Theory of Demand

Demand

The demand for a commodity is its quantity which consumers are able and willing to buy at various prices during a given period of time.

The Law od Demand

The law of demand states that other factors being constant (cetris peribus), price and quantity demanded of any good and service are inversely related to each other. When the price of a product increases, the demand for the same product will fall.

Assumptions

(i) There is no change in the tastes and preferences of the consumer;

(ii) The income of the consumer remains constant;

(iii) There is no change in customs;

(iv) The commodity to be used should not confer distinction on the consumer;

(v) There should not be any substitutes of the commodity;

(vi) There should not be any change in the prices of other products;

(vii) There should not be any possibility of change in the price of the product being used;

(viii) There should not be any change in the quality of the product; and

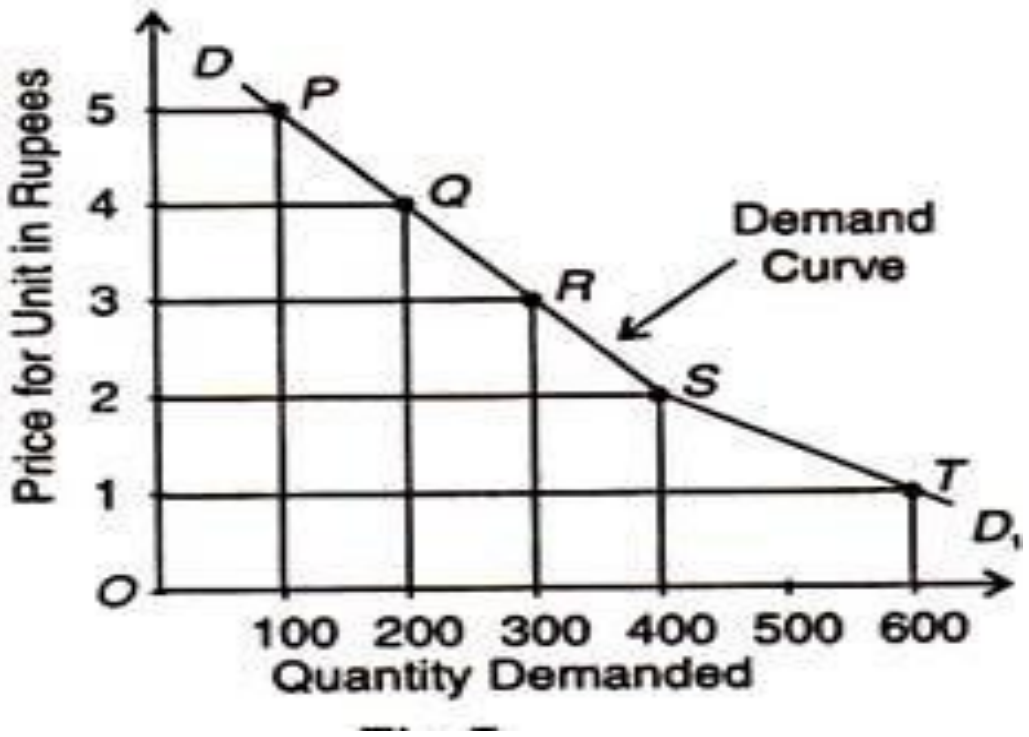
(ix) The habits of the consumers should remain unchanged.

Given these conditions, the law of demand operates. If there is change even in one of these conditions, it will stop operating.

Demand Schedule and Demand Curve

Demand Schedule

Price (Rs)	Quantity Demanded
5	100 Units
4	200 Units
3	300 Units
2	400 Units
1	600 Units



The demand for a commodity by a buyer is generally not a fixed quantity. It is affected by many factors. The factors that influence the demand are called the *determinants of demand*. The determinants of demand are also known as *demand shifters.* The following factors affect an individual's demand for a commodity:

(1) the price of the good or service,

(2) the incomes of consumers,

(3) the prices of related goods and services,

(4) the tastes or preference patterns of consumers,

(5) the expected price of the product in future periods, and

(6) the number of consumers in the market.

Demand Function

A demand function expresses the relationship between the quantity demanded of a commodity and its determinants.

Q_x = f (P_x, Y, P_s , P_z , T, N, E, A, I, S)

Where

Q_x = Quantity demand of commodity x

P_x = Price of commodity x

Y = Income of consumer

P_s = Price of substitute good

P_z = Price of compliment good

T = Taste and Preferences

N = population

T = Taste and Preferences

N = population

E = Future expectations

A = Expenditure on advertising and promotion

I = interest rate

S = Socio-cultural factor

Demand function can be expressed in a linear equation form

Q_x = a $-$ bP_x + cY + dP_s - eP_z + gT + hN + jE + kA – iI + mS

Where a = quantity when the value of all determinants of demand are simultaneously zero.

b, c, d, e, g, h, j, k, I, m correlation representing the degree to which different variable are associated with quantity demanded.

Demand function for price

A demand function for price can be expressed as

Q_{dx} = f(P_x)

Where Q_{dx} = quantity demanded of commodity x

P_x = Price of commodity x

f denotes a functional relationship

The demand function in the linear form can be expressed as

Q_{dx} = a - bP_x

Where a = quantity demanded when price is zero

b= correlation coefficient between quantity demanded and price

In the above equation

(i) **a** represents quantity demanded at zero price. It is a constant and is known as the intercept parameter. The demand curve will intercept the X-axis at quantity **a.**

(ii) The term b represents the slope pf demand function. . For the demand b will be negative as there is an inverse relationship between price and quantity demanded.

If a= 100, b = 5,

Then Q = a –bP

Putting the values

Q = 100 – 5 P

Price per unit (Rs)	Quantity demanded in units
4	80
8	60
10	50
15	25

Suppose the demand equation is

$Q_{dx} = 40 - 2P_x$

From this equation, we can derive the following demand schedule

Q_{dx}	P_x
	0
	1
	2
	3
	4
	5
	6
	7

Demand Schedule

It is a statement in the form of a table that shows the different quantities in demand at different prices. There are two types of Demand Schedules:

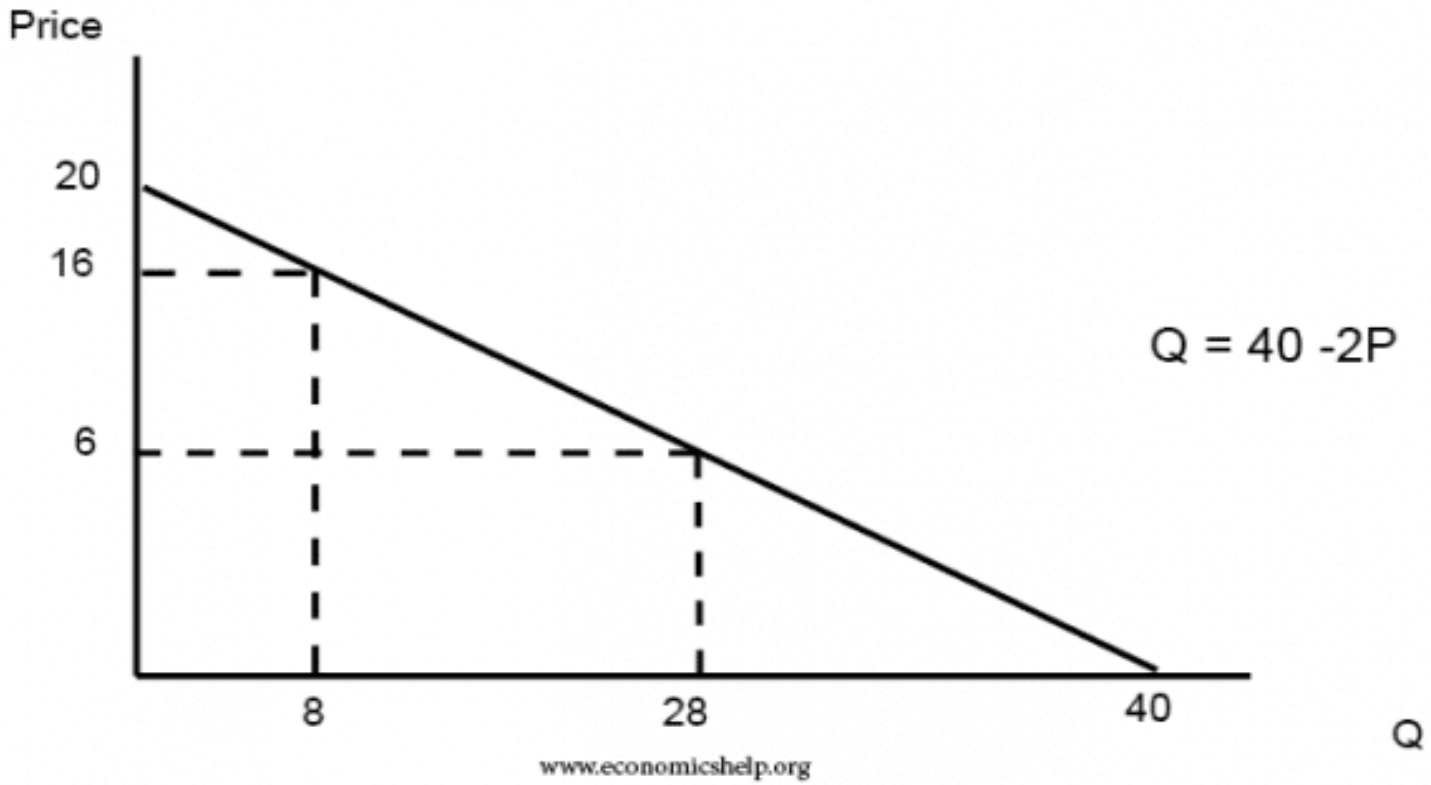
1. Individual Demand Schedule
2. Market Demand Schedule

Individual Demand Schedule

It is a demanding schedule that depicts the demand of an individual customer for a commodity in relation to its price.

Price per unit of commodity X (Px)	Quantity Quantity demanded of commodity X (Dx)
100	50
200	40
300	30
400	20
500	10

The Individual demand curve



This schedule depicts the individual demand schedule. We can see that when the price of the commodity is ₹100, its demand is 50 units. Similarly, when its price is ₹500, its demand decreases to 10 units.

Thus, we can conclude that as the price falls the demand increases and as the price raises the demand decreases. Hence, there exists an inverse relationship between the price and quantity demanded.

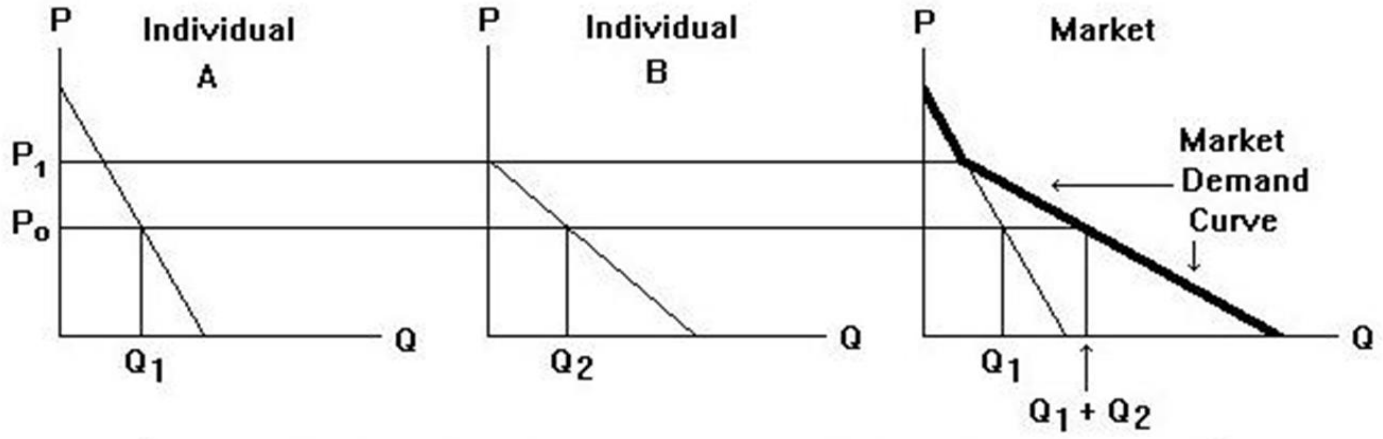
Market Demand Schedule

It is a summation of the individual demand schedules and depicts the demand of different customers for a commodity in relation to its price.

Price per unit of commodity X	Quantity demanded by consumer A (Q_A)	Quantity demanded by consumer B (Q_B)	Market Demand $Q_A + Q_B$
100	50	70	120
200	40	60	100
300	30	50	80
400	20	40	60
500	10	30	40

This schedule shows the market demand for commodity X. When the price of the commodity is ₹100, customer A demands 50 units while the customer B demands 70 units.

Thus, the market demand is 120 units. Similarly, when its price is ₹500, Customer A demands 20 units while customer B demands 30 units. Thus, it's market demand decreases to 40 units.



Market Demand Curve

Elasticity of Demand

Elasticity means percentage change in one variable due to the percentage change in another variable.

Let those two variables are A and B then

Coefficient of elasticity = $\frac{Percentage\ change\ in\ A}{percentage\ change\ in\ B}$

$$= \frac{\Delta A/A}{\frac{\Delta B}{B}}$$

This concept is used for

1. Price elasticity of demand
2. Income elasticity of demand
3. Cross elasticity of demand
4. Promotional elasticity of demand

Price Elasticity of Demand

Price elasticity of demand indicates the degree of responsiveness of quantity demanded of a good to the change in its price, other factors such as income, prices of related commodities that determine demand are held constant. Precisely, price elasticity of demand is defined as the ratio of the percentage change in quantity demanded of a commodity to a percentage change in price. Thus

e_P = Percentage change in quantity demanded/Percentage change in price.

Measurement of Price Elasticity of demand

1. Proportionate or Percentage Method:

This method is suitable to estimate price elasticity when the change in price is infinitely small. According to this method, price elasticity of demand (e_p) is measured by using the formula explained under the concept of price elasticity of demand. It is —

$$E_p = \frac{\%\ change\ in\ q}{\%\ change\ in\ p} = \frac{\Delta q / q}{\Delta p / p} = \frac{\Delta q}{\Delta p} \times \frac{p}{q}$$

$$e_p = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1}$$

$\Delta Q = Q_2 - Q_1$ and $\Delta P = P_2 - P_1$

Example 1:

From the given demand schedules of good X and Y, find out which goods has a more elastic demand.

Commodity X		*Commodity Y*	
Price/unit (Rs.)	*Quantity demanded (Units)*	*Price/unit (Rs.)*	*Quantity demanded (Units)*
6	10	10	12
3	16	6	30

$$e_p = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1}$$

In case of commodity X,

$P_1 = 6 \quad Q_1 = 10 \quad \Delta Q = Q_2 - Q_1 = 16 - 10 = 6 \quad \Delta P = P_2 - P_1 = 3 - 6 = -3$

Therefore, the price elasticity of demand (e_p) will be,

$$e_p^X = \frac{6}{-3} \times \frac{6}{10} = \frac{36}{-30} = -1.2$$

Similarly, in case of commodity Y,

$P_1 = 10 \quad Q_1 = 12$

$\Delta Q = Q_2 - Q_1 = 30 - 12 = 18$

$\Delta P = P_2 - P_1 = 6 - 10 = -4$

Therefore, the price elasticity of demand (e_p) will be,

$$e_p^Y = \frac{18}{-4} \times \frac{10}{12} = \frac{180}{-48} = -3.75$$

Thus, Goods Y (3.75) has more elastic demand than the Goods X (1.2), the negative sign being ignored.

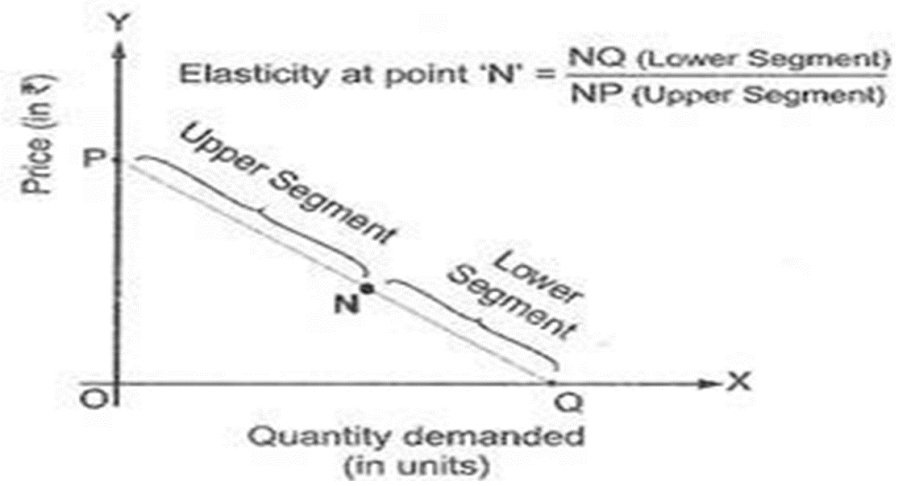
2. Geometric Method:

Geometric method was suggested by Prof. Marshall and is used to measure the elasticity at a point on the demand curve. When there are infinitely small changes in price and demand, then the 'Geometric Method' is used. This method is also known as 'Graphic Method' or 'Point Method'. Elasticity of demand (E_d) is different at different points on the same straight line demand curve.

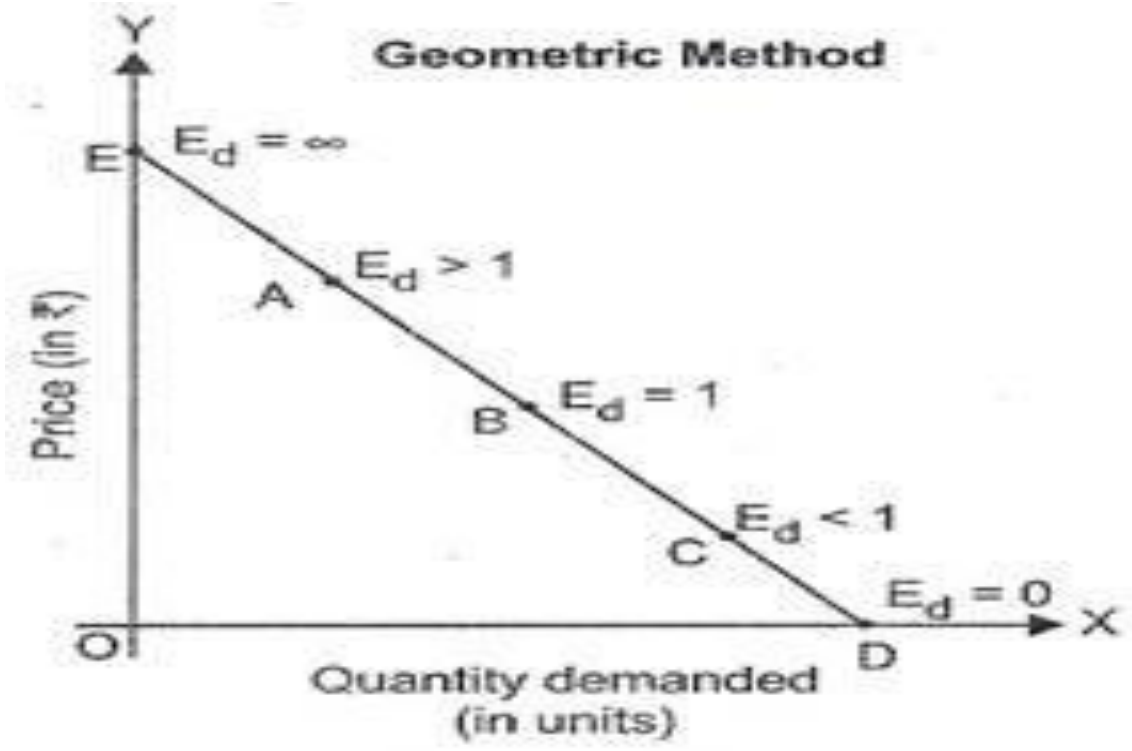
In order to measure E_d at any particular point, lower portion of the curve from that point is divided by the upper portion of the curve from the same point.

Elasticity of Demand (E_d) = Lower segment of demand curve (LS) / Upper segment of demand curve (US)

As seen in Fig. elasticity at a particular point 'N' is calculated as NQ/NP.



Elasticity of demand on different points of a straight line demand curve is shown in the following figure

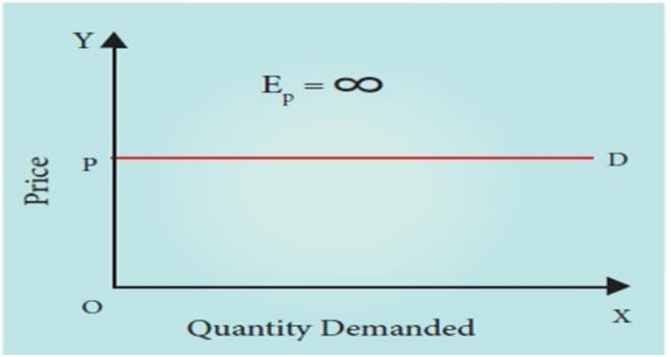


Degrees of Price Elasticity:

Different commodities have different price elasticity's. Some commodities have more elastic demand while others have relative elastic demand. Basically, the price elasticity of demand ranges from zero to infinity. It can be equal to zero, less than one, greater than one and equal to unity.

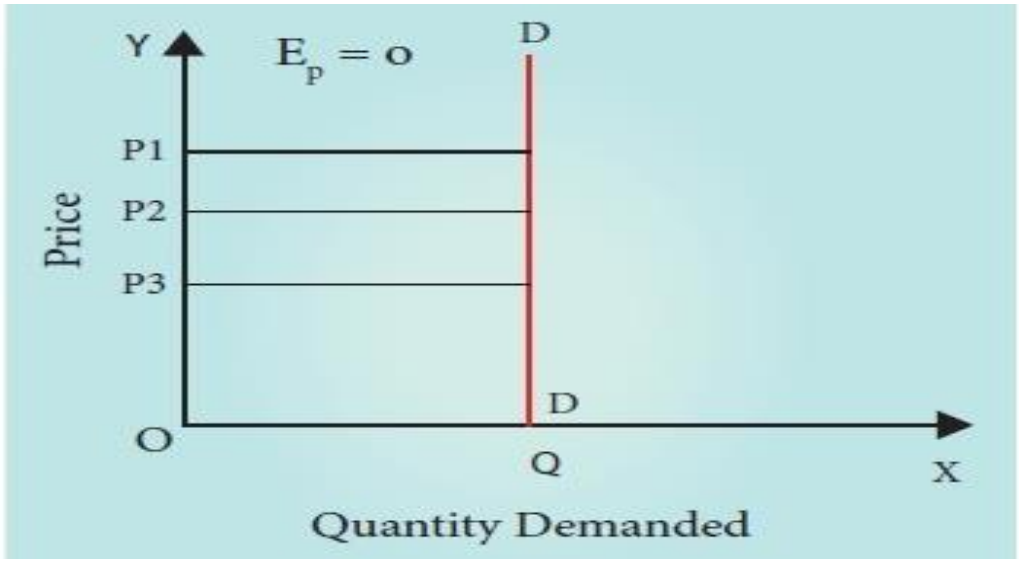
1. Perfectly Elastic Demand (Ep = ∞):

The demand is said to be perfectly elastic when a slight change in the price of a commodity causes an infinite change in its quantity demanded. Such as, even a small rise in the price of a commodity can result in greater fall in demand even to zero. In some cases a little fall in the price can result in the increase in demand to infinity. In perfectly elastic demand the demand curve is a **horizontal straight line** parallel to x axis.



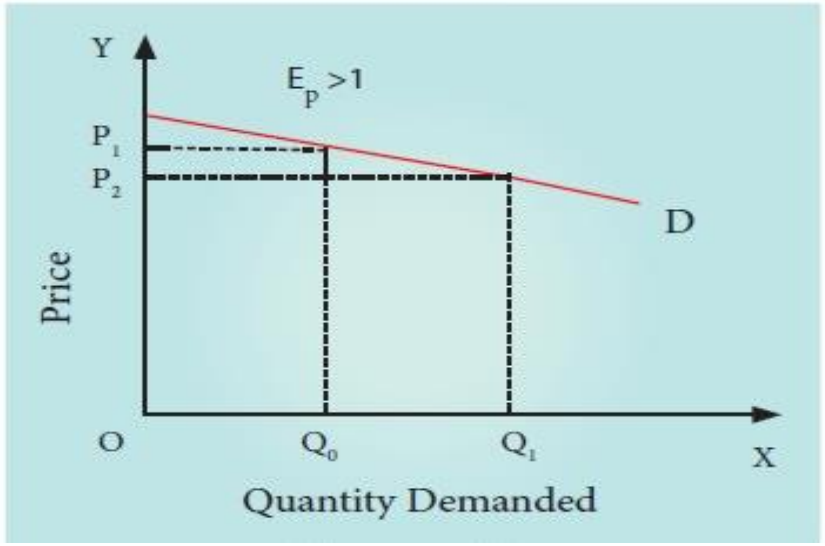
2. Perfectly Inelastic Demand (Ep =0):

When there is no change in the demand for a product due to the change in the price, then the demand is said to be perfectly inelastic. Here, the demand curve is a **vertical straight line** which shows that the demand remains unchanged irrespective of change in the price., i.e. quantity OQ remains unchanged at different prices, P1, P2, and P3.



3. Relatively Elastic Demand (Ep>1):

The demand is relatively elastic when the proportionate change in the demand for a commodity is greater than the proportionate change in its price. Here, the demand curve is **gradually sloping** which shows that a proportionate change in quantity from 5 to 10 is greater than the proportionate change in the price from 11 to 10. Change in demand is:

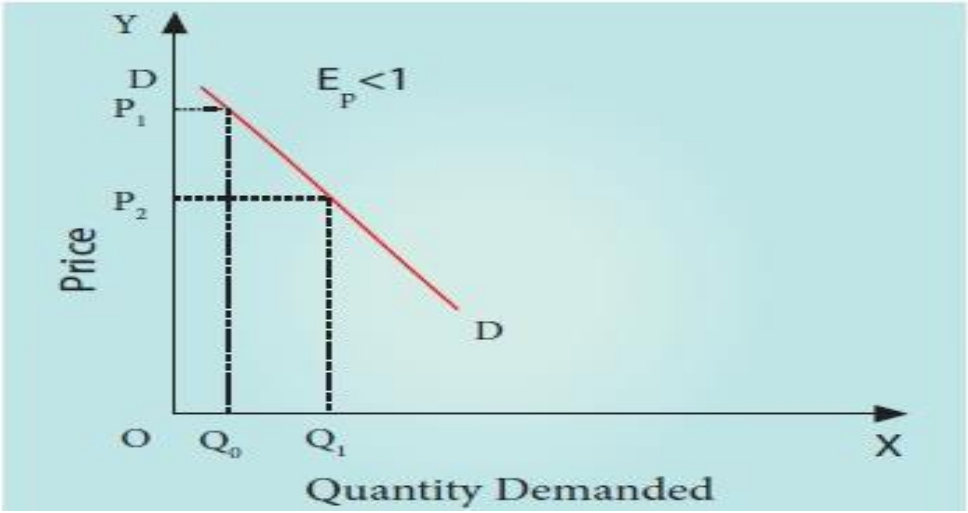


$0–5/5 \times 100 = 100\%$

Change in price =10%. Hence, it is more elastic demand.

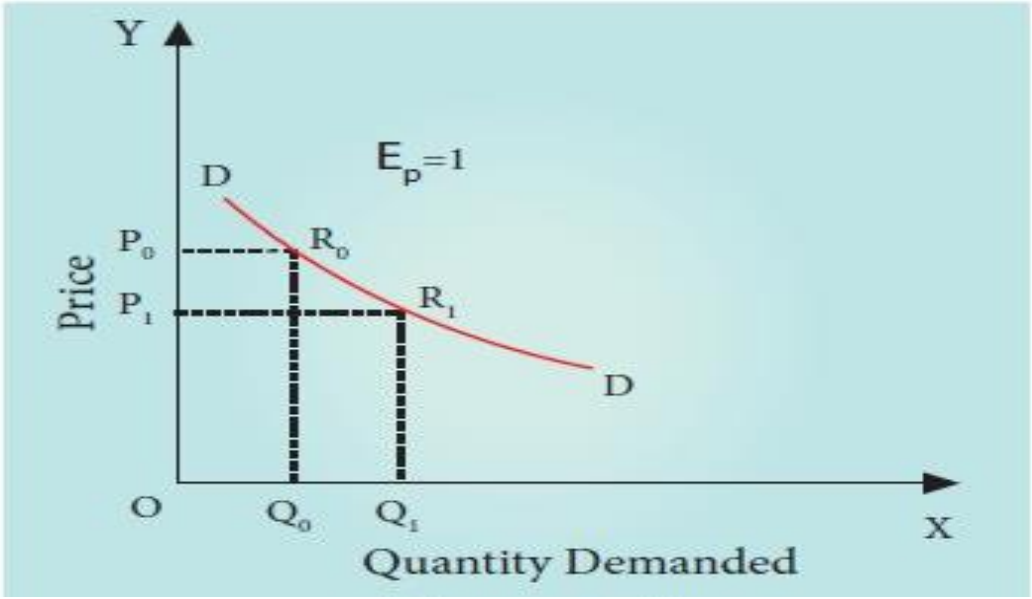
4. Relatively Inelastic Demand (Ep<1):

When the proportionate change in the demand for the product is less than proportionate change in the price, the demand is said to be relatively inelastic. It is also called as the elasticity less than unity. Here the demand curve is **steeply sloping**, which shows that the change in the quantity from OQ0 to OQ1 is relatively smaller than the change in the price from OP1 to Op2.



5. Unitary Elastic Demand (Ep =1):

The demand is unitary elastic when the proportionate change in the price of a product results in the same propionate change in the quantity demanded. Here the shape of the demand curve is a **rectangular hyperbola**, which shows that area under the curve is equal to one



Numerical Value	*Terminology*	*Description*	*Shape of the Demand curve*
$e_p = \infty$	Perfectly elastic	Change in demand is infinite at a given price	Horizontal
$e_p = 0$	Perfectly inelastic	Demand remains unchanged whatever be the change in price	Vertical
$e_p = 1$	Unitary elastic	$\%\Delta Q = \%\Delta P$	Rectangular Hyperbola
$0 < e_p < 1$	Inelastic	$\%\Delta Q < \%\Delta P$	Steeper
$\infty > e_p > 1$	Elastic	$\%\Delta Q > \%\Delta P$	Flatter

Factors affecting Price Elasticity of Demand

Various factors which affect the elasticity of demand of a commodity are:

1. Nature of commodity:

Elasticity of demand of a commodity is influenced by its nature. A commodity for a person may be a necessity, a comfort or a luxury.

i. When a commodity is a necessity like food grains, vegetables, medicines, etc., its demand is generally inelastic as it is required for human survival and its demand does not fluctuate much with change in price.

ii. When a commodity is a comfort like fan, refrigerator, etc., its demand is generally elastic as consumer can postpone its consumption.

iii. When a commodity is a luxury like AC, DVD player, etc., its demand is generally more elastic as compared to demand for comforts.

iv. The term ‘luxury’ is a relative term as any item (like AC), may be a luxury for a poor person but a necessity for a rich person.

2. Availability of substitutes:

Demand for a commodity with large number of substitutes will be more elastic. The reason is that even a small rise in its prices will induce the buyers to go for its substitutes. For example, a rise in the price of Pepsi encourages buyers to buy Coke and vice-versa.

Thus, availability of close substitutes makes the demand sensitive to change in the prices. On the other hand, commodities with few or no substitutes like wheat and salt have less price elasticity of demand.

3. Income Level:

Elasticity of demand for any commodity is generally less for higher income level groups in comparison to people with low incomes. It happens because rich people are not influenced much by changes in the price of goods. But, poor people are highly affected by increase or decrease in the price of goods. As a result, demand for lower income group is highly elastic.

4. Level of price:

Level of price also affects the price elasticity of demand. Costly goods like laptop, Plasma TV, etc. have highly elastic demand as their demand is very sensitive to changes in their prices. However, demand for inexpensive goods like needle, match box, etc. is inelastic as change in prices of such goods do not change their demand by a considerable amount.

5. Postponement of Consumption:

Commodities like biscuits, soft drinks, etc. whose demand is not urgent, have highly elastic demand as their consumption can be postponed in case of an increase in their prices. However, commodities with urgent demand like life saving drugs, have inelastic demand because of their immediate requirement.

6. Number of Uses:

If the commodity under consideration has several uses, then its demand will be elastic. When price of such a commodity increases, then it is generally put to only more urgent uses and, as a result, its demand falls. When the prices fall, then it is used for satisfying even less urgent needs and demand rises.

For example, electricity is a multiple-use commodity. Fall in its price will result in substantial increase in its demand, particularly in those uses (like AC, Heat convector, etc.), where it was not employed formerly due to its high price. On the other hand, a commodity with no or few alternative uses has less elastic demand.

7. Share in Total Expenditure:

Proportion of consumer's income that is spent on a particular commodity also influences the elasticity of demand for it. Greater the proportion of income spent on the commodity, more is the elasticity of demand for it and vice-versa.

Demand for goods like salt, needle, soap, match box, etc. tends to be inelastic as consumers spend a small proportion of their income on such goods. When prices of such goods change, consumers continue to purchase almost the same quantity of these goods. However, if the proportion of income spent on a commodity is large, then demand for such a commodity will be elastic.

8. Time Period:

Price elasticity of demand is always related to a period of time. It can be a day, a week, a month, a year or a period of several years. Elasticity of demand varies directly with the time period. Demand is generally inelastic in the short period.

It happens because consumers find it difficult to change their habits, in the short period, in order to respond to a change in the price of the given commodity. However, demand is more elastic in long run as it is comparatively easier to shift to other substitutes, if the price of the given commodity rises.

9. Habits:

Commodities, which have become habitual necessities for the consumers, have less elastic demand. It happens because such a commodity becomes a necessity for the consumer and he continues to purchase it even if its price rises. Alcohol, tobacco, cigarettes, etc. are some examples of habit forming commodities.

Income Elasticity of Demand

The income elasticity of demands (E_y) expresses the responsiveness of a consumer's demand (or expenditure or consumption) for any good to the change in his income

$$E_y = \frac{\text{Percentage change in the qsuantity demanded}}{\text{Percentage change in income}}$$

$$\frac{\Delta Q/Q}{\Delta Y/Y} = \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y} = \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q}$$

Where Δ is change, Q quantity demanded and Y is income.

The income elasticity of demand is positive for normal goods and negative for the inferior goods.

Income elasticity of demand varies from negative to grater than unity.

Income elasticity and classification of goods

1. Inferior Goods – Y ↑ → demand ↓ $E_y < 0$
2. Normal goods – Y ↑ → demand ↑

Normal goods are further divided into

(a) Necessities – $0 < E_y < 1$

Thus, an increase in income causes less than proportionate increase in quantity demanded and vice versa.

Eg basic food items and ordinary day-to-day clothings

(b) Comforts - – $E_y = 1$

Thus a change in income causes a direct and proportionate change in quantity demanded.

Eg. Semi-luxury items like good quality clothes, eating out etc.

(c) Luxuries - $E_Y > 1$

Thus, a change in income leads to direct and more than proportionate change in quantity demanded.

Eg. Expensive cars, foreign holidays etc.

3. Neutral Goods - $E_Y = 0$

A change in income does not bring about any change in the quantity demanded of such commodities.

Eg rice, wheat, salt, sugar etc.

Note : A commodity may be a luxury for some people and at some income level and comforts for other people and at other income levels.

Similarly a commodity may be normal for some individuals and at a some levels of income and inferior for others at other income levels.

Significance of Income Elasticity of Demand

If income elasticity for a commodity is 1.8, it means that 1 % increase in income will cause 1.8 % increase in demand for the commodity.

The demand for commodities with low income elasticity will not be much affected due to boom or recession in the economy.

The demand for commodities with large income elasticities will increase sharply during the boom and fall sharply during recession in the economy. Income elasticity helps the firm in their marketing and production strategies.

Cross elasticity of demand

The demand for a commodity may change due to a change in the price of a substitute or complementary commodity. This is known as cross demand. The ratio of responsiveness of the demand for a commodity due to the change in the price of the related commodity is known as the cross elasticity of demand.

Eg. X and Y commodities are substitutes. If the price of a commodity X rises, consumers may switch over to commodity Y, assuming no change in the price of Y.

The coefficient of cross elasticity of demand can be given as –

$$E_C = \frac{Percentage\ change\ in\ the\ quantoty\ demanded\ of\ commodity\ X}{Percentage\ change\ in\ the\ price\ of\ clmmodity\ Y}$$

$$E_C = \frac{{}^{\Delta Q_X}/_{Q_X}}{{}^{\Delta P_Y}/_{P_Y}} = \frac{\Delta Q_X}{\Delta P_Y} \times \frac{P_Y}{Q_X}$$

Note

- If the value of E_C is positive, commodities X and Y are substitutes.
- If E_C is negative, commodities X and Y are complementary goods.
- If E_C is zero, commodities X and Y are unrelated.

While the sign of cross elasticity includes whether the two goods are substitutes or complements, its magnitude measures the degree of the relationship. The greater the cross elasticity, the more related the two goods are. If the two goods have no relationship, the cross elasticity of demand between them will be zero.

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Cross elasticity of demand is helpful

1. To measure the interdependence of demand for a commodity with the price of another related commodities.
2. To find out the effect of change in the price of the goods on the demand for related goods.

Eg. If the two good X and Y are

a) substitutes, then if the cross elasticity of demand for goods X and Y is 1.25, it means that 1% increase in the price of good X will lead to 1.25 & increase in the demand of good Y. (Positive)

b) Complements, then if the cross elasticity of demand between X and Y is -0.68, it means that 1% increase in the price of good X will reduce the demand for good Y by 0.68%. (Negative)

c) unrelated then the cross elasticity would be zero. (Zero)

Promotional Elasticity of Demand

- Informative advertising is very helpful for the consumer in making rational purchase decisions.
- The extension of demand through advertising can be measured by advertising or promotional elasticity of demand (E_A) which measures the expected changes in demand as a result of change in other promotional expenses.
- The demand for some goods is affected more by advertising such as the demand for cosmetics.
- Following is the formula for advertising elasticity,

$$E_A = \frac{\%\ change\ in\ quantity\ demanded}{\%\ change\ in\ promotional\ expenses} = \frac{{}^{\Delta Q}/_{Q}}{{}^{\Delta A}/_{A}} = \frac{\Delta Q}{\Delta A} \times \frac{A}{Q}$$

Where A= original promotional expenses Q= original Quantity demanded

ΔQ = change in quantity demanded ΔA = change in promotional expenditure

The promotional elasticity of demand is usually positive. It is better for the firms to spend on promotional activities if the promotional elasticity of demand is higher.

It helps the firm to determine the outlay on promotional activities including advertisement and promotional strategy.

Importance of Elasticity of Demand

1. **Business decisions –** like the determination of the price of the product, determination of the factor of production and for demand forecasting
2. **Tax Policy –** Government gets the help from elasticity of demand for deciding the tax, like inelastic demand – more tax, so that more revenue would be generated. Similarly income elasticity helps govt to decide the taxes on essential goods and luxury goods.
3. **Foreign trade policy -** If demand for export and import is elastic trade policy is effective and changes in exchange rate would also have the desired effects.
4. **Trade Union –** Trade unions can do the wage bargaining if they would know the elasticity of demand
5. **Agriculture –** Elasticity of demand helps in understanding the fluctuations in agricultural prices. This would help the government in controlling large price fluctuations by framing appropriate policies.

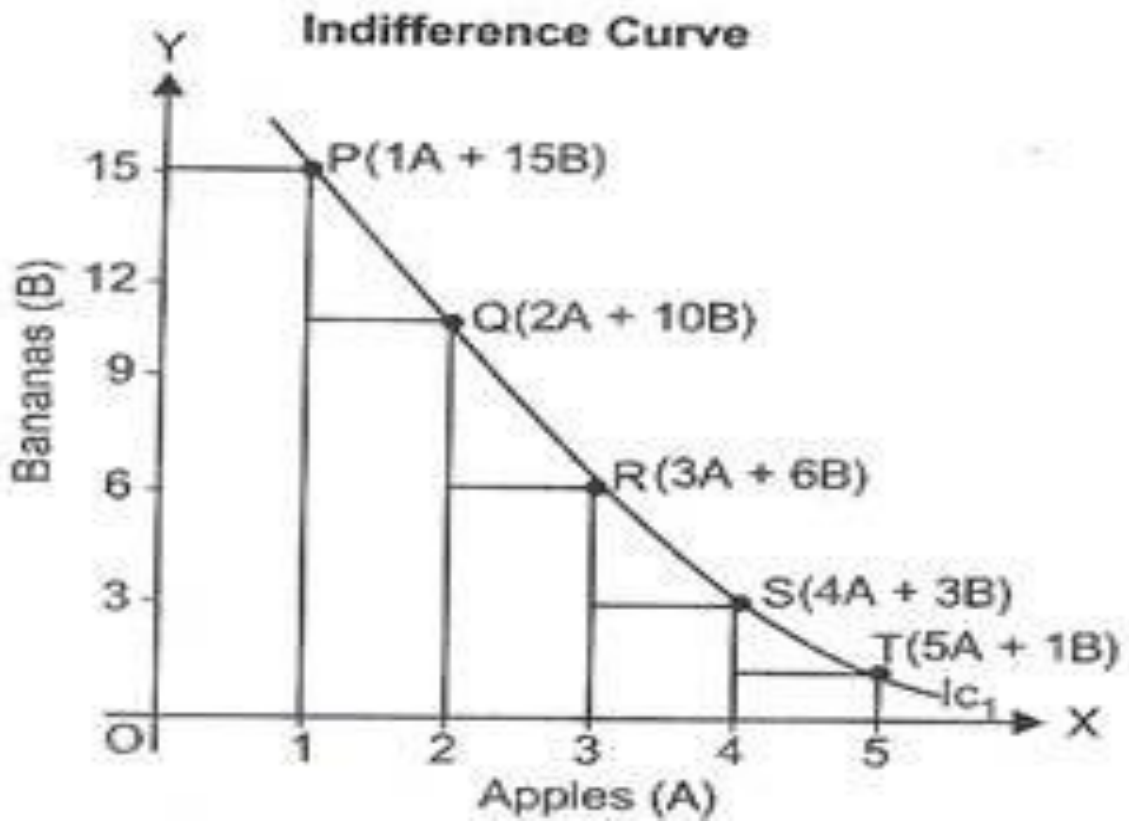
Eg. An increase in Wheat production would lead to a substantial fall in wheat prices if the demand for wheat is inelastic and the income elasticity of demand for wheat is low

Indifference Schedule and curve

Indifference curve refers to the graphical representation of various alternative combinations of bundles of two goods among which the consumer is indifferent (gets the same satisfaction). Alternately, indifference curve is a locus of points that show such combinations of two commodities which give the consumer same satisfaction.

Indifference Schedule

Combination of Apples	Apples (A)	Bananas (B)
P	1	15
Q	2	10
R	3	6
S	4	3
T	5	1



Every point on IC_1, represents an equal amount of satisfaction to the consumer. So, the consumer is said to be indifferent between the combinations located on Indifference Curve 'IC_1'. The combinations P, Q, R, S and T give equal satisfaction to the consumer and therefore he is indifferent among them. These combinations are together known as 'Indifference Set'.

Assumptions

i. A consumer has to choose between different combinations of only 2 commodities viz. X and Y.

ii. Ordinal measurement of utility or satisfaction is done.

iii. Consumption of commodities X and Y are subject to Law of Diminishing Marginal Utility.

iv. Commodities shown on an indifference curve are perfectly divisible; so that their quantity can be increased or decreased in small units.

v. Continuity i.e. the consumer can rank the combinations of X and Y in accordance of the satisfaction derive from them. It mean that minute changes in combination of X, Y are possible such that we will have a smooth and continuous indifference curve.

vi. Weak - ordering - it implies that the consumer may prefer A to B or B to A or he may be indifferent between A and B. It recognises the relation of preference as well as of indifference. As against this the strong ordering means the consumer prefers A to B or B to A but he is not indifferent between the two.

Properties of Indifference Curves

1. Indifference curves are always convex to the origin:

An indifference curve is convex to the origin because of diminishing MRS. MRS declines continuously because of the law of diminishing marginal utility.

Marginal Rate of Substitution

MRS refers to the rate at which the commodities can be substituted for each other, so that total satisfaction of the consumer remains the same.

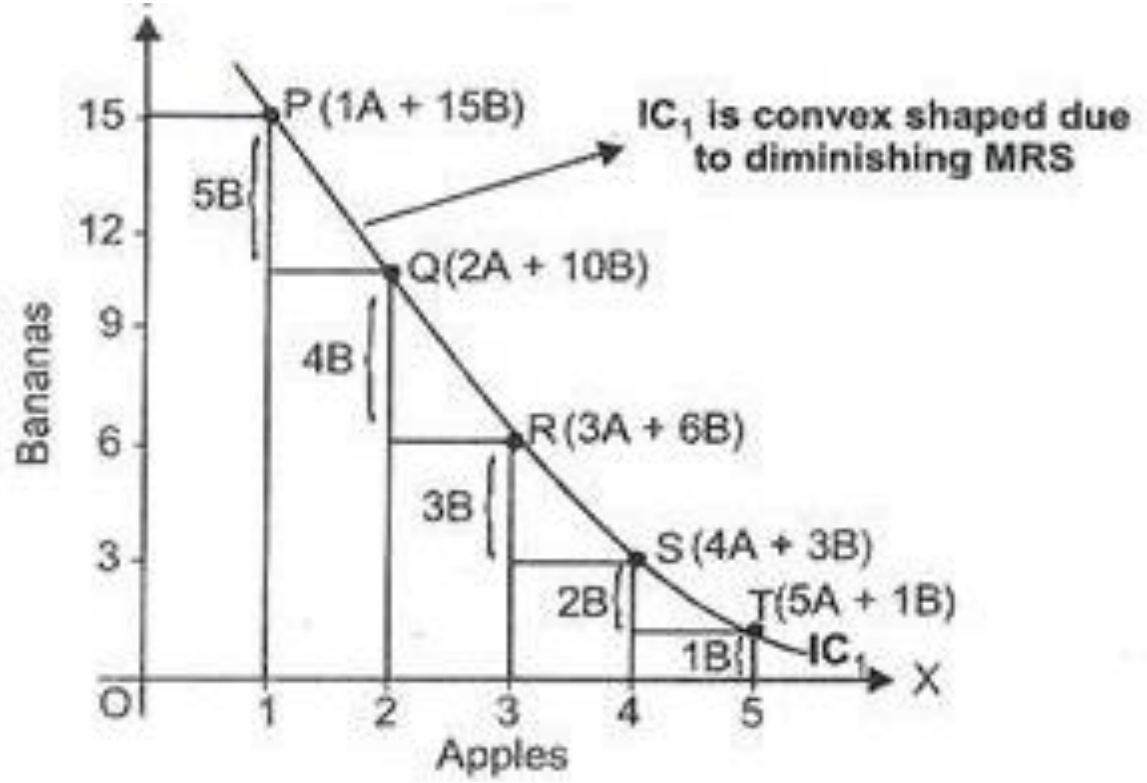
For example, in the example of apples (A) and bananas (B), MRS of ‘A’ for ‘B’, will be number of units of ‘B’, that the consumer is willing to sacrifice for an additional unit of ‘A’, so as to maintain the same level of satisfaction.

MRS_{AB} = Units of Bananas (B) willing to Sacrifice / Units of Apples (A) willing to Gain = $\Delta B/\Delta A$

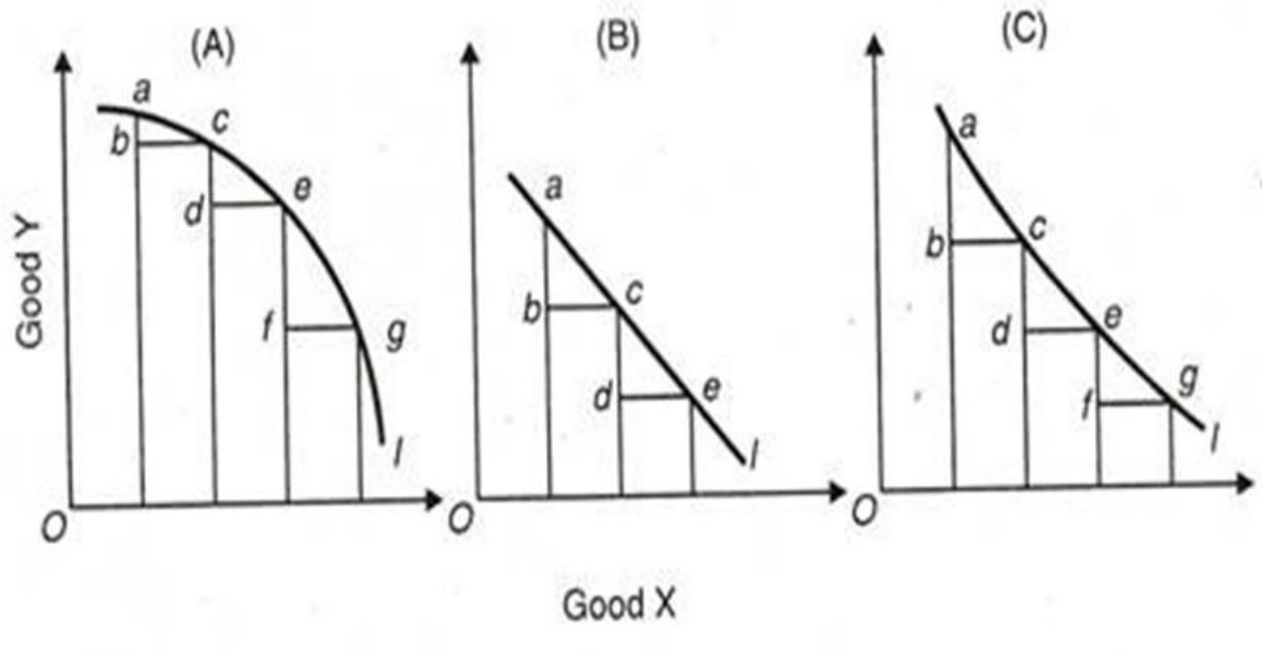
MRS_{AB} is the rate at which a consumer is willing to give up Bananas for one more unit of Apple. It means, MRS measures the slope of indifference curve.

Combination	Apples (A)	Banana (B)	MRSAB
P	1	15	–
Q	2	10	5B:1 A
R	3	6	4B:1A
S	4	3	3B:1A
T	5	1	2B:1 A

When the consumer consumes more and more of apples, his marginal utility from apples keeps on declining and he is willing to give up less and less of bananas for each apple. Therefore, indifference curve is convex to the origin.



Let us take a concave curve where the marginal rate of substitution of X for Y increases instead of diminishing, i.e., more of Y is given up to have additional units of X. As in Figure (A), the consumer is giving up ab< cd< ef units of Y for bc= de=fg units of X. But an indifference curve cannot be concave to the origin.



If we take a straight line indifference curve at an angle of 45° with either axis, the marginal rate of substitution between the two goods will be constant, as in Panel (B) where ab of Y= be of X and cd of Y= de of X. Thus an indifference curve cannot be a straight line.

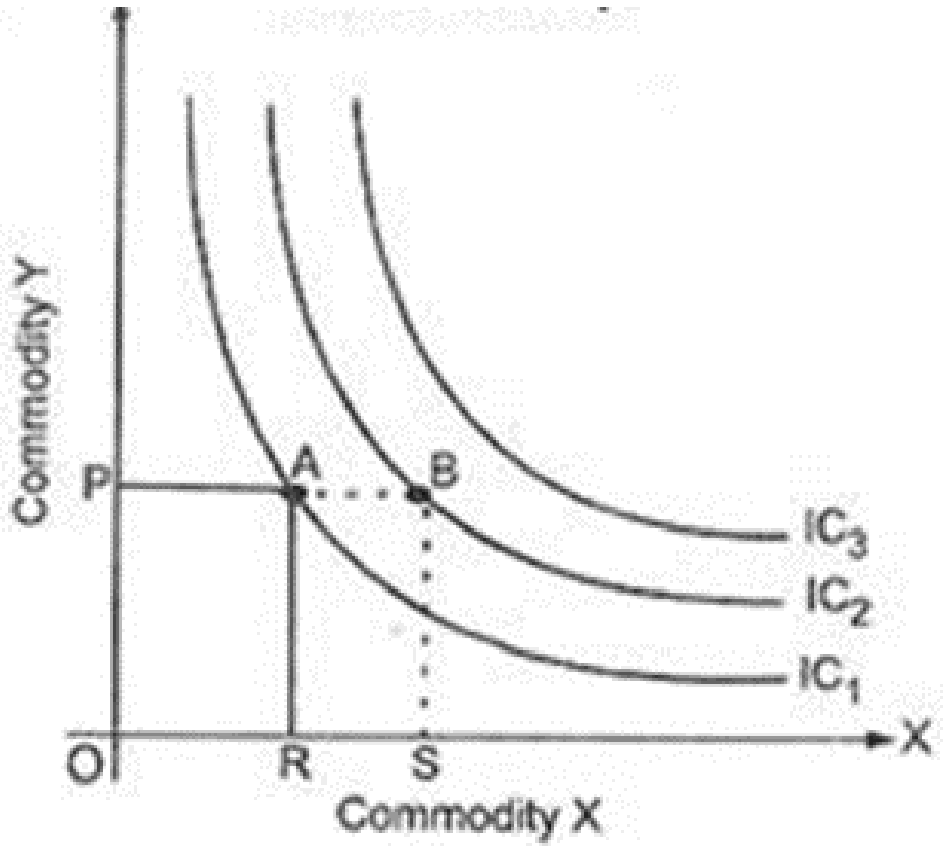
2. Indifference curve slope downwards:

It implies that as a consumer consumes more of one good, he must consume less of the other good. It happens because if the consumer decides to have more units of one good (say apples), he will have to reduce the number of units of another good (say bananas), so that total utility remains the same.

3. Higher Indifference curves represent higher levels of satisfaction:

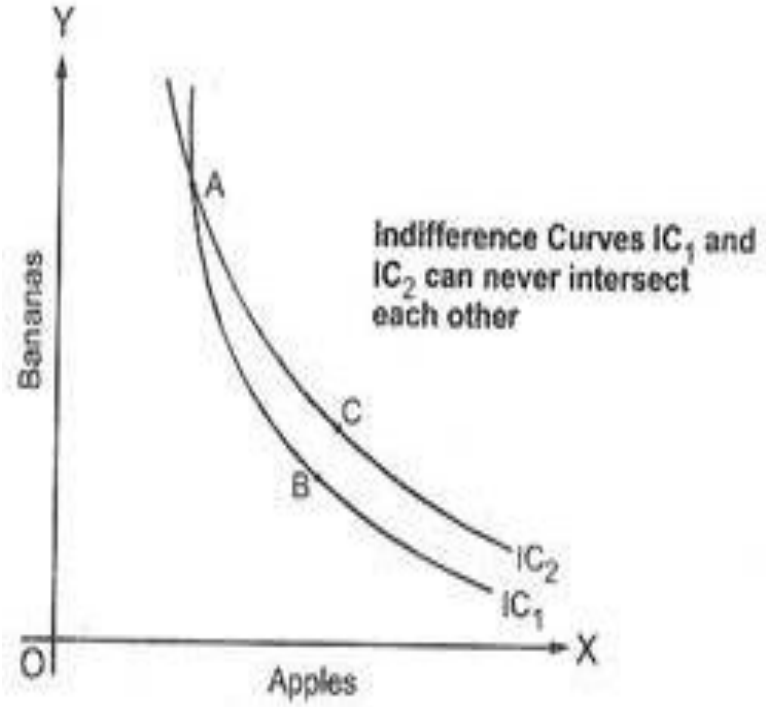
Higher indifference curve represents large bundle of goods, which means more utility because of monotonic preference.

In the fig point ‘A’ on IC_1 and point ‘B’ on IC_2. At ‘A’, consumer gets the combination (OR, OP) of the two commodities X and Y. At ‘B’, consumer gets the combination (OS, OP). As OS > OR, the consumer gets more satisfaction at IC_2.

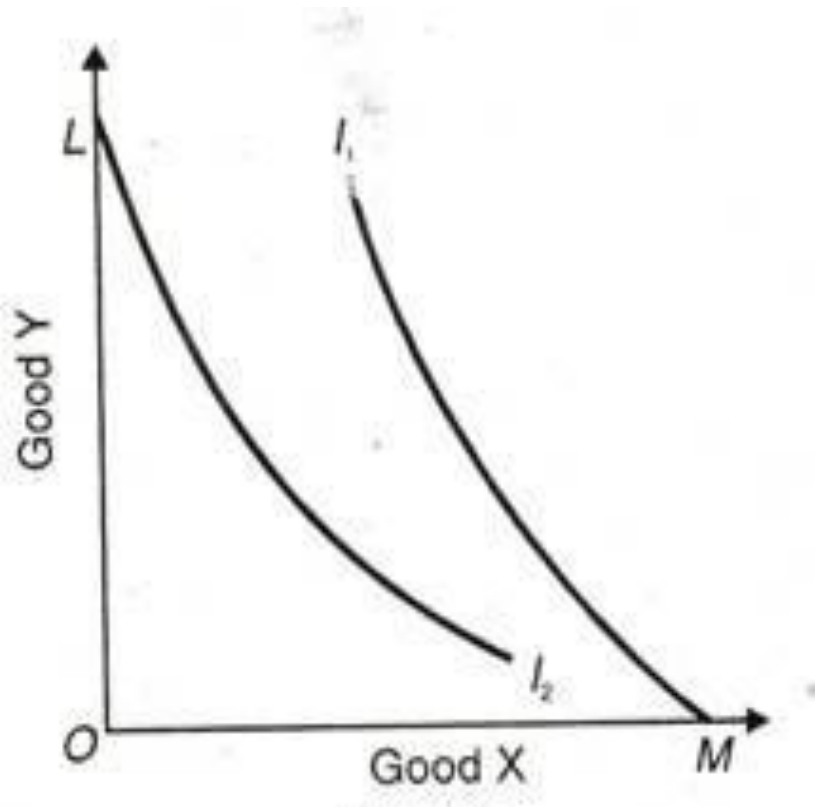


4. Indifference curves can never intersect each other:

As two indifference curves cannot represent the same level of satisfaction, they cannot intersect each other. It means, only one indifference curve will pass through a given point on an indifference map. In Fig., satisfaction from point A and from B on IC_1 will be the same. Similarly, points A and C on IC_2 also give the same level of satisfaction. It means, points B and C should also give the same level of satisfaction. However, this is not possible, as B and C lie on two different indifference curves, IC_1 and IC_2 respectively and represent different levels of satisfaction. Therefore, two indifference curves cannot intersect each other.



(6) **An indifference curve cannot touch either axis**. If it touches X-axis, as I_1, in Figure at M, the consumer will be having OM quantity of good X and none of Y. Similarly, if an indifference curve I_2 touches the Y-axis at L, the consumer will have only OL of Y good and no amount of X. Such curves are in contradiction to the assumption that the consumer buys two goods in combinations.



Budget Constraint or Budget Line

A budget line is defined as the purchasable combinations of two goods, given the prices of each good and consumer's income. Thus the budget constraint describes the different amount of two commodities that a consumer can afford.

Example

Suppose, a consumer has an income of Rs. 20. He wants to spend it on two commodities: X and Y and both are priced at Rs. 10 each. Now, the consumer has three options to spend his entire income: (i) Buy 2 units of X; (ii) Buy 2 units of Y; or (iii) Buy 1 unit of X and 1 unit of Y. It means, possible bundles can be: (2, 0); (0, 2) or (1, 1). When all these three bundles are represented graphically, we get a downward sloping straight line, known as 'Budget Line'. It is also known as price line.

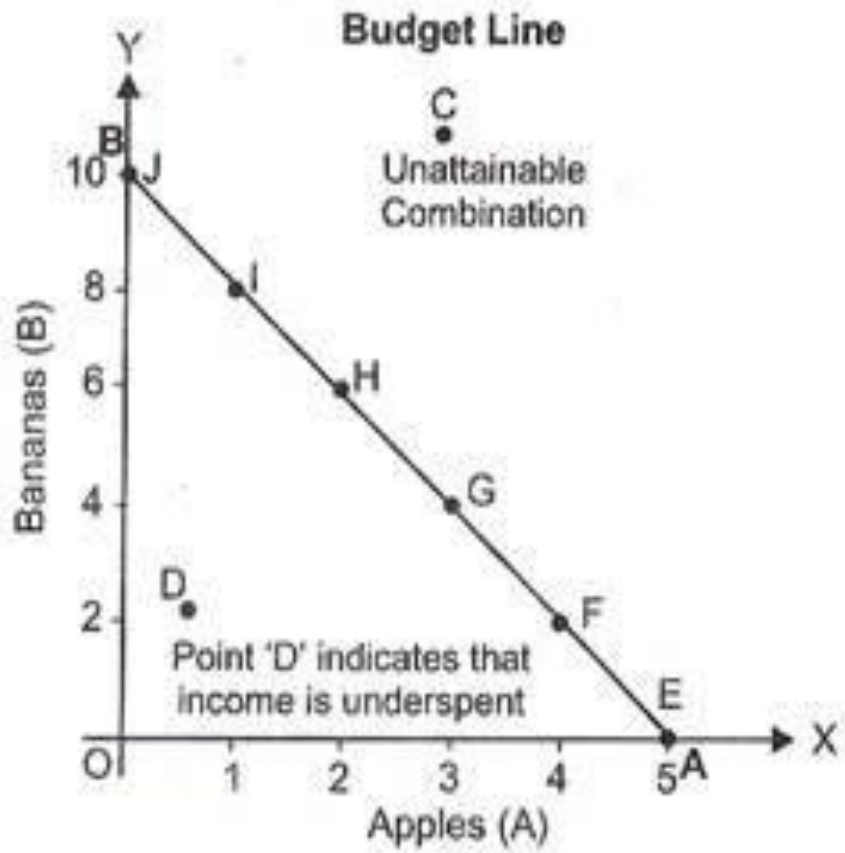
Schedule of Budget Line

Suppose, a consumer has a budget of Rs. 20 to be spent on two commodities: apples (A) and bananas (B). If apple is priced at Rs. 4 each and banana at Rs. 2 each, then the consumer can determine the various combinations (bundles), which form the budget line.

Combination of Apples and Bananas	Apples (A) 4 each)	Bananas (B) (Rs. 2 each)	Money spent = Income (Rs.)
E	5	0	(5 x 4) + (0 x 2) = 20
F	4	2	(4 x 4) + (2 x 2) = 20
G	3	4	(3 x 4) + (4 x 2) = 20
H	2	6	(2 x 4) + (6 x 2) = 20
I	1	8	(1 x 4) + (8 x 2) = 20
J	0	10	(Ox 4)+ (10×2) =20

Plotting each combination on a graph and joining the points we get a downward sloping straight line which is known as budget line or income line.

Every point on this budget line indicates those bundles of apples and bananas, which the consumer can purchase by spending his entire income of Rs 20 at the given prices of goods.



1. Budget line AB slopes downwards as more of one good can be bought by decreasing some units of the other good.
2. Bundles which cost exactly equal to consumer's money income (like combinations E to J) lie on the budget line.
3. Bundles which cost less than consumer's money income (like combination D) shows under spending. They lie inside the budget line.
4. Bundles which cost more than consumer's money income (like combination C) are not available to the consumer. They lie outside the budget line.

Slope of the Budget Line:

The slope of a curve is calculated as a change in variable on the vertical or Y-axis divided by change in variable on the horizontal or X-axis.

In the example of apples and bananas, slope of the budget line will be number of units of bananas, that the consumer is willing to sacrifice for an additional unit of apple.

$$\text{Slope of Budget Line} = \frac{\text{Units of Bananas (B) willing to Sacrifice}}{\text{Units of Apples (A) willing to Gain}}$$

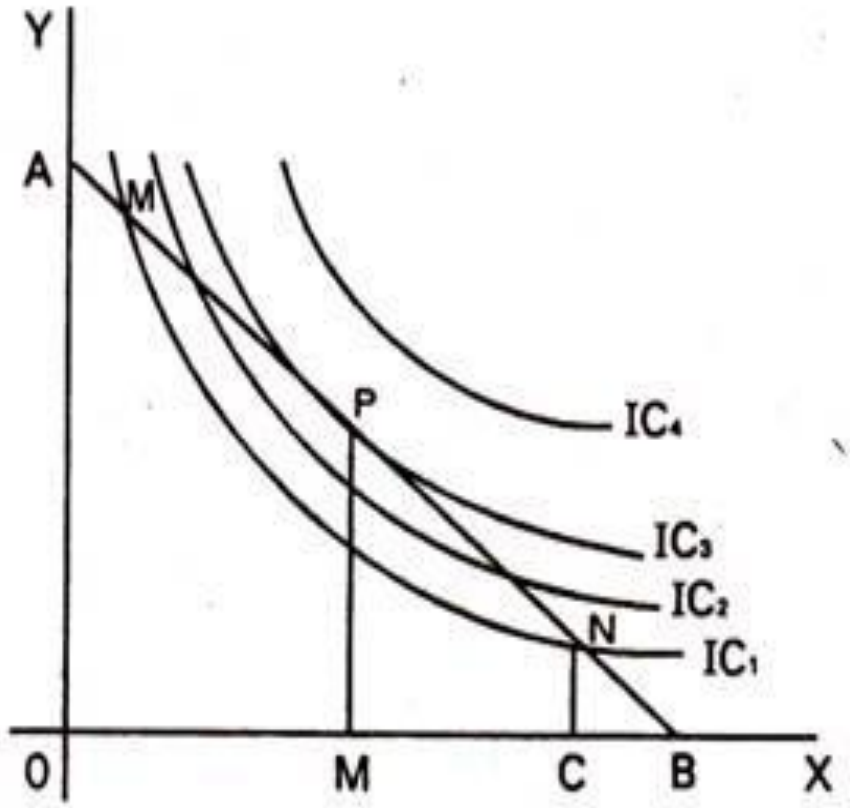
$$= \Delta B/\Delta A$$

$$= \frac{Price\ of\ X}{Price\ of\ Y} \qquad = \frac{Price\ of\ Apples}{Price\ of\ Bananas}$$

Equilibrium of the Consumer:

We assume a consumer with a fixed income M, spending the whole of his income only on two goods, X and Y. AB is the consumption possibility line and IC_1, IC_2 etc. are the indifference curves of the consumer.

The consumer may with M, buy OC of X and NC of Y. In this case he is on indifference curve IC_1. But with the same income M, he can also buy OM of X and PM of Y. In this case he is on IC_3 which denotes a better situation than IC_1. A rational consumer will try to attain the maximum possible satisfaction from his income. He will, therefore, be on the highest indifference curve that he can reach with his income.



Equilibrium of the Consumer

Consumer's Equilibrium is a situation when the consumer maximizes his satisfaction, spending his given income across different goods with the given prices. Here, the indifference curve and budget line are used to determine the consumer equilibrium point.

In other words, consumer equilibrium refers to a situation in which a consumer with given income and given prices purchases a combination of goods and services which gives him maximum satisfaction and he is not willing to make any change in it.

Assumptions :

1. The money income of the consumer is given and is constant.
2. The two goods, on which income is spent, are a substitute for each other.

3. The consumer is rational and always tries to maximize his satisfaction.
4. The prices of goods are constant.
5. The consumer is aware of the prices prevailing in the market for all goods.
6. He can spend his income in small quantities,
7. There is perfect competition in the market.
8. The commodities are divisible.
9. The consumer is fully aware of the indifference map.

Conditions of Consumer Equilibrium:

The consumer's equilibrium under indifference curve analysis is found at the tangent between the budget line and a convex indifference curve. To find out the consumer equilibrium, the following conditions must be satisfied :

1.Price or Budget line should be tangent to an Indifference curve.

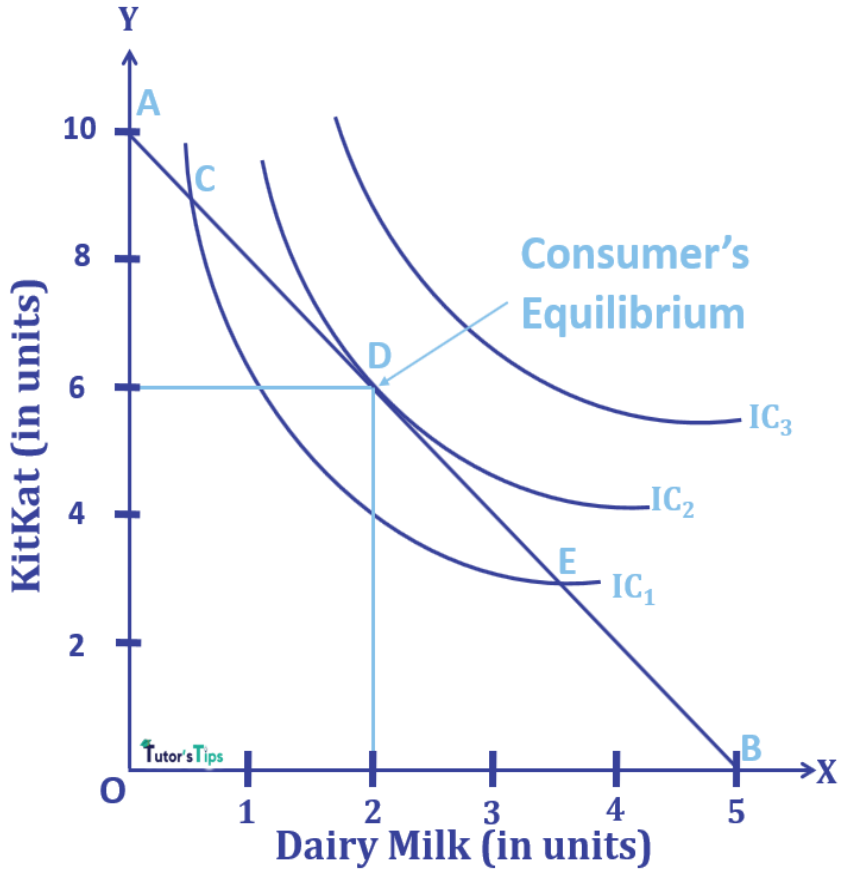
2.Indifference curve must be convex to the origin.

1. Price or Budget line should be tangent to an indifference curve:

In the words of Watson,

"When the consumer is in equilibrium, his highest attainable indifference curve is tangent to price line."

In fig, AB is the budget or price line, and IC_1, IC_2 and IC_3 are indifference curves. A consumer can buy any of the combinations whether C, D, and E of chocolates Kitkat and Dairy Milk, shown on budget line AB. He can't buy any combination on IC_3 as it is beyond the budget line AB. But, he can buy those combinations which are not only on the budget line AB but also coincide with the highest indifference curve which is IC_2



Out of the combinations C, D and E, the consumer will be at equilibrium at the combination D. Because, at this point, the budget line AB is tangent to the highest indifference curve IC_2. Though he can afford the combinations C and E as well but these will not give him the maximum satisfaction as these combinations belong to the lower indifference curve IC_1.

It means, that the consumer's equilibrium point is the point of tangency of the budget line and indifference curve. At point D, the slope of the indifference curve and budget line coincides.

The slope of the indifference curve is the marginal rate of substitution of commodity-1 for commodity-2 (MRS_{XY})

The slope of the budget line is the ratio of the price of commodity-1(P_1) and the price of commodity -2(P_2).

At equilibrium:

Slope of indifference curve= = Slope of Budget Line

Or $MRS_{XY} = \frac{P_1}{P_2}$

2. Indifference curve must be convex to the origin:

The other condition of equilibrium is that at the point of equilibrium, the indifference curve should be convex to the point of origin. It means, that the marginal rate of substitution of commodity-1 for commodity-2 should be diminishing.

Resources

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