility of the total units of stock of consumption of a given commodity and that of consuming one unit less in the stock considered. In symbolic terms:

$$MUx = Tux - TUx\text{-}1$$

$$TU_n = U_1 + U_2 + U_3 + \ldots\ldots\ldots + U_n \quad OR \quad TU_n = \Sigma MU_n$$

$$\text{Marginal Utility} = \frac{\text{Change in No. of Units Consumed } (\Delta TU)}{\text{Change in Total Utility } (\Delta Q)}$$

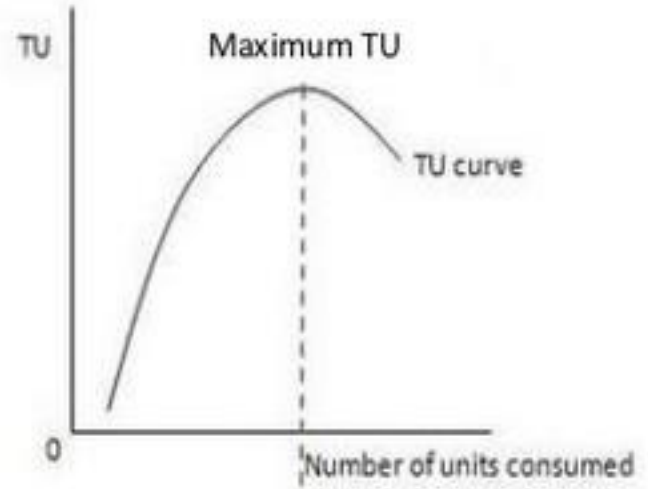
OR

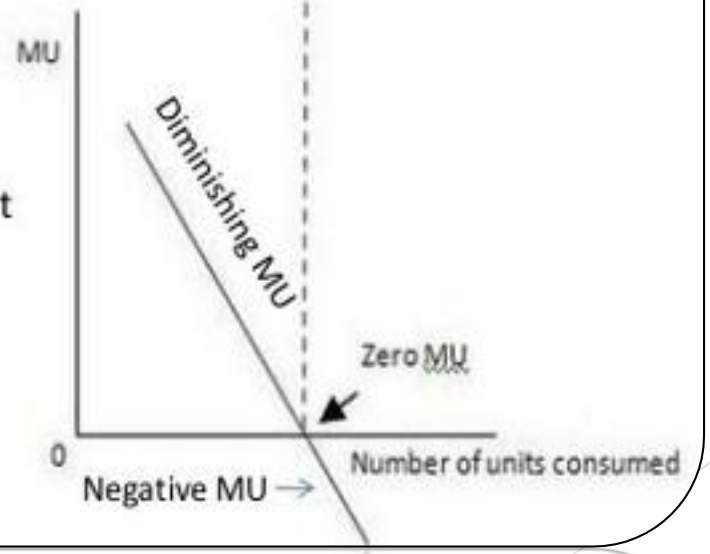
$$\text{Marginal Utility} = \frac{(TU_f - TU_i)}{(Qf - Qi)}$$

Relationship between Marginal Utility and Total Utility

Units	Total Utility	Marginal Utility
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2

- TU is increasing, but it increases by smaller and smaller amount for each additional unit. In other words, TU is increasing at decreasing rate.
- MU curve is downward sloping because of the fact that consumption of successive units gives less satisfaction.
- Increasing TU ⟶ Diminishing MU
- Maximum TU ⟶ Zero MU
- Decreasing TU ⟶ Negative MU





Consumer Equilibrium

- *It refers to a situation when he spends his given income on purchase of a commodity (or commodities) in such a way that yields him maximum satisfaction.*

CONSUMER EQUILIBRIUM INCASE OF SINGLE COMMODITY

- A consumer purchasing a single commodity will be at equilibrium, when he is buying such a quantity of that commodity, which gives him maximum satisfaction. The number of units to be consumed of the given commodity by a consumer depends on 2 factors:

1. Price of the given commodity;
2. Marginal utility from each successive unit.

- MU is expressed in utils and price is expressed in terms of money. However, MU and P can be effectively compared only when both are stated in the same units. Therefore, marginal utility in utils is expressed in terms of money.
- Marginal Utility in terms of Money = Marginal Utility in utils/ Marginal Utility of one rupee (MU_M)

Consumer in consumption of single commodity (say, x) will be at equilibrium when:

Marginal Utility (MU_x) is equal to Price (P_x) paid for the commodity; i.e. MU = Price

Units of X	Price (P_x) (Rs.)	Marginal utility (utils)	Marginal utility in Rs. (MU_x) 1 util =Rs. 1	Difference MU_x and P_x	Remarks
1	10	20	20/1 = 20	20-10= 10	$MU_x > P_x$ so
2	10	16	16/1 = 16	16-10= 6	consumer will increase the consumption
3	10	10	10/1 = 10	10-10= 0	Consumer's Equilibrium ($MU_x=P_x$)
4	10	4	4/1 = 4	4-10= -6	$MU_x < P_x$, so
5	10	0	0/1 = 0	0-10=-10	consumer will decrease the consumption
6	10	-6	- 6/1 = -6	-6-10=-16	

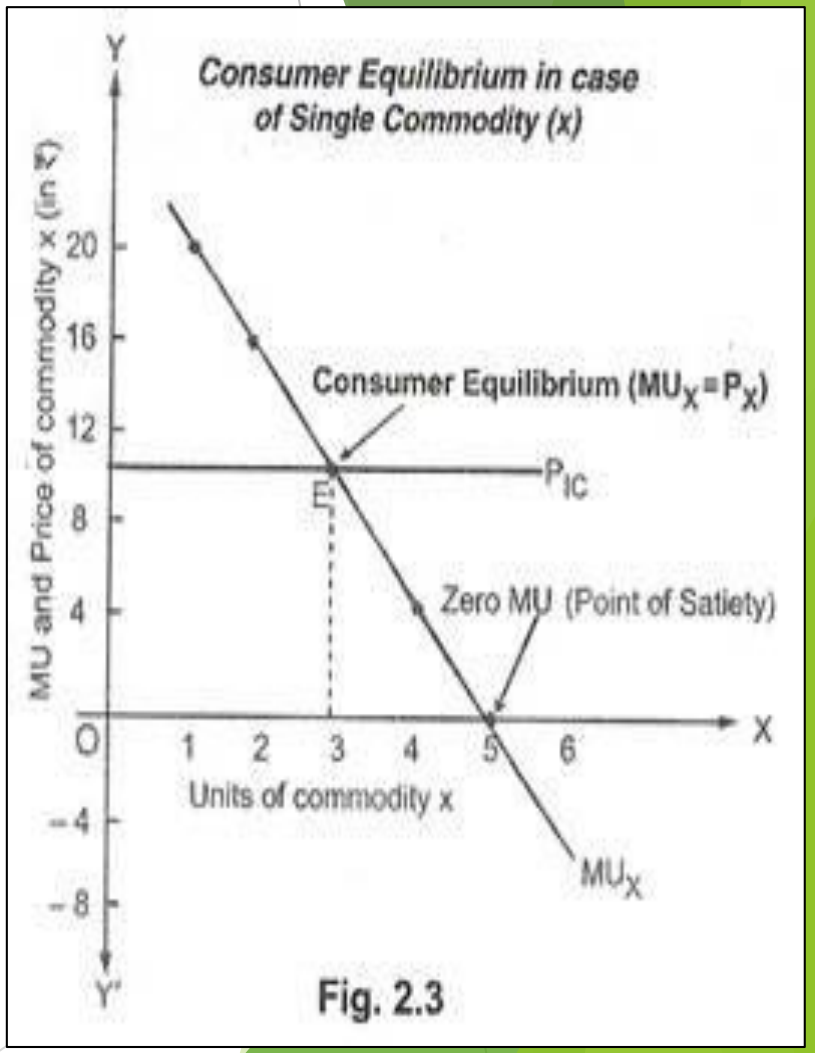


Fig. 2.3

CONSUMER EQUILIBRIUM INCASE OF TWO COMMODITIES

Two necessary conditions to attain Consumer's Equilibrium in case of Two Commodities:

(i) Slope of Budget line is equivalent to slope of indifference curve

A Consumer in consumption of single commodity (say, x) is at equilibrium when

$$MU_x/P_x = MU_M$$

A Consumer consuming another commodity (say, y) will be at equilibrium when

$$MU_Y/P_Y = MU_M$$

Equating 1 and 2, we get:

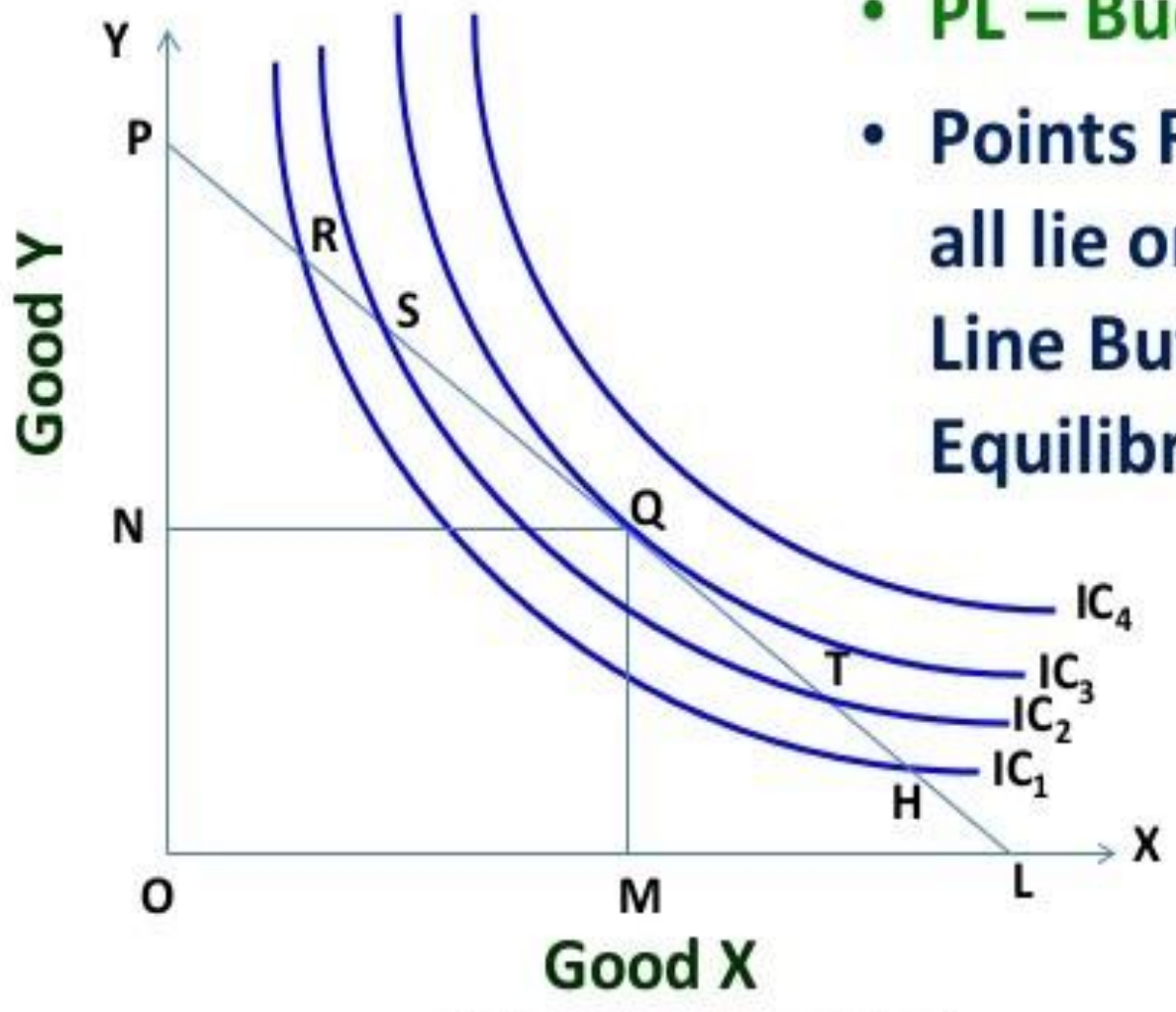
$$MU_X/P_X = MU_Y/P_Y = MU_M$$

$$MRSxy = Px/Py$$

(ii) MU falls as consumption increases:

A consumer in consumption of two commodities will be at equilibrium when he spends his limited income in such a way that the ratios of marginal utilities of two commodities and their respective prices are equal and MU falls as consumption increases.

Consumer Equilibrium



- PL – Budget Line
- Points R, S, Q, T, H all lie on Budget Line But Q is Equilibrium Point.

NUMERICALS

QUESTION 1

A person's Total Utility (TU) schedule is given below. Derive Marginal Utility from it.

UNITS	0	1	2	3	4	5
TU	0	10	25	38	48	55

UNITS	0	1	2	3	4	5
TU	0	10	25	38	48	55
MU	0	10	15	13	10	7

QUESTION 2

A person's Marginal Utility (MU) schedule is given below. Derive Total Utility from it.

UNITS	1	2	3	4	5	6
MU	9	6	4	2	0	-2

UNITS	1	2	3	4	5	6
MU	9	6	4	2	0	-2
TU	9	15	19	21	21	19

QUESTION 3

CALCULATE THE MISSING FIGURES…

UNITS	1	2	3	4	5
TU	16	_____	_____	_____	40
MU	_____	12	8	6	_____

UNITS	1	2	3	4	5
TU	16	28	36	42	40
MU	16	12	8	6	-2

QUESTION 4

Find out MRS_{YX} from the following information.

Combination	Units of X	Units of Y
A	30	1
B	26	2
C	23	3
D	21	4
E	20	5

Combination	Units of X	Units of Y	MRS_{YX}
A	30	1	-
B	26	2	4
C	23	3	3
D	21	4	2
E	20	5	1

QUESTION 5

A consumer has Rs.160 to spend on two goods X and Y. Given the price of good X at P_x= Rs.40 and price of good Y at P_y= Rs.40.

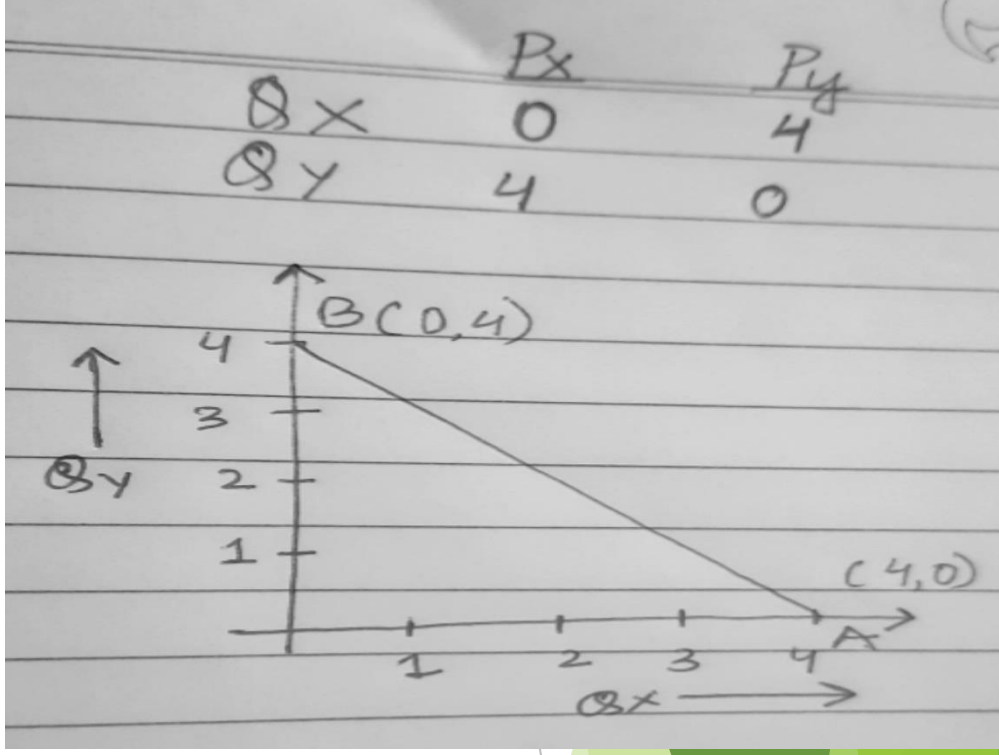
(i) Draw a budget line and write the budget equation for the consumer.

(ii) Can the consumer buy (4, 1) and (3, 2) bundles of the two goods? Why?

M=160, Px=40 & Py=40.

So X=4 & Y=4

Then, the budget equation
160=40x+40y.



So, you have to draw a budget line taking X=4 & Y=4.

ii. The consumer can not buy any bundle because these bundles are beyond the budget.

QUESTION 6

MU schedule for goods X and Y are given below. Both goods are priced at Rs 1 each. Income of Rakesh is assumed to be Rs 8. Determine how many units of both the commodities should be purchased by Rakesh to maximize his total utility.

QUANTITY (UNITS)	MARGINAL UTILITY OF X (MUx)	MARGINAL UTILITY OF Y (MUy)
1	11	19
2	10	17
3	9	15
4	8	13
5	7	12
6	6	10
7	5	8
8	4	6

Rakesh will consume 2 units of good x and will receive 10 utils of satisfaction and on the other hand he can consume 6 units of commodity Y and receive 10 utils of satisfaction as it satisfies the equation:

$$Mux/Px = Muy/Py$$

QUESTION 7

The following Table shows Thomas Utility from consuming two different food- salad and pastry. The price of a bowl of salad is Rs 3 and a price of a pastry is Rs 2.Fill up the Table.

QUANTITY	TU	MU	MU/UNIT (SALAD)	TU	MU	MU/UNIT (PASTRY)
1			15			20
2			10			10
3			9			6
4			6			5
5			5			4
6			3.3			1

ii) If Thomas has Rs 10 to spend on salad and pastry, how many units of each good should he purchase?

Thomas pocket money has increased from Rs 10 to Rs 18. If he spends only on these two goods, what is optimal consumption bundle?

QUANTITY	TU	MU	MU/UNIT	TU	MU	MU/UNIT
1	45	45	15	40	40	20
2	75	30	10	60	20	10
3	102	27	9	72	12	6
4	120	18	6	82	10	5
5	135	15	5	88	8	4
6	145	10	3.3	90	2	1

ii) 2 BOWLS OF SALAD + 2 PASTRIES
4 BOWLS OF SALAD + 3 PASTRIES

THANK YOU…