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**Editor:**  
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Topic 1

Introduction
Institutionalized behaviour pattern of man with regard to production, distribution and consumption of wealth or the material means of satisfying human desires, is the distinguishing mark of a particular economic system. But at the foundation of any such system, there will always be found a few universal economic conditions. Although each economic system has its own peculiarities, yet certain basic economic problems are common to all.

The Three Central Problems of an Economy

Any society, whether simple or complex, advanced or backward, free or controlled must somehow confront three fundamental, interdependent and central economic problems.

(1) What goods and services shall be produced and in what quantities?

(2) How will these goods and services be produced, i.e., by what method or technology and with what resources?

(3) How will the goods produced be allocated among the members who make up the society, i.e., whom are the goods produced for?

What, how and for whom to produce would not be problems if resources were unlimited, and an infinite amount of every good could be produced. The question of choice arises directly out of the scarcity of resources. The human wants that can be satisfied by consuming goods and services may be regarded, for all practical purposes, in today’s world as limitless. In relation to the known desires of individuals (for better food, clothes, housing, schooling entertainment and the like), the existing supply of resources is highly inadequate.

Suppose a society possesses unlimited resources in the form of land, labour and capital equipment. There will then be no economic problem because the economy can produce enough goods and services to meet all the wants of persons, individually as well as collectively. There would then be no economic goods, i.e., no goods that are relatively scarce. And there would hardly be any need for a study of economics or economizing. All goods would be free goods, like air, sun-shine and rain water. But in reality, it is possible to produce only a small fraction of the goods and services that people desire.

Moreover resources call be used to produce more than one type of commodity. A unit of labour, for example, can be employed either on a piece of land for agriculture, or for a factory building or housing. But be point to note is that the same unit of the factor cannot be available simultaneously to all the activities for which it is useful, and therefore, the community must choose between the different activities. Choosing activity a means denial of activities B C & D. If a factor unit such as labour or combination of factors of production is used to produce one commodity, say steel, then you will have less of some other commodity, say, food grains. Similarly, if the community decides to consume more now, it will have less for the future, i.e., for the production of capital goods and machinery-which can produce more consumers goods in future. The question what goods, to produce and what not to produce, therefore, concerns the allocation of scarce resources among alternative uses.
For resource allocation, one needs two sets of information. One, the wants of the people should be known with their preference intensifies. In other words, for a rational allocation of resources a society must set priorities among their needs. Second, information regarding production possibilities of different commodities with the given resources ought to be available. Such information is summarized in the production possibility curve. (See appendix for details).

The second problem concerns the organisation of resources, i.e., choice of technique. This question arises whenever there is more than one technically possible way to produce goods. Agricultural commodities, for example, can be produced by farming a large area of land while using small quantities of inputs like fertilizers and machinery or by farming a small area of land intensively, using large quantities of inputs such as fertilizers, labour and machinery. Both methods can be used to produce the same quantity of some commodity. One method economizes on land and uses large quantities of other resources, the other makes use of a large area of land and economizes on capital. Similar possibilities are available in the industrial sector also. It is usually possible to have the same output by several different techniques, ranging from highly labour intensive techniques using large quantity of labour and a few tools, to those using a large quantity of highly sophisticated machinery and only a very small number of workers. But such a choice is open only to the extent one factor is substitutable for another.

The third problem concerns the distribution of the national product among the members of the community. Since an economy can produce only a limited amount of goods and services (because of the resource constraint), it is not possible to meet all the demands of all the people. This poses before the community the problem of choosing criteria for allocating this limited amount of goods and services amongst various individuals and groups. In other words, the economy has to decide as to who will share the limited output and to what extent, and who will go without it.

The problems which we have just stated are common to all economies but different economic systems try to solve them differently. In a primitive society, custom may rule every facet of behaviour. You can also imagine a dictator who by arbitrary decrees decides what, how and for whom to produce. On the other extreme there is the capitalist free enterprise economy where all the three questions are decided automatically by the price mechanism.

**The Role of Price Mechanism**

In a system of free enterprise economy, no individual or organisation is consciously concerned with any of the three central problems stated above. In such an economy, production and distribution are the outcome of millions of independent decisions made by consumer and producers, all acting through the market mechanism. Hundreds of thousands of commodities are produced by millions of people more or less of their own volition and without control, direction or any master plan. And yet it is not a system of chaos and anarchy. There is a certain order in it.

Immediately the question arises, “how does the automatic price mechanism operate?” The bare outlines of a competitive market system are simple to describe. Everything has a price. Every commodity and service and every factor of production base its own price, freely determined by demand and supply in the market. There are millions of prices in fact as many prices as there are goods and factors of production. It is these prices which collectively are called the price mechanism. Everybody receives money for what he sells and uses this money to buy what he wants.

In a free enterprise economy, the consumers have the final say because everything is done to satisfy them. What goods and services will be produced in an economy depend on consumer’s demand and the resources are allocated accordingly. If they prefer more of A and less of B, then factors of production will be diverted from the manufacture of B to the manufacture or A. And this wish of the consumer is communicated to the producers through the price mechanism. If consumers prefer more of coffee and less of tea, the price of coffee will go up while that of tea will come down. This will induce the
producers to divert resources from tea to coffee as coffee is now comparatively dearer than tea. Production of coffee will rise and that of tea will fall. Similarly, if more or a commodity becomes available, then people want to buy at a given market price, its price will fall as a result of competition amongst the sellers. At a lower price, producers will no longer produce so much. Equilibrium will thus be restored by the forces of supply and demand. Resources will be diverted to some other branch or economic activity. This happens because the foundation of a free enterprise economy is the profit motive. All activities are carried on with a view of earning profits. In such a society resources will be allocated to those activities which promise more profits to the entrepreneurs. In this way, ‘what goods will be produced’ is determined by the votes of consumers or their every day decisions to purchase various commodities.

What is true of the markets for consumers goods is also true of markets for factors of production such as labour, land and capital. Under competitive condition, only that producer who can adopt the most efficient method of production and keep the cost at the lowest, can hope to secure high profits. Thus every producer tries to produce in the cheapest possible manner. The method that is cheapest at any time, will displace a more costly method. For example, motive power will be generated by atomic process rather than by steam, if the price of coal is high. But the most obvious choice is with regard to the use or capital and labour. If labour is cheaper than capital, as is the case in most of the underdeveloped countries, emphasis will placed on labour intensive techniques. On the contrary, highly sophisticated machines will be used with a minimum need for labour in developed countries where there is shortage of labour, but capital is in abundant supply. In agricultural sector, tractor-operated large farm will displace the family size farm if this leads to lower cost of production.

The price system, therefore, indicates to the producer which combination of factors of production should be chosen to make production cheapest, given the state of technology. The choice of technique will thus depend upon the relative availability of resources reflected through their respective prices.

The third problem, namely, the distribution of national product, is connected with the first. Goods and services will be produced for those who can afford to pay for them. This capacity to pay is reflected in the effective demand of the people for various goods and services. In other words, effective demand is dependent on people’s income. The first problem and third, therefore, are like two sides of the same coin. If people demand more of luxury goods, more of them will be produced and given to those who can pay for them. In a capitalist economy, therefore, the distribution of goods and services will depend upon the effective demand of people which in turn will depend on their incomes. Income of a person is determined by the quantities or various factors of production he owns and their prices. Thus the distribution of national product depends on the prices of factors of production, given the pattern of ownership.

To sum up, we may say that in a capitalistic economy, there is no visible authority which controls and directs the economic system. However, the price mechanism solves and the economic problems-What goods will produced? How much will be produced? How will they be produced? Who will consume them?

**Limitations or Price Mechanism**

We have tried to show above how in a modern capitalist economy, every economic activity is controlled, directed and guided by the price mechanism. A writer called the price mechanism as the ‘Invisible conductor of the economic orchestra’. There are million of prices and all of them are determined simultaneously in such a way that there is perfect co-ordination in the production, distribution and consumption of all these goods and services. Overproduction and underproduction of any commodity at a given time, will be set right by the price mechanism in course of time. Overproduction, for instance, will lead to a fall in price and curtailment of production by the producer, and underproduction will lead to a rise in the price and increase in production. The question now is, whether the price system is really so effective, as it is made out to be.
Does the price mechanism really represent the wishes of the people? In a capitalist economy, demand is made effective by those who have an income and are prepared to spend and not by those who need various goods, but do not have the necessary purchasing power. The fortunate few with large, incomes are able to influence producers to manufacture those goods which they like. The poor, on the other hand, have sometimes to go without even the bare necessaries of life. The capitalistic system, thus, does not bring about an equal and fair distribution of goods and services among the people according to their needs.

Prices, wages and profits are supposed to be determined by demand and supply in a free market. But actually markets are not free and competition is not perfect. Prices are determined and influenced by a few powerful producers who are called monopolistic. A monopolist can fix a high price. As a result of imperfect competition, there can be divergence between demand and supply. Besides, the tastes and fashions may change suddenly and consequently, there may be overproduction in some industries and underproduction in others. It is possible that by the time the necessary adjustment in supply takes place, demand may have changed again.

The consumers, themselves may sometimes, be at fault. They may demand goods and services which do not yield real utility but which may be meant for show of power or prestige. Sometimes, they may even demand goods which are harmful. Many a time, a man will prefer a cheap detective novel to a good book. People may demand cheap films and drinks which tend to spoil their tastes and morals. In this connection, we can mention the possible adverse effects of advertisement on the consumers. It has been found that with the help of advertisement any commodity, however bad or inferior, can be sold. It is through the media of advertisement that many bad and positively harmful drugs and medicines and other such goods are sold in a ‘free’ enterprise economy. Thus, though the capitalistic economy, may help in maximising national income, it is not necessary that this will automatically maximise national welfare.

**Role of Government**

The modern capitalist economy is not solely a price economy, but is a mixed system. The government attempts to control and direct production, distribution and consumption.

*The Government Controls through Social and Labour Laws:* In the first place, the governments enact laws to protect the women and children in mines, factories and workshops against exploitation. Women and children are weak and are not able to survive in a competitive economy without help. The workers are generally weaker than the employers in the matters of bargaining. Factory laws are passed to protect the labourers, to assure them minimum wages and to protect them from exploitation, by the factory owners.

Through various laws, the government also tries to control the quality of products, to prevent adulteration of goods, to enforce standard weight and measures, to see that trade is fair and so on. Further the government passes laws to control the activities of monopolies and monopolistic organisations which tend to act against the interest of the consumers. Thus, modern governments take all types of measures to restrict free enterprise and free play of self-interest and ensure perfect competition. To keep competition perfect means to create a situation in which all have equal opportunities to participate in the competition or the competition is amongst equals.

*Re-distribution of National Income by Taxes:* Again, government attempts to control economic activity through its tax and expenditure measures. For instance, progressive taxes on income and property reduce the incomes of the rich and thus their effective demand for goods and services. At the same time, through free education, free medical services, subsidised housing, recreational facilities, etc., the government can raise the real income of the masses. In these ways the government can influence and direct the volume of economic activity so as to promote the welfare of the community.
Welfare and Social Measures: Further, in all modern economies, the government undertakes to provide certain essential services which the community requires but which cannot be provided by the private businessmen. These services involve large investments which are beyond the capacity of private individuals and groups. For instance, the government provides water supply, education and other social services; it protects the people from foreign aggression and it maintains law and order within the country.

Government in certain countries have assumed responsibility of providing full employment: In recent years the government has also taken the responsibility of maintaining full employment. The government helps people to secure jobs. During economic depression, the economy functions at a low level; there is a lot of unemployment. In certain countries, governments have gone far beyond all these. They undertake economic enterprises such as power projects, basic and heavy industries transport and communication, etc.

Thus in a modern capitalist economy the government has started playing a very important role in the field of economic activity. In the 20th century, some of the feature of capitalism such as private property, self-interest and free enterprise have been considerably modified by government regulations. Many economists have, therefore, started calling the modern capitalist economy as mixed system in which private enterprise has a free hand but within the overall control and direction of the state.

PRODUCTION POSSIBILITY CURVE

How much of goods and services can the economy produce? This will depend upon (a) the extent of resources the economy has in terms of land, labour and capital which it can devote to the production of these goods, (b) the quality or efficiency of these factors and (c) the nature of technology available to the community. It is possible over a period of time to bring in additional land under cultivation, to have more labour through an increase in population and to increase machines and other capital equipment by means of capital accumulation. The quality of these factors of production can also be improved and the state of technology can always be raised through innovation and invention. The total volume of goods will depend upon these conditions.

Every economy can produce a certain amount or goods with the help of its resources. Since the same factors of production can be used to produce more than one type of commodity, it is possible to have various combinations of different commodities, by transferring resources from the production of one commodity to another. Each combination represents a distinct production possibility.

Let us take a simple illustration to explain the production possibilities of wheat and cotton in India. Let us assume that India is using all its resources to produce cotton and wheat. Let us further assume that all these resources are such that they are equally efficient in the production of both these goods. The table below gives the alternative possibilities of producing wheat and cotton by allocating different areas to the two crops out of the total available land.

<table>
<thead>
<tr>
<th>Possibility</th>
<th>Wheat (Million tons)</th>
<th>Cotton (Million bales)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>2nd</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>3rd</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>4th</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>5th</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>6th</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
You may note the two extreme possibilities. The first possibility shows that India is able to produce 100 million bales of cotton and no wheat if whole of the area is devoted to cultivation of cotton. The sixth possibility shows that India can produce 100 million tons of wheat and no cotton if whole of the area is devoted to cultivation of wheat. Between these two extreme possibilities the economy can produce different combinations of cotton and wheat. For instance, the second possibility shows that the country can produce 80 million bales of cotton and 20 million tons of wheat; the third possibility shows the combination of 60 million bales of cotton and 40 million tons of wheat and so on. The above table can be illustrated with the help of a diagram.

![Diagram 1.1 Production-Possibility Curve (straight line)](image)

*Method of the drawing the diagram:* First draw OX and OY line. The OX lines is known as the X-axis or the horizontal axis and the OY line is known as the Y-axis or the vertical axis. Wheat is represented on the horizontal axis and cotton on the vertical-axis. Starting from origin 0, the X-axis is divided, into equal parts, each part presenting 20 million tons of wheat. Similarly, the Y-axis is divided, each division representing 20 million bales of cotton. It is not necessary that the scales on both the axes should be the same which we have assumed for purpose of convenience. The first production possibility in this case is 100 million bales or cotton and no wheat. This is marked as A in the above figure. The second combination is 80 million bales of cotton and 20 million tons of wheat. Take a point against 80 on the Y-axis and 20 on the X-axis. This is point B For the other combinations, plot points C, D, E and F. Connect all the points and you will have a downward sloping line AF. This line shows the production possibilities or two goods and is known as the production-possibility curve. It is also called the transformation curve, since the factors which can be used for the production of one commodity can be transformed to produce the other commodity. As we moved from A to B, resources employed in cotton production are being transferred to the production of wheat.

Go through the table and the diagram carefully. The downward shape of the AF curve shows that if the community wants more of wheat, it can have it only by reducing the quantity of cotton. Again in the diagram, AF is a straight line. This implies that addition of a certain amount of wheat will replace the same amount or cotton throughout due to the assumption that the factors of production are equally efficient in the production of cotton and wheat. In the given example, for every increase of 20 million tons in the production of wheat, the production of cotton has to be decreased by 20 million bales.

Normally, the production-possibility curve in real life is not a straight line but concave towards the point of origin. A more realistic production-possibilities table and curve will be as follows:
TABLE 2
Alternative Possibilities in the Production of Wheat and Cotton

<table>
<thead>
<tr>
<th>Possibilities</th>
<th>Wheat (in million tons)</th>
<th>Cotton (in million bales)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>2nd</td>
<td>20</td>
<td>90</td>
</tr>
<tr>
<td>3rd</td>
<td>40</td>
<td>75</td>
</tr>
<tr>
<td>4th</td>
<td>60</td>
<td>55</td>
</tr>
<tr>
<td>5th</td>
<td>80</td>
<td>30</td>
</tr>
<tr>
<td>6th</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

For the above illustration, we do not assume that factors of production are equally efficient. Let us assume that some plots or agricultural land are more suitable for the production of cotton and some others are better suited for production or wheat. By using all the plots of land only for cotton, the community can produce 100 million bales of cotton. Now if the community wants to have 20 million tons of wheat, some plots or land which are less suitable for cotton will be put under wheat. But as the community wants to have more and more wheat, then the land allotted for cotton cultivation will also be used to produce wheat. As a result, the cost of producing wheat in terms of cotton will increase. For instance, to produce the first 90 million tons of wheat, the community has to sacrifice only 10 million bales of cotton but to produce the next 20 million tons of wheat, the community has to sacrifice 15 million bales of cotton and so on. Finally, in the case of the last 20 million tons or wheat, the community has to sacrifice 30 million bales of cotton. This implies that land suitable for the production of cotton, which could produce as much as 30 million bales of cotton, when put under wheat can produce only 20 million tons of wheat. It is clear from the above illustration that the cost of producing additional wheat in terms of cotton goes on increasing. The increasing cost of wheat in terms of loss or cotton is represented in the following table 3.

TABLE 3
Cost of Producing Wheat in Terms of Cotton

<table>
<thead>
<tr>
<th>Possibilities</th>
<th>Cost of producing each additional 20 million tons of wheat in terms or bales of cotton</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>—</td>
</tr>
<tr>
<td>2nd</td>
<td>10</td>
</tr>
<tr>
<td>3rd</td>
<td>15</td>
</tr>
<tr>
<td>4th</td>
<td>20</td>
</tr>
<tr>
<td>5th</td>
<td>25</td>
</tr>
<tr>
<td>6th</td>
<td>30</td>
</tr>
</tbody>
</table>

Diagram 1.2 Production Possibility Curve (Concave)
Diagram 3 shows both types or production-possibility curves which we have illustrated separately so that you can easily compare them.

It may be observed that the curves have been constructed on the assumption that all the resources available for the production of wheat and cotton are being fully utilised. For any reason, if some of the resources remain idle, the production-possibility will not be indicated by the curve but will be anywhere below the curve. Secondly, if there is a quantitative and qualitative improvement in the factors of production available to the community to produce these goods and if there is an improvement in the technology of production, the production-possibility curve will be pushed outwards. This will indicate that both the goods can be produced in larger quantities, with the resources fully employed.

*The law of diminishing returns*: From the production possibility curve and increasing cost of production of one commodity in terms of another, I would take you to the study of the law of diminishing returns. All human effort is subject to this law. Every economy makes continuous and persistent endeavour to overcome the operation of diminishing returns. It is a law of great importance in economics.

The law of diminishing returns states that whenever one factor of production is used more and more, the other factors remaining the same, the addition to total output goes on diminishing. Let us take an example to illustrate this law. Let us assume that we have a plot of land of 10 acres which is put under wheat cultivation through the application of labour only. There will be no produce if we do not engage any worker to cultivate the land. Suppose the output is 10 mounds of wheat if we employ one worker. We decide to employ one more worker on that plot of land and the total output increases to 18 mounds. The addition to total output in this case will be 8 mounds as compared to 10 mounds in the first case. Thus, if more and more of labour is applied to the same plot of land, the additional units of labour will not yield the same additional output but something less. This is illustrated in the following table and diagram.

<table>
<thead>
<tr>
<th>Case</th>
<th>Land (acres)</th>
<th>Labour (units)</th>
<th>Total output (in toins)</th>
<th>Marginal output (addition to total output in mounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2nd</td>
<td>10</td>
<td>1</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>3rd</td>
<td>10</td>
<td>2</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>4th</td>
<td>10</td>
<td>3</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>5th</td>
<td>10</td>
<td>4</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>6th</td>
<td>10</td>
<td>5</td>
<td>30</td>
<td>2</td>
</tr>
<tr>
<td>7th</td>
<td>10</td>
<td>6</td>
<td>30</td>
<td>0</td>
</tr>
</tbody>
</table>
The information of the Table 4 can be represented in the following diagram.

![Diagram 1.4 Law of Diminishing Returns](image)

Let us examine diagram 4 carefully. Labour units are represented on the X-axis and the marginal output on the Y-axis. Marginal output is the addition made to the total output by increasing labour by one unit. We can also describe the marginal output as the output added by the marginal worker. When we increase the employment from one to two workers, according to our illustration, the total produce increases by 8 mounds which is the marginal product. When three workers are employed, the third worker is marginal and marginal output is 6 mounds. It is clear from the above table and diagram that as the number of workers is increased on the same plot of land, the total produce increases but at a diminishing. We can say, in general terms that if we increase one factor of production keeping the others constant, the marginal product will go on diminishing.

**Universal application of the law of diminishing returns:** Does the law of diminishing returns apply to land only? At one time, it was thought that the law was applicable to those industries only where land was predominant end labour and capital were of the secondary importance. Agriculture, mining, fisheries, forestry, etc., come under this category. These industries are, sometimes, called extractive industries. It was thought that in the manufacturing industries, capital and labour played a predominant role and land was comparatively insignificant. Therefore these industries were considered to be subject to the law of increasing returns. According to this view, if more of labour and/or capital are applied in a manufacturing industry, marginal output would go on increasing. But this is only partly true. It is now held that the tendency to diminishing returns is universal. In some industries, marginal output may increase up to a certain stage and the operation of the law of diminishing returns may be deferred. After a certain stage, however, diminishing returns are bound to set in. There can hardly be any exception to this tendency.
DEMAND AND SUPPLY ANALYSIS

Human wants are unlimited, but the resources which are required to satisfy these wants are limited. The scarcity of resources gives rise to economic problems which are termed as central problems. In a capitalist or free market economy these problems are solved with the help of what we call the price mechanism. Each commodity or service has a price. Earlier, goods were used to be exchanged for goods which was called the barter system of exchange. With the invention of money, the prices of goods and services are expressed in terms of money. Prices of all the goods and services collectively is known as price mechanism.

The price of a commodity is determined by its demand and supply. However, it is not the demand of a single buyer or the supply of a single seller which determines the price of a commodity in the market. It is the demand of all the buyers of a commodity taken together and the supply made by all the sellers selling that commodity taken together, which determine the price of that commodity in the market. The price of a commodity is determined when its demand is equal to its supply. This is called the equilibrium price. We shall now discuss in detail the demand and supply analysis and explain how these together determine the price of a commodity in the market.

1.1 DEMAND ANALYSIS

The Meaning of Demand

Demand, in economics, refers to the amount of a commodity which the consumers are prepared to purchase at a particular price per unit of time. Demand in economics, is therefore, is not the same thing as desire. You may have a desire to have a car but if you do not have sufficient money with you to purchase it and even if you have sufficient money with you but are not prepared to spend it on the purchase of the car, it will merely remain a desire and will not be called demand. Your desire to have a car will become demand when you have sufficient money with you and are willing to spend the money on the purchase of the car at the particular price per unit of time. The time may be one hour, one day, one week, one month and so on. It is meaningless to say that the demand of car in our country is 10,000 because this statement does not specify the price of car and the unit of time. Even it is not correct when you say that the demand of car in India is 10,000 when price per car is Rs. 80,000, because it does not refer to the unit of time. The correct statement would be that the demand for car in India per year is 10,000 at the price of Rs. 80,000 per car. Thus desire becomes demand when the consumer has sufficient resources with him and is willing to spend those resources on the purchase of the commodity at a particular price and per unit of time. Even if you have, say, one lakh rupees with you but are not willing to spend the money on the purchase of a car at the price of Rs. 80,000 per car today, then you cannot say that you have a demand for a car.
Factors Determining the Demand

The demand for a commodity does not remain constant. It keeps on varying with changing conditions. We shall, therefore, now discuss the various factors which determine the demand for a commodity by a consumer or the family of the consumer i.e. household demand and the total demand of the whole market i.e., market demand of a commodity.

(i) Household Demand

The demand for a commodity by a consumer or a household depends upon the following factors:

(a) Income: The income of family is a very important factor determining its demand for a commodity. Other things remaining constant, if the income increases, normally the demand for goods will increase and vice-versa. With increase in income the demand for superior goods and goods of comforts and luxuries will increase and the demand for inferior goods will decline. But if the income declines the demand for superior goods and those of comforts and luxuries will decline.

(b) Price of the commodity: Normally there is an inverse relationship between the price of a commodity and its demand. Other things remaining constant, if the price of a commodity declines normally more of it will be purchased and if the price increases, lesser amount of the commodity will be purchased.

(c) Taste and Preferences of consumers: Taste, fashion and preferences of the consumers also affect the demand for a commodity. If people have developed a taste or preference for a commodity-its demand will increase but if a commodity has gone out of fashion, its demand will decline.

(d) Price of related goods: The changes in the price of related goods i.e., complementary and substitute goods also affect the demand for a commodity. Complementary goods are those goods where one commodity has utility and is demanded only when the second related commodity is also available. For instance scooter and petrol are complementary goods. If the price of petrol increases, it will reduce the demand for scooter. Similarly, change in the price of refills will affect the demand for ball-pens. Substitutes goods are those where one goods can be used in place of another. For instance, tea and coffee are close substitutes. One can use tea in place of coffee and vice-versa. If the price of coffee increases, people will start substituting tea for coffee and therefore the demand for tea will increase even though there is no change in the price of tea.

(ii) Market Demand

The above factors determine the households demand for a commodity. When we take market demand i.e. the total demand for a commodity in the market, in addition to the above four factors, there are two other factors which also determine the market demand. These two factors are: the size and composition of the population and distribution of income:

(e) Size and composition of Population: Large and increasing population increases the demand for various types of goods and vive-versa. Similarly the composition of population i.e., ratios of male-female, children-adult-old-age people etc., also affect the demand for different types of goods. For instance, if there are more children, the demand for goods such as toys, baby foods, biscuits etc., will be more.

(f) Distribution of Income: If there is an unequal distribution of national income and few people have large income while other have to do with small income, the demand for goods of comforts and luxuries will be more and that of the goods needed by the majority of people, who are poor, will be small. If there is an even distribution of income in a country, the demand for luxuries will be less and that of goods of mass consumption will be more.
**Law of Demand**

We have earlier explained that the demand for a commodity is always expressed with reference to a price. There will be different quantities of goods demanded at different prices. If the price of a commodity rises, normally less of its quantity will be demanded and vice-versa. This inverse relationship between the price of a commodity and the quantity of its demand is known as the Law of Demand.

We have explained that the price a commodity is only one of the various factors which determine the demand for a commodity. The other factors are the income of the consumer, their tastes, preference etc., prices of related goods, expectations about the future changes in the price of the commodity etc. the price of a commodity as well as these other factors keep on changing. We therefore, cannot find out the effect of the changes in the price of a commodity on its demand unless we assume that all other factors which also affect the demand for a commodity remain constant. For instance, suppose the price of a commodity has increased and therefore, normally its demand should decline. But if the same time, the income of the consumers has also increased, the consumers will demand more of the commodity even at a higher price because the increase in income may offset the impact of the price rise on his demand. Therefore, in order to find out the effect of the change in the price of commodity on its quantity demanded, we have to assume that there is no change in factors other than the price. We may say that ‘other things being equal’ normally more of a commodity will be demanded at lower price and less will be demanded at higher price. This is known as the Law of Demand. The Law of Demand is only a qualitative statement. It tells only the direction in which the quantity of a commodity will normally change in response to any change in its price. The Law of Demand does not say anything about the quantum or the amount of change in response to change in the price of a commodity.

We should like to emphasise, that the law of demand is always qualified by such phrases as ‘in given conditions of demand’ or ‘other things remaining equal or constant’. This relates to the assumption on which the law of demand is based. It means that law may not hold true if any of the factors, mentioned above, other than the price of a commodity in question is also changing. Law of Demand can be explained with the help of what is called a demand schedule and a demand curve.

**Demand Schedule**

If we put the different amounts of a commodity demanded at different prices in a tabular form, as given below in tables 1.1 and 1.2, it is called demanded schedule. Thus the demand schedule is a tabular statement which states different quantities of a commodity demanded at different prices. Demand schedule is of two types:

(i) Individual or Household demand schedule and (ii) Market demand schedule.

**Individual or Household Demand Schedule:** Individual Household demand schedule shows the different amounts of a commodity demanded by a consumer or a household at its different prices. Let us take an example. Suppose a consumer (or a household) demands 1, 2, 3 and 4 dozens of oranges at prices of Rs.3.00, Rs.2.50, Rs.2.00 and Rs. 1.50 per dozen of oranges respectively. When we put the different quantities of oranges demanded at different prices in a tabular form, as given in Table 1.1, we call it an individual (or household) demand schedule.

<table>
<thead>
<tr>
<th>Price of Oranges (Per dozen) Rs.</th>
<th>Quantity Demanded (Oranges) (dozens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>1</td>
</tr>
<tr>
<td>2.50</td>
<td>2</td>
</tr>
<tr>
<td>2.00</td>
<td>3</td>
</tr>
<tr>
<td>1.50</td>
<td>4</td>
</tr>
</tbody>
</table>

16
This demand schedule clearly shows that more of oranges are demanded at a lower price and vice-versa.

**Individual or Household Demand Curve:** If we represent the above demand schedule (Table 1.1) graphically we can get a demand curve as given in figure 1.1 below:

![Diagram 1.1]

In the diagram 1.1, the horizontal axis represents the quantity of oranges demanded and vertical axis represents the price of oranges per dozen. A, B, C, and D, show the different quantities of oranges demanded at different prices as given in the demand schedule, Table 1.1. By joining these points we get a curve which is called the demand curve. This demand curve shows the different quantities of a commodity demanded at different prices. It shows that at a higher prices, less is demanded and at a lower price, more is demanded, other things remaining equal.

The demand curve may be a straight line or a curve depending upon the changes in quantities demanded in response to changes in price.

**Market Demand Schedule and Curve**

Different consumers or household demand different amounts of a commodity at different prices. Therefore, if we add the demand schedule of all individuals or household, we can get the market demand schedule. Let us take an example. Suppose, for the sake of simplicity, say, there are only two consumers or household, say, A and B, that demand orange. Their demand for oranges at different prices are given in table 1.2. If we add the demand schedule of these two consumers, we can get the market demand schedule, as given below:

**TABLE 1.2**

<table>
<thead>
<tr>
<th>Prices of Oranges (per dozen) Rs.</th>
<th>Individual Demand Schedule Quantity Demanded (dozens)</th>
<th>Market Demand Schedule Total Market Demand for Oranges (A+B) (dozens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00</td>
<td>A</td>
<td>1</td>
</tr>
<tr>
<td>2.50</td>
<td>B</td>
<td>2</td>
</tr>
<tr>
<td>2.00</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>1.50</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
Thus the market demand schedule is the aggregate of the individual demand schedules. This also shows, as the individual demand schedule, that more of a commodity is demanded at a lower price and vice-versa.

If we represent the above table 1.2 on a diagram, we can get the market demand curve, as shown in diagram 1.2. The market demand curve DD as shown in figure (c) has been obtained by adding the individual demand curve D1D2 of consumer A as given in figure (a) and the individual demand curve D2D2 of consumer B as given in figure (b). For instance consumer A buys 4 dozens (A) and (B) buys 5 dozens (B) of oranges when the price is Rs. 1.50 per dozen. Therefore, the market demand for orange will be 9 dozens its (A + B = C). Market demand curve also shows the inverse relationship between price of a commodity and its quantity demanded i.e. more of a commodity will be demanded at a lower price and less will be demanded at higher price.

Diagram 1.2

In the examples of a market demand schedule and the market demand curve given above, for the sake of convenience we have assumed that there are only two consumers A and B of the commodity i.e. oranges. The market demand schedule and the market demand curve have been obtained by the addition of the individual schedules and the individual demand curves of the two consumers A and B. However in practice we find that there are many consumers of a commodity. In such a case it becomes very difficult and cumbersome to determine the individual demand schedule or individual demand curves of all the consumers of that commodity and then add them all together to find out the market demand schedule and market demand curve of the commodity. There is an alternative method of finding market demand schedule or market demand curve of a commodity. Of all the consumer of a commodity, one consumer of that commodity is taken as an average or representative consumer and find out the average consumer’s demand schedule. Then we multiply the quantities being demanded by this average consumer at different prices by the estimated number of total consumers of this commodity. This will give us the market demand schedule of the commodity and on its basis we can draw the market demand curve of the commodity. For example, suppose at the price of Rs. 2.50 per dozen, an average consumer demands 2 dozens of oranges. Suppose there are 1000 consumers of oranges. In that case the market demand for oranges at the price of 2.50 per dozen will be 2000 dozens of oranges. Similarly we can find out the market demand for oranges at different price by multiplying with the total number of consumers of oranges i.e. 1000.

Both demand schedule and demand curve show the different quantities of a commodity which the consumers are prepared to but at different prices given in the market. It does not mean that at a particular time there are different prices of a commodity prevalent in the market. The demand schedule or demand curve is prepared on the basis of the past experience of a consumer/consumers. A consumer on the
basis of his past experience can say that if other things remain constant, what will be the different quantities of a commodity which he would be prepared to buy at different prices in the market. Therefore, a demand schedule or demand curve is imaginary.

Basis of Law of Demand

Why does a demand curve generally slope downwards from left to right: A demand curve generally slopes downwards from left to right or in other words it shows that more of a commodity is demanded at a lower price and less is demanded at a higher price. Why do people purchase more of a commodity at a lower price and purchase less at a higher price? In other words why does law of demand operate or demand curves slope downward? The law of demand operates or demand curves slope downwards due to the following reasons:

(i) *Operation of Law of Diminishing Marginal Utility:* The Law of Demand is based on the law of diminishing marginal utility. According to law of diminishing marginal utility, which we shall discuss in detail later on in section 4.1. As the consumer consumes more and more units of a commodity the marginal utility which he derives from the successive units will keep on diminishing. In the example of the individual demand schedule given in the table 1.1 the consumer demands one dozen of oranges when the price is Rs 3.00 per dozen. He is prepared to pay Rs 3 because as per the utility analysis, the marginal utility which he gets from the consumption of first dozen of oranges is worth Rs. 3.00 (As per the Marshallian utility analysis, the utility which a consumer gets from the consumption of a commodity can be measured in terms of money i.e., the maximum price which he gets from the second dozen will be less than what he had got from the first dozen of oranges and therefore he is prepared to pay to obtain that commodity). But when he consumes the second dozen, the utility which he will be prepared to buy second dozen of oranges only if price is less than Rs. 3.00. Suppose he gets marginal utility from the second dozen of oranges worth Rs 2.50 and therefore, he would be prepared to buy the second dozen of oranges, if price per dozen of oranges declines to Rs. 2.50. In other words, consumer will buy more of a commodity only at a lower price. A diminishing marginal utility curve can be converted into a demand curve. We shall discuss it in detail later on when we discuss the Marshallian utility analysis of demand. Similarly consumer will be prepared to buy 3rd and 4th dozens of oranges only at lower and lower prices.

(ii) *New Consumers:* The market demand for any commodity is made up of individual demands of numerous consumers. When the price of any commodity is sky high, only the rich few can afford to purchase such a costly commodity and the poor sections of the society have to go without it or do with the inferior substitutes. When the price falls, the commodity becomes accessible to some more consumers who are not very poor. And when the price falls, still further the commodity becomes accessible to still more persons. Thus, one reason why market demand for any good increases in response to a fall in its price, is that each fall in its price brings in new consumers for the commodity.

(iii) *Income effect:* The change in the price of a commodity also affects the real income or the purchasing power of the consumer. A fall in the price of a commodity in fact amounts to a rise in the real income or the purchasing power of the consumer. Therefore, he can afford to buy more of the commodity. On the other, a rise in price will reduce his purchasing power or real income and therefore he will be able to buy only less amount of the commodity. In other words fall or rise in the price of a commodity induces consumers to buy more or less of a commodity. The change in the demand for a commodity as a result of the change in real income (due to fall or rise in the price of the commodity) is called income effect of a price change.
(iv) **Substitution effect:** When the price of a commodity falls, besides, increasing purchasing power or a real income, it becomes relatively attractive to the consumers to substitute this commodity in the place of other commodity and therefore they buy more of it. For instance a fall in the price of tea will induce consumers to substitute tea for coffee and therefore the demand for tea will increase but conversely, a rise in the price of tea will induce consumers to substitute coffee for tea and will reduce the demand for tea.

Because of these factors, normally a demand curve slopes downwards from left to right i.e. more of a commodity is demanded at lower price and vice-versa.

**Exceptions to the Law of Demand**

Normally, the demand curve slopes downwards from left to right, showing that more is demanded at lower price and vice-versa. However, there are some exceptions to the law of demand in which case the fall in the price of a commodity will contract the demand and vice-versa i.e., the demand curve may slope upward to the right. These are as follows:

(i) **Goods which are expected to become scarce or whose prices are expected to rise in future:** In case of goods which are expected to become scarce in future the consumers may buy more of those goods even at a higher price. Similarly when the price of a good has increased but consumers expect that it will rise further in future, then they will prefer to buy more of the commodity even at a higher price at present. Conversely, though the price has fallen but the people expect that it will fall further in future, they prefer not to buy more of it even at lower price at present and will prefer to wait for the further fall.

(ii) **Goods carrying social status:** There are some goods e.g., diamonds, the possession of which carry social status and are bought by rich people because their prices are very high. If the prices of these goods become low, the consumers will buy less of them because the fall in their prices will reduce their prestige value. If their prices go up, their demand may also go up because of increase in their social prestige.

(iii) **Giffen goods:** The real exception of the law of demands is in case of giffen goods. If the price of inferior good falls, its demand may also fall. This is because the fall in the price of an inferior good increases the real income of the consumers and therefore they can afford to buy superior goods. They will start substituting superior good in place of an inferior good and therefore the demand for the inferior good will decline. Conversely, if the price of an inferior good reduces the real income of the consumers and they will also increase. The increase in the price of an inferior good reduces the real income of the consumers and they will be forced to spend more on the inferior good. This phenomenon was first of all observed by Sir Robert Giffen. In Great Britain, in early 19th century when the price of bread (considered to be an inferior good) increased, low paid British workers purchased more bread and not less of it. This was contrary to the law of demand. Giffen explained this paradox by stating that the bread was a necessity of life. Low-paid British workers consumed a diet of...
mainly bread. When the price of bread increased, they had to spend more on the given quantity of bread. They were left with little income to be spent on meat and therefore could not afford to buy as much meat as before. They substituted even bread for meat in order to maintain their total food intake. Therefore, increased price of bread resulted into the increased demand for bread. In other words there was a direct price-demand relationship. After the name of Robert Giffen, all such goods whose demands increase with increase in prices and whose demands fall with fall in their prices, are called ‘Giffen Goods’. However, it should be noted that a ‘Giffen Good’ is an inferior good but every inferior good can not be called a ‘Giffen Good’. There is a difference between an inferior good and a Giffen good. Only those inferior goods are called Giffen Goods, in whose case there is a direct price-demand relationship i.e., both price and demand of the commodity move in the same direction as shown in diagram 1.3

In the figure, when the price per bread (loaf) is 20 paise each, a consumer buys 30 loaves of bread. But when the price of bread increases to 30 paise each, he buys 40 loaves of bread. It means that when the price of bread increases, a consumer buys more of it and vice-a-versa. In this case, there is a positive or direct relationship between the price of a commodity and its quantity demanded. Therefore, the demand curve will slope upward from left to right, as is shown by the demand curve DD in diagram 1.3 Here bread will be considered as ‘Giffen’ good. We shall discuss the case of Giffen Good in detail in the section on the Indifference Curve Analysis of the Demand. However, it is extremely difficult, if not impossible to find an example of a Giffen good in real life.

**Difference between Expansion and Contraction of Demand of a Commodity and Increase and Decrease in Demand of a Commodity**

* (a) Expansion and Contraction of Demand: We have told you that the demand is affected by various factors. In explaining the law of demand we consider only the effect of the changes in the price of a commodity on its demand, assuming that there is no change in other factors e.g., income, taste and fashion of the consumers, prices of other goods etc. Change in the demand of a commodity due to changes in its price alone, are called extension and contraction in demand. It is also called ‘change in the quantity demanded’ or ‘movement along the same demand curve’. When the quantity demanded of a commodity rise due to fall in its price alone, it is called extension of demand. On the other hand, if the quantity demanded falls due to rise in prices, it is called contraction of demand. Suppose, as a result of the fall in the price of oranges from Rs. 3.00 per dozen to Rs. 2.50 per dozen, the demand for oranges rises from 1 dozen to 2 dozens, it is called extension of demand. Conversely, if as a result of rise in price of oranges from Rs. 1.50 per dozen to Rs. 2.00 per dozen the demand for oranges falls from 4 dozens, it is called the contraction of demand. Here we have assumed that the rise or fall in the demand for a commodity has taken place only due to fall or rise in the price of oranges, assuming that there is no change in other factors which also affect the demand. We can explain them with the help of the diagram 1.4.

We have drawn the demand curve DD which shows the different quantities of commodity X demanded at different prices, assuming that other factors which also affect the demand e.g. income, tastes and fashion of the consumers, prices of related goods etc. are constant. In the figure, when the price is OP, the quantity demanded is OS. If the price falls from OP to OQ the quantity demanded rises from...
OS to OT. This rise in demand ST is called extension of demand. Conversely, if the price of the commodity X rises from OP to OM, the quantity demanded falls from OS to OR. This RS fall in the quantity demanded is called contraction of demand. Thus the extension and contraction of demand takes place only due to changes in the price of the commodity and are represented by the movement on the same downward sloping demand curve.

(b) Increase and Decrease in Demand: The changes in the demand for a commodity due to the factors other than the price of the commodity e.g., changes in consumer’s income, tastes, fashion, prices or related goods etc., are called increase and decrease in demand. Suppose the income of the consumer has increased (assuming the price of commodity has remained constant) and therefore he will demand more of the goods. The rise in his demand for goods is called increase in demand. On the other hand if the income of the consumer declines he demands less of goods. This fall in his demand is called decrease in demand. Though the extension and contraction of demand can be represented on the same demand curve, but the increase or decrease in demand are represented by the upward or downward shifts in demand curve. This is explained in diagram 1.5.

![Diagram 1.5](image)

Initially, DD is the demand curve. At price OP the quantity demanded of commodity X is OM. Suppose the price of the commodity has remained constant but the consumer’s income increases or the fashion of a good has increased, the consumer is able to buy greater quantities of the good than before and therefore the demand curve DD will shift upward to right and the new demand curve is D1D1. The consumer will now buy ON quantity instead of OM quantity at the old price OP. This is called increase in demand. On the other hand, when the consumer’s income declines or the fashion of a good has declined, the demand curve DD will shift downwards to the left and the new demand curve will be D2D2. The consumer will now be able to buy only OR quantity of the good at the old price OP instead of OM quantity and this decline in demand is called decrease in demand.

To sum up, extension and contraction of demand take place due to changes in the price of the commodity alone assuming other things being equal, and are represented by the movements on the same demand curve. Increase and decrease in demand take place due to changes in other factors e.g., consumer’s income, tastes, preferences, fashion, prices of related goods etc., and are represented by upward or downward shifts in the demand curve.
1.2 SUPPLY ANALYSIS

The price of a commodity is determined by its demand and supply. We have so far discussed the demand aspect. We shall now discuss the supply aspect.

The Meaning of Supply

Supply refers to the quantity of a commodity which the producers are prepared to sell in the market at a particular price per unit of time. Like demand, supply is also expressed with reference to a particular price and time. The amount of goods available with the producers (i.e., stock) cannot be called supply because the producers may not be prepared to offer the entire stock of a commodity for sale in the market at a particular price and time. Only that amount of the goods which the sellers are actually prepared to offer for sale in the market at a particular price and time is called supply. Like demand, quantities supplied will be different at different prices. In case of demand, there is an inverse relationship between the price of a commodity and its quantities demanded i.e., more is demanded at a lower price and vice-versa. But in case of supply there is a direct relationship between the price of a commodity and its quantities supplied i.e., more of the quantities of a commodity will be supplied at a higher price and vice-versa.

Factors Determining the Supply

(i) Price of a commodity: The objective of the producer is to get maximum profits. Other things being equal, producers will supply more of a commodity at a higher price and less at a lower price. This direct relationship between the price of a commodity and its quantities which the producers are prepared to offer for sale in the market is called the Law of Supply.

(ii) Prices of other goods: If the prices of other goods have increased, whereas the price of the commodity which the producers have been producing has not increased or not increased to the same extent to which the prices of other goods have increased, it will become profitable for the producers to produce other goods and therefore the supply of the particular commodity which they have been producing will fall. The supply of one commodity, therefore, falls when the prices of other goods increase and vice-versa.

(iii) Prices of Factors of Production: Other things being equal, the changes in the prices of factors of production also affect the cost of production. The rise in the price of one factor or factors of production used in the production of a commodity will cause increase in its cost of production and reduces the profitability of the production of that commodity. The producer will reduce the supply of that commodity and increase the supply of other commodity.

(iv) State of Technology: There have been tremendous technological improvements during the last few years and are also taking place every day. There have made it possible to produce varieties of goods at low cost of production and therefore the supply of various types of commodities has increased.

(v) The Goals of Producers: The objectives of the producers is to maximize their profits. But if the producer of a commodity wants to sell as much as possible even if it costs him some profits, he will produce more of that commodity and therefore, its supply will increase. If the producers are prepared to take risk, the supply of the commodity whose production is risky, will increase.

The Law of Supply

Supply of a commodity directly depends upon the price of that commodity. Higher the prices, larger will be quantities supplied. This direct relationship between the price of a commodity and its quantities supplied is called the Law of Supply. We can define Law of Supply in this way-other things being equal,
more of a commodity will be supplied at higher prices and less at lower prices i.e., the price of a commodity and its supply is directly related. It is apparent from the fact that the objective of the producer is to maximize his profits, therefore, if the price of a commodity has risen, it is profitable for the producer to produce and supply more of that commodity. Lower prices will induce the producers to reduce the supply of that commodity.

Law of supply can be explained with the help of supply schedule and supply curve. Supply Schedule of a Firm

We have-said earlier that supply of a commodity is expressed with reference to a price and there will be different quantities of a commodity supplied at its different prices. Suppose a producer (firm) supplies 10, 14, 17 and 19 ball-pens per day when the prices of ball-pens are Re. 1, Rs. 1.50 Rs. 2.00 and Rs. 2.50 per ball-pen respectively. If we put it in a tabular form as given below in Table 4.3, showing the different quantities of a commodity which a producer is prepared to supply at its different prices, we call it a firm’s supply schedule of that commodity.

TABLE 1.3

<table>
<thead>
<tr>
<th>Price (per ball-pen)</th>
<th>Quantity supplied Ball-pens Rs. (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>10</td>
</tr>
<tr>
<td>1.50</td>
<td>14</td>
</tr>
<tr>
<td>2.00</td>
<td>17</td>
</tr>
<tr>
<td>2.50</td>
<td>19</td>
</tr>
</tbody>
</table>

The supply schedule clearly shows that more quantities of ball-pens will be supplied at higher prices and vice-versa.

Supply Curve of a Firm

If we represent the above supply schedule on a graph, we can get the supply curve of a firm, as given in diagram 1.6.

In diagram 1.5, vertical axis OY represents the different prices of ball-pens and horizontal axis, OX, the quantities of ball-pens supplied. A, B, C, and D represent the different quantities of ball-pens supplied at different prices as given in the supply schedule Table 1.3. If we join A, B, C and D, we get a curve which is called the supply curve. Supply curve slopes upward from left to right. This supply curve shows that there is a direct relationship between the prices of ball-pens and their quantities supplied i.e., larger will be the quantities supplied at higher prices and smaller will be the quantities supplied at lower prices, assuming other things remaining same.

Diagram 1.6
Market Supply Schedule and Market Supply Curve

In order to find out the market demand schedule and the market demand curve, we aggregate the individual demand schedules and individual demand curves. Similarly we can find out the market supply schedule and the market supply curve of a commodity by aggregating the individual supply schedules and individual supply curves of all the firms which are supplying that commodity. Suppose for the sake of simplicity, there are only two firms A and B which are supplying ball pens in the market. The table 1.4 below, gives the different quantities of ball pens supplied by the firms A and B at different prices.

<table>
<thead>
<tr>
<th>Price (per ball-pen) (Rs.)</th>
<th>Quantities supplied</th>
<th>Market Supply (Total quantities supplied)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------</td>
<td>-------</td>
</tr>
<tr>
<td>1.00</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>1.50</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2.00</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>2.50</td>
<td>19</td>
<td>20</td>
</tr>
</tbody>
</table>

If we represent the supply schedule given above in table 1.4 on a diagram, we can find out the market supply curve of ball pens as shown in diagram 1.7:

In diagram 1.7 (c), the market supply curve $S_m$ has been obtained by aggregating the supply curve of firms A and B and shown in figures (a) and (b) above respectively. For instance at price Rs. 1.50 per ball pen, firm A supplies 14 ball pens (OM quantity) and firm B supplies 15 ball pens (ON quantity). Therefore the total market supply will be 29 ball pens (OT quantity) at price Rs. 1.50 per ball pen. The market supply curve also shows the direct relationship between the price of a commodity and its quantities supplied. More of a commodity will be supplied at a higher price and less at a lower price.
Difference between a change in Quantity Supplied and an Increase or Decrease in Supply

(i) A Change in Quantity Supplied: If the quantity supplied is more or less due to the change in the price of that commodity alone, assuming all other factors which affect the supply of a commodity mentioned earlier, remains constant, we call it a change in the quantity supplied. In the example given earlier, when the price of a ball pen rises from Rs. 1.50 to Rs. 2.00 per ball pen, the supplier supplies 17 ball pens instead of 14 ball pens. This is called a change in the quantity supplied. This is represented by the movements along the same supply curve as given in diagram 1.6. With the rise in price from Rs. 1.50 to Rs. 2.00 per ball pen, we move from B to C on the same supply curve SS and with the fall in the prices, we move downwards along the same supply curve.

(ii) Increase or Decrease in Supply for Shifts in the Supply Curve: If the price of a commodity remains constant but the supply changes due to the changes in any of the other factors (factors other than price) affecting the supply of a commodity e.g., an innovation, discovery of cheap raw materials, prices of other goods etc., it is called an increase or a decrease in supply. If as a result of an innovation, the producers are willing to produce and sell more in the market, it is called an increase in supply. On the other hand, if as a result of an increase in the prices of factors of production the producers are willing to produce and sell less, this will be called a decrease in supply.

An increase in the Supply of a commodity is represented by a shift in its supply curve to the right and a decrease in the supply is represented by a shift to left of the original supply curve, as given in the following diagram 1.8

If as a result of the change in factors other than the price, the supply of a commodity increases, the supply curve SS will shift to the right and the new supply curve will be $S_1S_1$. This shows that even if the price OP remains constant, the Supply of the commodity has increased from OM to OM$_1$. On the other hand, if as a result of the changes in factors other than the price, the supply has decreased, the supply curve SS will shift to the left and the new supply curve will be $S_2S_2$. This shows that price remaining constant at OP, the supply has decreased from OM to OM$_2$. 

Diagram 1.8
1.3 DETERMINATION OF EQUILIBRIUM PRICE

The price of a commodity in the market is determined jointly by its demand and supply. The price of a commodity is determined where its quantity demanded is equal to its quantity supplied.

Let us take an example. The following table 1.5 shows the market demand schedule and market supply schedule of ball pens i.e, the different quantities of ball pens demanded and supplied at different prices in the market.

<table>
<thead>
<tr>
<th>Price (Per ball pen) (Rs.)</th>
<th>Demand schedule (quantity supplied) (Ball Pens)</th>
<th>Supply schedule (Quantity supplied) (Ball Pens)</th>
<th>Pressure On Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>38</td>
<td>8</td>
<td>upward</td>
</tr>
<tr>
<td>1.50</td>
<td>31</td>
<td>13</td>
<td>upward</td>
</tr>
<tr>
<td>2.00</td>
<td>25</td>
<td>17</td>
<td>upward</td>
</tr>
<tr>
<td>2.50</td>
<td>20</td>
<td>20</td>
<td>Equilibrium</td>
</tr>
<tr>
<td>3.00</td>
<td>16</td>
<td>22</td>
<td>Downward</td>
</tr>
<tr>
<td>3.50</td>
<td>13</td>
<td>23</td>
<td>Downward</td>
</tr>
</tbody>
</table>

The table shows that as the price is increasing the quantity demanded is falling but the quantity supplied is increasing. At the price of Rs. 2.50 per ball pen, quantity of ball pens demanded (20) and supplied (20) are equal. Therefore, price of ball pen in the market will be Rs. 2.50 each. This is also called the equilibrium price. This can also be explained with the help of the diagram 1.9.

DD is the market demand curve and SS is the market supply curve which show the quantity of ball pens demanded and supplied at different prices. Demand and supply curves intersect each other at point A showing the equality of demand (OM or 20) and supply (OM or 20) of ball pens. At this point the price is OP or Rs. 2.50 per ball pen. Therefore, the market price will be Rs. 2.50 (OP) per ball pen. It is not possible to have the price of ball pen in the market different (less or more) than that of Rs. 2.50 per ball pen and therefore this is also known as equilibrium price and the quantity demanded and supplied i.e., OM is known as equilibrium quantity. Suppose the price in the market is Rs. 3 per ball pen. At this price, 22 ball pens are supplied but 16 ball pens are demanded. The supply is in excess (22–16 = 6) of demand. The producers will be left with unsold quantity and will incur losses and therefore they will reduce the price. The consumers, finding glut of unsold quantity, will be prepared to purchase the commodity at a lower price. As a result, the price will decline and will ultimately come down to the equilibrium price. This hypothesis is shown by the arrow indicating a downward pressure to all prices above Rs. 2.50, On the other hand, let us take the example when the price is Rs. 2.00 per ball pen. At this price there is an excess demand; demand is for 25 ball pens...
and its supply is 17. The excess demand will increase the price. The consumers will offer higher price in order to get the commodity which is in short supply and the producers will also offer the commodity at higher price. As a result, the price will start increasing till it becomes equal to the equilibrium price. This is illustrated by the arrow indicating an upward pressure on all prices below Rs. 2.50 per ball pen. Therefore, if the price is above Rs. 2.50 per ball pen it will fall and if price is below Rs. 2.50, it will rise till it becomes equal to Rs. 2.50. At the price of Rs. 2.50, the quantity supplied is equal to the quantity demanded and there is no tendency for the price to change. Therefore, this price is called equilibrium price. The term equilibrium means a state of balance; such a state of balance occurs when consumers are prepared to buy the same quantity as the suppliers are prepared to offer for sale in the market. It is the equilibrium price which will ultimately prevail in the market. If at any time the price in the market is above or below the equilibrium, certain forces in the system will operate to bring the price to the level of the equilibrium price.

1.4 EFFECTS OF SHIFTS IN DEMAND AND SUPPLY CURVES ON EQUILIBRIUM PRICE

Since the price of a commodity is determined by its demand and supply, any change in its demand or supply will therefore affect its price. Let us now discuss the effects of the changes in demand-supply conditions on the price.

(a) Shifts of The Demand Curve and Equilibrium

(i) Leftward shifts of the Demand Curve (Decrease in Demand)

Normally, a leftward/downward shift of the demand curve, given any supply curve, tends to decrease the equilibrium price as well as the quantity bought and sold as shown in diagram 1.10.

In diagram 1.10 as a result of the leftward shift of the demand curve DD to D1D1, price falls from P0 to P1 and the quantity brought and sold falls from q0 to q1.

However, as shown in the diagrams 1.11, for a given leftward shift to the demand curve, the higher the elasticity of the supply curve, the greater the fall in price and lesser the decrease in the quantity bought and sold and vice versa. In the extreme case of a perfectly inelastic supply curve (diagram 1.11 A) the fall in price is the maximum while the quantity bought and sold does not change at all. On the other hand, in case of a perfectly elastic supply curve, (diagram 1.11 B) price does not fall at all and only the quantity bought and sold decreases. In the intermediate case, when supply is neither perfectly elastic nor perfectly inelastic (i.e., upward rising supply curve in diagram 1.11 C) the price falls and the quantity bought and sold decreases.
Diagram 1.11

In part A of the diagram above, as a consequence of a leftward shift of the demand curve DD to \( D_1D_1 \), price falls from \( p_0 \) to \( p_1 \) while quantity bought and sold remains constant at \( q_0 \). In part B on the other hand, price remains constant at \( p_0 \) whereas quantity bought and sold decreases from \( q_0 \) to \( q_1 \). In part C, partly the price falls and partly the quantity bought and sold decreases.

(ii) Rightward shifts of the Demand Curve (Increase in Demand)

Normally, a rightward shift of the demand curve, given and supply curve, tends to increase the equilibrium price as well as quantity bought and sold as shown in the diagram 1.12

In the diagram 1.12, as a result of a rightward shift of the demand curve DD to \( D_1D_1 \), price increases from \( p_0 \) to \( p_1 \) and quantity increase from \( q_0 \) to \( q_1 \).

However, for any rightward shift of the demand curve, move elastic the supply curve, lower will be the increase in price and higher will be the increase in quantity. In the extreme case of a perfectly elastic supply curve, price does not increase at all and only the quantity bought and sold increases. On the other hand, when the supply curve is perfectly inelastic, only the price increases and the quantity remains unchanged. This is shown in the diagrams 1.13A and 1.13B.

Diagram 1.13 A shows that when the supply curve is perfectly elastic price remains unchanged at \( P_0 \) and quantity increase from \( q_0 \) to \( q_1 \). Diagram 1.13B on the other hand, shows how quantity remains unchanged and only price increases from \( p_0 \) to \( p \), when the supply curve is perfectly inelastic.

(b) Shifts of the Supply Curve and Equilibrium

(i) Leftward shift of the Supply Curve (Decrease in Supply)

Normally, given and demand curve, a leftward shift of the supply curve tends to increase price and reduce quantity bought and sold as shown in the diagram 1.14.
In the diagram 1.14, as a result of a leftward shift of the supply curve from SS to S₁S₁, price rises from p₀ to P₁ and quantity decrease from q₀ to q₁.

However, for any given leftward shift of the supply curve, higher the elasticity of demand, lower the increase in price and greater the reduction in the quantity bought and sold and vice versa. If the demand curve happens to be perfectly elastic, equilibrium price remains unchanged and only the quantity bought and sold decreases. On the other hand, if the demand curve is perfectly inelastic, quantity remains unchanged while price increases. In the intermediate case partly price rises and partly quantity decreases. Diagrams below demonstrate extreme cases of perfectly inelastic demand curves.

Diagram 1.15 A depicts the case of a perfectly elastic demand curve in which case price remains constant at OP₀ but the quantity decreases from Oq₀ to Oq₁. Diagram 1.15B, on the other hand, shows the case of a perfectly inelastic demand curve in which increases from Op₀ to Op₁ while quantity remains unchanged at Oq₀.
(ii) Rightward shift of the Supply Curve-Increase in supply

In case of a rightward shift of the supply curve the results are exactly the opposite of what have been explained above. Normally, a rightward shift of the supply curve, given any demand curve, tends to lower equilibrium price and to increase the quantity. However, for a given rightward shift of the supply curve, more elastic the demand curve, lower is the fall in price and greater is the increase in the quantity bought and sold and vice versa. If the demand curve is perfectly inelastic, the quantity bought and sold remains unchanged and only the price falls. On the other hand, if the demand curve happens to be perfectly elastic, price remains unchanged while quantity increases. These cases are depicted in the diagrams 1.16A, B and C:

Diagram 1.16

Diagram 1.16A shows that if the demand curve is perfectly inelastic, only the price falls as a result of a rightward shift of the supply curve but the quantity remains constant. In case of a perfectly elastic demand curve (shown in diagram 1.16 C) the quantity bought and sold increase from $q_0$ to $q_1$, whereas price remains constant at $p_0$. In the intermediate case (shown in 1.16 B) there is some decline in the price but the there is some increase in quantity.
LESSON 2

ELASTICITY OF DEMAND

2.1 INTRODUCTION

The demand for a commodity depends, as we have already discussed in detail, on a number of factors such as price of the commodity itself, prices of other commodities, incomes of consumers, their tastes and preferences, advertisement, taxes or subsidies, and a host of other factors including weather and expectations about movement of prices in future. For example, the law of demand tells us that, other things remaining constant, normally the quantity demanded of a commodity increases when its price falls and vice versa. Similarly, we known how quantities demanded of different goods vary in response to changes in the incomes of the consumers or prices of related goods. Or, to take another example the demand for ice varies with changes in temperature. However, these laws or tendencies only point the direction in which quantities demanded of various goods tend to varies in response to changes in certain factors but do no tell us the extent of changes in the quantities demanded.

The Concept

For analytical purposes and practical decision-making it is often necessary to know the degree of responsiveness of demand to each of the factors that may be influencing it as well as relative responsiveness of demand to one factor compared to another factor or a comparison of the relative responsiveness of demand for different goods to the same factor. The concept of elasticity of demand is a device to measure the responsiveness of the quantity demanded to changes in any factor that may influence the demand for a commodity.

In principle, it be possible to use the concept of elasticity of demand to measure the responsiveness of quantity demanded to changes in any factor that may influence the demand for various goods are quantifiable and it is, therefore, possible to measure responsiveness of demand to changes in them, some other factors cannot be quantified and responsiveness of demand to changes in them cannot possibly be measured. The concept of elasticity of demand is generally used to measure the responsiveness of demand to changes in (a) prices of the goods themselves, (b) changes in the prices of related goods and (c) changes in the incomes of the consumers. The measure of the degree of responsiveness of the quantity demanded of a good change in its price is described as ‘price elasticity of demand’. A measure of the degree of responsiveness of demand for a good to changes in the incomes of the consumers is described as the ‘income elasticity of demand’. And, finally, a measure of the degree of responsiveness of demand for a good X to changes in the price of another related good Y is called the ‘cross elasticity of demand’.
Price Elasticity of Demand (e)

Price elasticity of demand is defined as the degree of responsiveness of quantity demanded to change in the price of the commodity.

\[
\text{Price elasticity of demand} = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}
\]

\[
= \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} \times 100
\]

For example, suppose when the price of a good falls from Rs. 20 to Rs. 19, the quantity demanded increases from 1000 units to 1100 units. In this example the percentage change in price is 5\% (\frac{1}{20} \times 100 = 5) and percentage change in quantity demanded is 10\% (\frac{100}{100} \times 100 = 10). Thus, value of elasticity in the case would be 10\% - 5\% = 2.

Symbolically, if we write ‘e’ for elasticity of demand, ‘Q’ and ‘P’ for the original quantity demanded and the original price respectively and AQ and AP for absolute changes in quantity and price respectively, we can write the above formula in the form of the following expression.

\[
e = \frac{(\Delta Q/Q)100}{(\Delta P/P)100}
\]

\[
= \frac{\Delta Q/Q}{\Delta P/P}
\]

\[
= \frac{\Delta Q}{Q} \times \frac{P}{\Delta P}
\]

\[
= \frac{\Delta Q}{Q} \times \frac{P}{\Delta Q} \times \frac{Q}{P}
\]

Normally e is negative because of negative relationship between price and quantity given other things. The value of e ranges from 0 to \( \infty \). The shape of the demand curve will vary depending on value of e.

1. In the extreme case when there is no change in the quantity demanded in response to a price change, elasticity of demand is said to be equal to zero or demand is described as ‘perfectly inelastic’. The demand curve is vertical as shown in diagram 2.1 (A).

2. On the other hand, when there is an infinite change in quantity demanded due to a change in price, elasticity of demand is said to be equal to infinity or demand for the good is described as ‘perfectly elastic’. The demand curve is horizontal as shown in dig. 2.1 (B).

3. If the percentage change in quantity demanded is equal to the percentage change in price, elasticity of demand is said to be equal to one or demand for the good in question is described as of ‘unit elasticity’. The demand curve is rectangular hyperbola as shown in diagram 2.1 (C).

4. It the percentage change in quantity demanded is greater than the percentage change in price, elasticity of demand is said to be greater than one or demand for the good in question is described as ‘elastic’. The curve is flatter as shown in diagram 2.1 (D).
5. If the percentage change in quantity demanded is less than the percentage change in price, elasticity of demand is said to be less than one or demand for the good in question is described as 'inelastic'. The curve is steeper as shown in diagram 2.1 (E).

### Diagram 2.1

#### 2.2 THE PROBLEM OF MEASUREMENT

When we think of measuring elasticity of demand one method which at once suggests itself is to measure responsiveness of quantity demanded in terms of absolute changes in price and quantity demanded. However, from the nature of the problem it is evident that we cannot measure responsiveness of demand in terms of absolute changes in price and quantity demanded. For example, due to a one rupee fall in price the quantity demanded of rice may increase by 1000 quintals. But the units of measurement being different (e.g., price is measured in rupees and rice in quintals), there is no basis for comparing a rupee change in price with a 1000 quintal change in demand. On the basis of these figures we cannot say whether the change in quantity demanded is more than equal to or less than the change in the price. And, when it is a question of comparing the relative responsiveness of the quantities demanded of two or more than two goods, even equal absolute changes in their prices or quantities demanded as a measure of relative responsiveness may actually conceal more than what it reveals. For example, suppose that as a result of a Rs.5/- reduction in the prices of wheat and radios, the demand for the former expends by 10,000 quintals and the demand for the latter expands by 500 units. Ignoring the question of incomparability of a quintal of wheat with a unit of radio, on the basis of the absolute changes in prices and quantities...
we are tempted to conclude that demand for wheat is more price-elastic than the demand for radios. But the given change in the prices of the two goods may not have the same significance for the consumers. Suppose the original price of wheat was Rs. 100 per quintal and that of radios was Rs. 500 per set. A Rs. 5 reduction out of Rs. 100 is certainly a more significant price cut than the same reduction out of Rs. 500. This simply means that the prices cut is 5% in case of wheat and only 1% in case of radios. Similarly, a given change in demand may be an insignificant change if the original quantity demanded was high and it would be a significant change if the original demand was small. Suppose, according to the above example, the demand for wheat expanded from 1,000,000 tons to 1,0010,000 tons and the demand for radios expanded from 10,000 to 10,500 units. This means that the demand for wheat expanded only by 1% while the demand for radios expanded by 5%. By comparing the percentage change in prices and quantities it turns out that due to a 5% fall in the price of wheat its demand expanded only by 1% whereas due to a 1% fall in the price of radios demand expanded by 5%. It is thus evident that the demand for radios is much more price-elastic than the its demand for wheat. A comparison of the absolute changes in prices and quantities had given us an entirely distorted impression. Therefore, elasticity of demand (and for that matter all elasticities) is always measured in terms of (i.e., percentage or proportionate) changes in prices and quantities demanded. These percentage changes are independent of the units of measurement. Merely by comparing the percentage changes in price and quantity demanded we can immediately say whether percentage change in demand is more than, equal to or less than the percentage change in price. Because of the difficulties mentioned above elasticity is never measured in terms of absolute changes. It is always measured in term of relative (i.e., the proportionate or percentage) changes in price and quantity demanded. The purpose of all elasticity measures is to determine whether the percentage change in demand is more than equal to or less than the percentage change in price causing the change in the former.

2.3 METHODS OF MEASUREMENT

We will discuss three different methods of measuring elasticity of demand, namely-total outlay method, point method and arc elasticity.

(i) The Total Outlay Method

A variant of the above method is to compare the consumer’s total outlay (i.e., expenditure = quantity bought x price) on the commodity after the price change with their original outlay and make qualitative statements about the value of elasticity as was done above. The logic behind this variant is very simple. When due to a price change the quantity demanded of a good change, this tends to change the total outlay of the consumers on the commodity. We know that if the percentage in the quantity demanded is greater than the percentage change in price, the total outlay of consumers will be larger than before in case of a fall in price and less than before in case of a rise in price. On the other hand if the percentage change in quantity demanded is less than the percentage change in price, the total outlay of consumers will be smaller than before in case of a fall in price and larger than before in case of a rise in price. And if the percentage change in quantity demanded is equal to the percentage change in price, the total outlay will remain constant. Making use of this simple arithmetical property economists have devised a variant of the percentage change method which is known as the 'total outlay method'.

According to the total outlay method, instead of comparing the percentage change in quantity demanded with the percentage change in price, we simply compare the total outlay of consumers on the commodity after the price change with their original outlay and make following qualitative statements about the value of elasticity:

1. If the total outlay of consumers on the commodity after the price change (i.e., $Q_1 \times P_1$) is greater than the original outlay ($Q_0 \times P_0$) in case of a fall in price (and less than the original outlay
in case of rise in price), elasticity of demand is said to be greater than one or demand is described as ‘elastic’.

2. If the total outlay of consumers remains the same even after a rise or fall in price (i.e. \( Q_1 \times P_1 = Q_0 \times P_0 \)) elasticity of demand is said to equal one or demand is described as of ‘unit elasticity’.

3. If the total outlay of consumers after the price change is less than the original outlay in case of a fall in price (\( Q_1 \times P_1 < Q_0 \times P_0 \)) and greater than the original outlay in case of a rise in price (\( Q_1 \times P_1 > Q_0 \times P_0 \)) or the changes in the price and total outlay move in the same direction, elasticity of demand is said to be less than one or demand is described as ‘inelastic’.

Let us explain the above method with a simple arithmetical example. Suppose, as the price of a commodity falls, the total outlay of consumers changes as shown in the table 2.1:

<table>
<thead>
<tr>
<th>Price</th>
<th>Quantity demanded (Units)</th>
<th>Total Outlay</th>
<th>Value of elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rs. 9</td>
<td>13</td>
<td>Rs. 117</td>
<td></td>
</tr>
<tr>
<td>Rs. 8</td>
<td>15</td>
<td>Rs. 120</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>Rs. 6</td>
<td>20</td>
<td>Rs. 120</td>
<td>= 1</td>
</tr>
<tr>
<td>Rs. 5</td>
<td>23</td>
<td>Rs. 115</td>
<td>&lt; 1</td>
</tr>
</tbody>
</table>

Elasticity of demand is said to be greater than one when total outlay on the commodity increases from Rs. 117 to Rs. 120 due to a fall in price from Rs. 9 to Rs. 8. Alternatively, we can say that when price rises the total outlay decreases from Rs. 120 to Rs. 117. Therefore, elasticity of demand is greater than one.

Elasticity of demand is equal to unity when total outlay remains constant at Rs.120 as price falls from Rs. 8 to Rs. 6 (Or alternative when price rises from Rs. 6 to Rs. 8, the total outlay remains the same).

Elasticity of demand is less than one when due to a fall in price from Rs. 6 to Rs. 5 total outlay decreases from Rs. 120 to Rs. 115. (Alternatively, we can say that when price rises from Rs.5 to Rs.6 the total outlay increases from Rs. 115 to Rs. 120 elasticity of demand is greater than one.

Let us note that the outlay method enable us only to know whether elasticity of demand is greater than, less than or equal to one. This method does not give us the exact value of elasticity except in the unit elasticity case. The following two methods enable us to calculate the exact value of elasticity of demand.

(ii) The Graphical Method of Measuring Elasticity (Point Elasticity)

Actually this method is only a graphical version of the ‘Percentage change method’ discussed above. The demand curve is only a graphical representation of demand schedule. Therefore, the results obtained through the two methods must necessarily be identical. In order to illustrate how value of elasticity is measured with the help of a demand curve, we draw a straight-line demand curve such as TS in the diagram 2.2.

According to diagram 5.2 when price falls from AR to BD, quantity demanded increases from OA to OB. Thus, the change in quantity demanded (\( \Delta Q \)) is equal to AB (or CD), the change in price (\( \Delta P \)) is CR, while the original quantity demanded (Q) is OA and the original price (P) is AR. According to the percentage method the elasticity of demand,
\[ e = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \]

In terms of the above diagram we have:

\[ e = \frac{AB}{CR} \times \frac{AR}{OA} \]

\[ = \frac{CD}{CR} \times \frac{AR}{OA} \quad \text{(because } AB = CD) \]

\[ = \frac{AS}{AR} \times \frac{AR}{OA} \quad \text{(because } RCD \text{ and } RAS \text{ are similar triangles).} \]

Therefore,

\[ = \frac{CD}{CR} \times \frac{AS}{AR} \]

\[ = \frac{AS}{OA} \]

\[ = \frac{RS}{TR} \quad \text{(because } AR, \text{ being parallel to } OT, \text{ divides } OS \text{ and } TS \text{ in the same ratio)} \]

Note that in the fraction \( \frac{RS}{TR} \) the numerator RS is the lower segment and TR is the upper segment of the straight-line demand curve which meets the two axis in T and S. Therefore, for measuring elasticity at any point on a downward sloping straight-line demand curve which meets the two axis, we can devise a rule of thumb and say that value of elasticity at any point on a downward sloping straight-line demand curve which meets the two axis is equal to the lower segment divided by the upper segment of the demand curve.

(iii) ‘ARC’ Elasticity

We must study arc elasticity because of the problem of a sang in the elasticity expression \( e = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \) which was derived above. The fraction \( \frac{Q}{P} \) is the rate of change of Q per unit change in P but it does not specify whether the change in P is small or relatively large. When \( \Delta P \) is relatively large it creates a range of prices (and quantity demanded associated with each price) thus, giving birth to a number of \( \frac{P}{Q} \) ratios. For example, in the diagram 2.3 opposite the fall in price from \( P_0 \) to \( P_1 \) creates a number of \( \frac{P}{Q} \) ratios such as

\[ \frac{P_0 Q_0}{OQ_0}, \frac{P_1 Q_0}{OQ_0}, \frac{P_2 Q_1}{OQ_1}, \frac{P_3 Q_1}{OQ_1} \]

etc. and so on. In other words, we have a different \( \frac{P}{Q} \) ratio at each point over the stretch.
of the demand curve $P_0P_1$. Which one of the several $P/Q$ ratios occurring over the stretch $P_0P_1$ to choose for calculating the value of elasticity? This is one problem. Secondly, the fraction $\Delta Q/\Delta P$ will be the same for a finite as well as for an infinitesimally small change in $P$ over a whole price range only when the rate of change of $Q$ per unit change in $P$ is constant over the relevant price range (i.e., when the given segment of the demand curve is a straight line) From the above the following conclusions follows:

A. In case of a straight line demand curve (so that $\Delta Q/\Delta P = dQ/dP$ throughout) value of elasticity $(e = dQ/dP \times P/Q)$ will normally vary from one point to another (because of the variations in the value of the ratio $P/Q$) except in the following two cases:

I. When $\Delta Q/\Delta P = dQ/dP = 0$, i.e., in case of a vertical demand curve along which quantity demanded does not vary at all in response to price changes. The elasticity of demand will be zero (i.e., $dQ/dP \times P/Q = 0$) at all points. Such a demand curve is described as ‘perfectly inelastic’. It is vertical and runs parallel to the Y axis as shown in the diagram 2.4 (A).

Illustrations:

(A) Straight line demand curve with various price points.

(B) Vertical demand curve.

(C) Downward sloping demand curve.

Diagram 2.4
According to this diagram quantity demanded remains constant a OQ₀ whether the price is zero or OP₁ or OP₂ or OP₃ or anything else.

II. When \( \frac{\Delta Q}{\Delta P} = \frac{dQ}{dP} \) (infinity), i.e., in a case in which an infinite amount of a commodity is bought at a certain price and nothing at all at any slightly higher price. Such a demand curve will be horizontal and parallel to the X axis as P₀D in the diagram 2.4 (B).

According to diagram 2.4 (B), an infinite amount of the commodity is brought at P₀ price and nothing at all at any higher price. Such a demand curve is known as ‘perfectly elastic’.

B. In case of a non-linear demand curve, in addition to the variations in the value of the ratio P/Q, the value of the ratio \( \frac{\Delta Q}{\Delta P} \) will also be different for a relatively large (finite) change in P and for an infinitesimally small change in P. Therefore, in case of a non-linear demand curve value of elasticity will normally vary from one point to another except when \( \frac{dQ}{dP} \cdot \frac{P}{Q} \) always equals 1.

A demand curve with unit elasticity at all points is of the shape of a rectangular hyperbola as shown in the diagram 2.4 (C).

It is the peculiar property of a rectangular hyperbola that the areas of all the rectangles subtended through different points on it are all equal. Thus, in the diagram above ABCO-EFHO-JKLO, etc. What do these rectangles represent? They only represent the total outlays. For example, the area the rectangle ABCO is calculated by multiplying OC (the quantity demanded) by BC (the price) which is nothing but the total outlay. Similarly the areas of rectangles EFHO and JKLO would represent total outlays at prices FH and KL. All these outlays are equal when the elasticity of demand is unity at all points along the demand curve.

In case of all other non-linear demand curves the value of elasticity varies from one point to another.

**The Concept of Arc Elasticity**

The moral of the above discussion is this: When there is a relatively large (finite) change in P, it creates a price range over which value of elasticity normally varies from one point to another except the special cases mentioned above. In such a case no unique value of elasticity can be taken as the elasticity of the whole price range (i.e., the given segment of the demand curve). In order to take care of this problem we use the concept of ‘arc elasticity’. Arc elasticity is a measure of the average responsiveness of Q to relatively large (finite) changes in P (or average responsiveness to price change exhibited by a demand curve over a finite stretch such as P₀P₁ in the diagram 2.5).

**Method for Measuring Arc Elasticity**

For measuring arc elasticity, instead of picking up any particular P and the Q associated with it for the ratio P/Q, it is customary to fix P = \( \frac{P₁ + P₀}{2} \) (i.e., the average of the two end values P₀ i.e, original price and P₁ i.e., changed price and similarly to fix Q = \( \frac{Q₁ + Q₀}{2} \) (i.e., average of the two end values Q₀ i.e., the original quantity and Q₁ i.e., changed quantity. Hence arc elasticity is defined by the following expression:

\[
\text{Arc elasticity of demand} = \frac{\Delta Q}{\Delta Q} \times \frac{P}{Q}
\]
Let us illustrate the method for measuring arc elasticity with a simple numerical example. Suppose, due to a fall in the price of a commodity from Rs. 10 to 8 per unit the quantity demanded of it increases from 1000 units to 1500 units. What will be the value of arc elasticity in this case? Let us translate these figures in symbols of the above expression.

According to the example \( P_0 = 10, P_1 = 8, Q_0 = 1500, \Delta Q \) (i.e., \( Q_1 - Q_0 \)) = 500 and \( \Delta P \) (i.e., \( P_1 - P_0 \)) = 2.

Arc elasticity of demand
\[
\frac{Q_1 - Q_0}{P_1 - P_0} \times \frac{P_1 + P_0}{Q_1 + Q_0}
\]

\[
= \frac{1500 - 1000}{10 - 8} \times \frac{8 + 10}{1500 + 1000}
\]

\[
= \frac{500 \times 18}{2 \times 2500} = 1.8.
\]

Had we used either of the two end values of \( P \) and \( Q \) in the ratio \( P/Q \) (i.e., either \( P_0/Q_0 \) or \( P_1/Q_1 \)) we would have obtained different results. For example, if we had calculated value of elasticity on the basis of the ratio \( P_0/Q_0 \) (i.e., \( 10/1000 \)), \( \Delta Q / \Delta P \) remaining the same (\( 1500 – 1000 / 10 – 8 \)), its value would have equalled 2.5. \[
\frac{1500 - 1000}{10 - 8} \times \frac{10}{1000} = \frac{500 \times 10}{2 \times 1000}
\]

On the other hand, if we had calculated value of elasticity on the basis of the ratio, \( P_1/Q_1 \) (i.e., \( 8/1500 \)), \( \Delta Q / \Delta P \) remaining the same, its value would have equalled 1.33. \[
\frac{1500 - 1000}{10 - 8} \times \frac{8}{1500} = \frac{500 \times 800}{2 \times 1500} = 1.33
\]

Thus, we get different values of elasticity according to the ratio \( P/Q \) we choose. It is 2.5 when we calculate value of elasticity on the basis of \( P_0/Q_0 \) (\( 10/1000 \)), 1.33 when we calculate it on the basis of \( P_1/Q_1 \) (\( 8/1500 \)) and 1.8 when we calculate the elasticity on the basis of \( \frac{P_1 + P_0}{Q_1 + Q_0} \). The values 2.5 and 1.33 are the extreme values of elasticity of the price \( P_0P_1 \) (the arc or the given stretch of the demand curve). On the other hand, arc elasticity (= 1.8 in the present case) does not measure responsiveness of demand with reference to a particular \( P/Q \) (at any particular point) but in fact represents the approximate average responsiveness of demand over a finite price range (or a given stretch) of the demand curve.

**METHOD FOR MEASURING POINT ELASTICITY ON A NON-LINEAR DEMAND CURVE**

The value of elasticity at any point on a straight-line demand curve is given by the fraction: right hand side segment of the demand curve from the given point divided by the left-hand side segment. Also,
as explained above, at the point of tangency of a straight-line tangent with a non-linear curve the values of the two terms \( \frac{P}{Q} \) and \( \frac{dp}{dq} \) are the same on the tangent as well as on the curve. From this it follows that at the point of tangency the value of elasticity on the straight-line tangent as well as on the curve will be same. Therefore, in order to measure elasticity at any point on a non-linear demand curve, we draw a straight-line tangent to it at that point meeting the two axes at \( T \) and \( R \). The value of elasticity on the straight-line tangent at the point of tangency is also the value of elasticity on the non-linear demand curve at that point. For example, in the diagram 2.6 \( DD_1 \) is a non-linear demand curve and \( TR \) has been drawn tangent to it at \( P \). The value of elasticity at \( P \) on \( DD_1 \) is given by the fraction \( \frac{PR}{PT} \).

Note Regarding the Sign of the Elasticity Coefficient

An important point about the sign of the elasticity coefficient needs to be mentioned here. Elasticity coefficient is calculated by multiplying. According to the law of demand price and quantity demanded are inversely related, that is, the two move in opposite directions. When price falls quantity demanded increases, and vice-versa. From this it follows that if the change in one is a positive quantity the change in the other must be a negative quantity. For example, if due to a fall in price from Rs. 10 to Rs. 8 quantity demanded increases from 100 to 120 units, the change in price will be a negative quantity (–2) and the change in quantity will be a positive quantity (+20). Hence in all normal cases the \( \frac{Q}{P} \) must be a negative fraction and as a result in all normal cases the elasticity coefficient must have a negative sign. Only in the unlikely case i.e. in case of ‘giffen good’, when price and demand move in the same-direction, however, elasticity coefficient will be a positive fraction. Conventionally, however, when price and quantity behave in the normal manner (i.e., move in opposite directions in accordance with the law of demand) elasticity coefficient is taken to be a positive fraction and in the abnormal case (when price and quantity move in the same direction) elasticity coefficient is taken to be a negative fraction. Therefore, the sign of the elasticity coefficient should be carefully marked and its significance should be accordingly interpreted.

2.4 FACTORS DETERMINING ELASTICITY OF DEMAND FOR DIFFERENT GOODS

The price-elasticity of demand varies from commodity to commodity. The demand for certain commodities is highly elastic while the demand for some other commodities is less elastic or highly inelastic. This is because a number of factors influence elasticity of demand for different goods. It is not possible to discuss all such factors here. Below we mention only some of the more important factors which determine elasticity of demand for different goods.

(i) Availability of Close Substitutes: One of the most important factors determining elasticity of demand for a good is the availability of close substitutes. Some commodities like tooth paste, shaving blades, soaps, shoe polish, etc., have a number of quite close substitutes (i.e., different brands). If the price of a particular brand of tooth paste (say, Forhan’s) change, price of other brands of tooth paste remaining constant; it is likely to cause substantial substitution—a fall in price leading consumers to buy more of it and a rise in the price leading consumers to buy more of the other brands. Therefore, elasticity of demand for a good which has several close substitutes is bound to be high. On the other hand, elasticity of demand for goods which
have few or no satisfactory substitutes is bound to be inelastic. Salt, for example, has hardly any substitute for it. Therefore, elasticity of demand for salt is inelastic.

(ii) **Character of the commodity:** Elasticity of demand depends also upon the character of the good—whether it is considered a necessity or a luxury by the consumers. The demand for necessities of life is usually inelastic while the demand for luxuries tends to be highly elastic. The demand for a staple food is likely to be insensitive to price changes because when its price rises a consumer has no alternative but to continue buying it. On the other hand, luxury goods can be easily dispensed with when their prices are high. Therefore, demand for necessities of life is usually inelastic while the demand for luxuries is highly elastic.

(iii) **Level of Price:** At very high and at low prices elasticity of demand is usually very low. If the price of a commodity is very high or very low a slight change in it will not affect its demand significantly. Pencils, for example, which are already selling at low prices will not be purchased in larger quantities if prices fall still lower. On the other hand, slight fall in the price of cars, for example, will not bring them within the reach of average consumers. Cars will still be purchased only by the rich who, in any case, buy them whether the price is somewhat higher or lower. Therefore, elasticity of demand is usually low at very high and at very low prices.

(iv) **Importance of the commodity in the consumer’s budget (i.e., the proportion of income spent on the commodity):** When a commodity claims only a small fraction of a consumer’s income, he makes no great effort to look for substitutes when its price rises. For example, one normally spends a very small amount of money on goods like match boxes, salt, shoe polish, newspapers, etc. When the price of such a good rises it will not affect the consumer’s budget significantly and consequently he is not inclined to change its consumption very much. The demand for such a good is bound to be relatively inelastic. On the other hand, when a good claims a fairly large fraction of a consumer’s income, as for instance with most groceries, a rise in price will affect the consumer’s budget significantly. This will compel him to look for some cheaper substitute and somehow cut down his expenditure on the commodity in question. Therefore, the demand for a good on which a consumer spends a large proportion of his income is likely to be relatively more elastic as compared to another goods on which a consumer spends a small amount.

(v) **The possibility of new customers entering the market:** When the price of a commodity is high only the relatively rich people can afford to buy it. But as the price gradually falls, it becomes accessible to new customers who could not afford to but it when price was high. Thus, with each fall in price more and more new customers are induces to buy the commodity. Hence a fall in price which induces consumers in several income-groups to buy will result in a considerable elasticity of demand.

(vi) **Possibility of postponing purchases:** The elasticity of demand for a good also depends on whether or not its purchases can be postponed if the situation so demands. The demand for consumer durables such as furniture, refrigerators, television sets and less essential items can usually be postponed for better time in future. The demand for a good the purchase of which can be easily deferred to future is likely to be more elastic as compared to the demand for a good the purchase of which cannot be postponed. For this reason the demand for commodities such as medicines, education, necessities of life, etc. is usually very inelastic.

(vii) **The period of time under consideration:** In the event of a rise in price of a good a consumer’s real income is reduced and he is compelled to readjust his consumption pattern. He does so by changing his consumption habits and by finding cheaper substitutes. Since it takes time to find suitable substitutes and to change one’s consumption habits, elasticity of demand for
any good will tend to greater the longer the period of time allowed for these adjustments. Elasticity of demand for a good will tend to be lower shorter the period of time under consideration.

Finally, let us note that a number of factors may be in operation in making the elasticity of demand for a good what it is. For example, salt is a necessity of life, it has no substitute for it, is sells cheap and therefore, claims a very small fraction of one’s income, its consumption cannot be postponed either. Thus, more than one factor account for the low elasticity of demand for salt. Therefore, in order to explain the magnitude of elasticity in any particular case, it is necessary to look for all the possible factors that may influence the demand for the good in question.

2.5 CROSS ELASTICITY AND INCOME ELASTICITY OF DEMAND

So far in our discussion we have been concerned with the responsiveness of demand to changes in the price of the good itself i.e. price elasticity of demand. However, the demand for a commodity depends on a number of other factors besides price of the good. The more important and quantifiable among these factors are price of related goods and incomes of the consumers. Just as we measure responsiveness of demand to change in the price of a good, similarly we can measure responsiveness of demand for a good to changes in the incomes of the consumers and to changes in the price of a related good. A measure of the degree of responsiveness of the demand for a good to changes in the incomes of the consumers is known as the “income-elasticity of demand”. And a measure of the degree of responsiveness of demand for a good X to changes in the price of some other related good Y is described as the ‘cross-elasticity of demand’.

Method for Measuring Income-elasticity of Demand

The same percentage or proportionate change method is used to measure income-elasticity of demand for a good. The formula is:

\[
\text{Income-elasticity of demand for a good} = \frac{\% \text{ change in the demand for } X}{\% \text{ change in Income of consumer}}
\]

Suppose, for instance that due to a 20% increase in the real incomes of the consumers the demand for television sets increases by 10%. In this example income-elasticity of demand for television sets equals 0.5 (i.e., 10% – 20 = 0.5). Normally, an increase in the consumer’s incomes tends to increase the demand for most goods except what are known as ‘inferior goods’. In case of inferior goods an increase in the incomes of the consumers tends to reduce demand for them and a decrease in incomes tends to increase demand for them. As a matter of convention value of income-elasticity of demand is taken to be positive when the demand for a good behaves in the normal manner in response to changes in income-increase in incomes leading to increase in demand and a decrease in incomes leading to a decrease in demand. In the abnormal case (i.e., in case of an inferior good) when incomes of consumer increase demand for a good decreases and vice versa, value of income-elasticity of demand is taken to be negative.

Method for Measuring Cross-elasticity of Demand

The same percentage change method is used to measure cross-elasticity of demand. Suppose X and Y are two related goods and we want to measure the cross-elasticity of demand for X with respect to changes in the price of Y. The formula for measuring cross-elasticity of demand is:

\[
\text{Cross-elasticity of demand for X} = \frac{\% \text{ change in the demand for } X}{\% \text{ change in the price of Y}}
\]
For example, suppose X and Y are two substitute goods and a 10% reduction in the price of Y causes the demand for X to increase by 15%. In this case the cross-elasticity of demand for X will equal $15\% / 10\% = 1.5$. Goods may also be related to each other as complements. In case of complementary goods a reduction in the price of one will cause the demand for the other complementary good to increase. Thus, in case of substitute goods price of one good and the demand for the other good move in the same direction whereas in case of complementary goods they move in opposite directions. However, as a matter of convention value of cross-elasticity is taken to be positive when price and demand move in the same direction (as is the case with substitute goods) and value of cross-elasticity is taken to be negative when price and demand move in opposite directions (as is the case with complementary goods). In other words, value of cross-elasticity of demand is treated as positive in case of substitute goods and negative in case of complementary goods. Thus on the basis of the value of the cross elasticity of demand, we may find out whether the two goods are related to each other as substitutes or complements and what is the degree of substitutability and complementarily between them.

2.6 SOME INTERESTING ELASTICITY THEOREMS

1. Value of point elasticity varies from zero to infinity along a downward sloping straight line demand curve.

Proof:

$$ e = \frac{dq}{dp} \cdot \frac{P}{O} $$

DD being a straight line, its slope (dp/dq) and hence its reciprocal, the ratio (dq/dp) is constant at all points. The ratio P/Q varies from zero to infinity ($\alpha$) along DD. P/Q = zero at D1 where DD meets the quantity axis and at D where it meets the price axis. Therefore, $e = 0$ at D1 (where P/Q = zero) and at D (where P/Q = $\alpha$). At the middle point A on the demand curve DD, the elasticity of demand will be unity ($e = 1$) because lower segment AD of the demand curve is equal to the upper segment AD of the demand curve. On any point, say, B, above the mid-point A on the demand curve DD, the elasticity of demand will be more than one ($e > 1$) because BD > BD. On the other hand, the elasticity on any point say C, which lies below the mid-point A on the demand curve DD, the elasticity of demand will be less than one ($e < 1$) because CD < CD. In other words, as we move towards D1, the elasticity of demand goes on decreasing because the lower segment of the demand curve becomes smaller and smaller and the upper segment will be increasing. At point D1 the elasticity will become zero because at D1, the lower segment will be equal to zero and the upper segment will be the whole DD.

2. Elasticity at different points along two (or more) parallel (i.e., having the same slope) demand curves.

A. Of the two (or more) parallel demand curves, the one farther from the origin is less elastic at each price than the one closer to the origin.

Proof: $e = \frac{dq}{dp} \cdot \frac{P}{Q}$
Being parallel the value of \(dq/dp\) is the same at all points along \(D_1D_2\) and \(D_2D_2\) but the ratio \(P/Q\) is smaller at each price on \(D_2D_2\) than \(D_1D_1\) e.g.

Therefore \(D_2D_2\) is less elastic at each price than \(D_1D_1\). From this also follows the conclusion that parallel rightward shift of a downward sloping demand curve makes it less elastic at each price and a parallel leftward shift makes it more elastic at each price.

**B. The one farther from origin is more elastic at each level of demand than the one closer to the origin.**

Proof: \(e = dq/dp \cdot P/Q\)

In the diagram 2.8, being parallel the ratio \(dq/\ dp\) is the same at all point along \(D_1D_1\) and \(D_2D_2\). But the ratio \(P/Q\) is greater at each level of demand along \(D_2D_2\) than \(D_1D_1\) (e.g., \(P_2Q/OQ > P_1Q/OQ\)). Therefore, \(D_2D_2\) is more elastic at each level of demand than \(D_1D_1\).

**C. Have the same elasticity at points lying along a straight line drawn from the origin (0)**

Proof: \(e = \frac{dq}{dp} \frac{P}{q}\)
In the diagram 2.9, being parallel the ratio \( \frac{dq}{dp} \) is the same at all points along \( D_1D_1 \) and \( D_2D_2 \). The ratio \( \frac{P}{Q} \) is also the same at all points along \( OZ \) because the two triangle \( OQ_1P_1 \) and \( OQ_2P_2 \) are similar and therefore,

\[
\text{the ratio} = \frac{P_1Q_1}{OQ_1} = \frac{P_2Q_2}{OQ_2}
\]

Therefore, elasticity of two (or more) parallel demand curves at points lying along a straight line drawn from the origin(0) is the same.

3. Value of elasticity of downward sloping straight-line demand curves originating from the same point on the price axis.

(i) Are iso elastic at each price

Proof: In the diagram 2.11, \( PP_2 \) has been drawn parallel to \( OD_2 \).

Therefore,

\[
\frac{P_1D_2}{P_2D} = \frac{P_1D_1}{P_1D} = \frac{OP}{PD}
\]

Elasticity of \( DD_2 \) at \( P_2 = \frac{P_2D_2}{P_2D} \) and

Elasticity of \( DD_1 \) at \( P_1 = \frac{P_1D_1}{P_1D} \)

Therefore, elasticity at \( P_2 \) and \( P_1 \) is the same.

(ii) The flatter is more elastic at each level of demand than the steeper one.

Proof: In the diagram 2.12 \( P_2Q \) being paralleled to \( OD_1 \), \( \frac{P_1D_1}{P_1D} = \frac{QD_1}{OQ} \) and \( \frac{P_2D_2}{P_2D} = \frac{QD_2}{OQ} \). Comparing the two ratios \( \frac{QD_2}{OQ} \) and \( \frac{QD_1}{OQ} \) we find that \( \frac{QD_2}{OQ} > \frac{QD_1}{OQ} \).
Therefore, \( \frac{P_2D_2}{P_2D} > \frac{P_1D_1}{P_1D} \). Hence value of elasticity at \( P_2 \) \( \left( = \frac{P_2D_2}{P_2D} \right) \) is greater than value of elasticity at \( P_1 \) \( \left( = \frac{P_1D_1}{P_1D} \right) \).

Therefore of two (or more) demand curves originating from the same point on the price axis, the flatter is more elastic at each levels of demand than the steeper one.

4. Downward sloping straight-line demand curves meeting the quantity axis at the same point have the same elasticity at each level of demand.

Proof: In the diagram 2.13 since \( P_2Q \) is parallel to \( OD_2 \) therefore, \( \frac{P_2D}{P_2D_2} = \frac{P_1D}{P_1D_1} = \frac{QD}{OQ} \).

Elasticity at \( P_2 = \frac{P_1D}{P_2D_2} \) and elasticity at \( P_1 = \frac{P_1D}{P_1D_1} \). Hence elasticity at \( P_2 = \) elasticity at \( P_1 \).

Therefore, \( D_1D \) and \( D_2D \) have the same elasticity at each level of demand.

5. Of the two (or more) intersecting straight-line demand curves the flatter one is more elastic at the point of intersection, than the steeper one.

In the diagram 2.14, at \( P \) the ratio \( P/Q \) is the same for \( D_1D_1 \) as well as \( D_2D_2 \). Therefore, value of elasticity will vary only with the value of \( dq/dp \) along the two curves. Value of \( dq/dp \) is larger at each point along \( D_2D_2 \) (i.e. the flatter curve) than along \( D_1D_1 \) (i.e., the steeper of two). Therefore elasticity of \( D_2D_2 \) at \( P \) is greater than elasticity of \( D_1D_1 \) at the same point \( p \).

2.7 ELASTICITY OF SUPPLY

Elasticity of supply is defined as the degree of responsiveness of quantity supplied to change in the price of the commodity. The percentage formula for measuring the elasticity of supply in given as

\[
es = \frac{\text{percentage change in quantity supplied (} Qs \text{)}}{\text{percentage change in price (} P \text{)}} \times 100
\]

\[
es = \frac{\Delta Qs}{Q} \times 100
\]

\[
es = \frac{\Delta Qs}{\Delta P} \cdot \frac{P}{Qs} \times 100
\]

Elasticity of Supply varies from 0 to \( \infty \).

(1) If \( e_s \) is 0 then supply is perfectly inelastic. The supply curve is vertical in this case.

(2) If \( e_s \) is \( \infty \) then supply is perfectly elastic and the supply curve is horizontal.
(3) If $e_s > 1$, then supply is elastic and the supply curve passes through price (vertical) axis.

(4) If $e_s < 1$, then supply is inelastic and the supply curve cuts the quantity (horizontal) axis.

(5) If $e_s = 1$, then supply is unitary elastic and the supply curve originates from the origin. See diagram 2.15 given above.
LESSON 3

SOME APPLICATIONS OF DEMAND & SUPPLY

3.1 PRICE CONTROL AND RATIONING

Often, in view of shortages due to natural or man made factors, government try to hold down prices of essential commodities by fixing ‘price ceilings’. At present our government is trying to control the rate of inflation by imposing price controls on a wide range of commodities. What would you expect to be the consequences of fixing some prices by law rather than allowing them to be determined by the market forces of supply and demand?

The purpose of fixing a maximum price is to prevent price from rising above some desired level. However, it does not prevent it from falling below the desired level. It is evident that if the legally fixed maximum price is above the equilibrium price, it will have no effect either on the quantity or the price. This can be clearly seen from the diagram 3.1.

The equilibrium price is \( p_0 \). If the maximum price is fixed at a level higher than \( p_0 \), say at \( p_1 \), there is nothing to prevent it from falling to the equilibrium level. In such a case, the market price will stay at its equilibrium level. On the other hand, if the maximum price is fixed at a level lower than the equilibrium level, say at \( p_2 \), then the equilibrium price will no longer be legally obtainable in the market. At this price suppliers will offer to supply \( q_1 \) quantity of the commodity whereas buyers will be willing to buy \( q_2 \) quantity. In other words, excess demand equal to the excess of \( q_2 \) over \( q_1 \) will emerge.

In a situation of excess demand, unless the available supply is allocated to purchasers through some method of rationing, they will try “to compete away the limited supply by offering higher prices. Therefore, in the absence of strictly enforced rationing, a black market will develop in which the commodity will sell at a price higher than the legally fixed price. Normally, what happens is that even in the presence of strict rationing measures some of the limited supply is sold at the controlled price and some at the black market price.

3.2 RENT CONTROL—AN ILLUSTRATION

With the objective of ensuring residential accommodation at a reasonable rent, governments very often
pass legislation fixing maximum rents for private accommodation. For example in Delhi we have a Rent Control Act in operation. The peculiar feature of built houses is that in the short period their 'supply is fixed-completely inelastic-since once rental houses are built the owners have no alternative but to let them out for whatever rent is available. As shown in the diagram 3.2, in the short run the effect of rent control, which reduces market rent from $p_0$ to $p_1$, is to create a shortage because the quantity demanded increases from $q_0$ to $q_1$, whereas the supply remains unchanged.

However, with the passage of time, the lower return on rental housing will cause the supply to shrink. Because of the lower return, new rental houses will not be built and old houses will not be maintained properly. In fact, if the legally fixed rent is below the cost of maintenance, landlords may simply abandon their buildings to let them collapse with decay. As a result, the supply curve will become much more elastic as years pass by as $S_1$, in the diagram above. When supply becomes elastic, supply adjusts to the new situation and becomes equal to $q_2$. As a result, shortage increases further from $q_0$ to $q_1$.

In a situation of shortage of houses, tenants would compete for the available supply by offering higher rents. Since this is not legally permissible, landlords find it convenient to charge lump sum amounts as 'entrance fee' (as pugree) from new tenants. When this becomes possible, there is also an incentive for the landlords to evict sitting tenants with the objective of charging pugree from new tenants.

### 3.3 MINIMUM PRICE LAWS

Sometimes, with a view to protecting the interests of certain sections of society, it becomes necessary for the government to pass laws fixing minimum price below which certain goods and services cannot be bought and sold. Minimum wages laws for different categories of labour, support prices in agriculture, resale price, etc. are some examples.

It is evident that the need for fixing minimum prices arises only when the free market price is considered to be lower than the desired price. Therefore, fixing a price lower than the free market price would be meaningless and ineffective. The free-market price in the case would be compatible with the minimum price law. On the other hand, when the minimum price is fixed above the free-market price, in that case the latter price is not legally obtainable in the results in the market. As already explained, in section I above, a price higher than the equilibrium price results in the emergence of excess supply-suppliers ready to offer for sale more of the commodity than purchasers are willing to purchase. In other words, there emerges a shortage of buyers and suppliers try to attract buyers in various ways such as price cutting, finding loopholes in laws or flouting them altogether. For example when minimum wages are fixed for certain categories of labour, it will create unemployment which will induce workers to offer their services for less than the legally fixed wage. Very often we hear complaints that private schools in Delhi pay much less salaries to teachers than what they are made to sign in the account books. It is a general practice in smaller establishments such as shops, small factories, workshops, etc.

### 3.4 INCIDENCE OF COMMODITY TAXES

Taxes on commodities, (or indirect taxes) such as sales taxes, excise duties, import and export duties,
etc., are major source of revenue for most government in capitalist economies. What does our price theory predict about the effects of such taxes on the quantities and prices of taxed goods? Who really pays the tax—the buyer or the producer?

The immediate effect of a commodity tax is to shift the whole supply curve upward vertically by the amount of the tax as shown in the diagram 3.3. In this diagram, consequent upon imposition of a tax equal to \( p_0 \) \( p \) per unit, the original supply curve \( S \) shifts to \( S_1 \). The new supply curve \( S_1 \) shows that compared to the pretax position each quantity is now supplied at a higher price because a part of the price is now taken by the government as tax. The new supply curve \( S_1 \) intersects the demand curve at new point determining \( p_1 \) as the price and \( q_1 \) as the quantity sold. Thus imposition of a tax on a commodity leads to partly a rise in price and partly to a reduction in the quantity bought and sold. It should be noted carefully that the price paid by the purchasers rise by less than the amount of tax (\( = p_0p_1 \)) and the net of tax price received by the producers falls by \( p_0p_3 \). In other words, purchasers pay \( p_0p_1 \) part of tax per unit and the producers pay \( p_0p_3 \) part of the tax per unit. The term “incidence of a tax” means who actually pays the tax. In the present case the incidence of the tax is borne by the purchasers and the producers in the ratio of \( p_0p_1 \) to \( p_0p_3 \).

Normally, we would expect the price to rise by less than the amount of the tax when the supply and demand curves are not perfectly inelastic or elastic. However, as discussed below, depending upon the relative elasticities of supply and demand curves, the result may be quite different.

### 3.5 INFLUENCE OF ELASTICITIES OF DEMAND AND SUPPLIES

Diagrams 3.4 A, B and C clearly bring out the role of elasticities in determining the post-tax price and consequently the distribution of the tax incidence.

The same supply curve \( SS \) has been drawn and as a result of an equal amount of tax per unit the upward vertical shift of the supply curve is also identical. The pre-tax price and quantity, determined by the intersection of the original supply and demand curves, are also identical in all these diagrams.
In order to bring out clearly the effect of elasticity of demand on the post-tax price and quantity (and hence on the distribution of tax incidence) demand curves with different elasticities ranging from zero to infinity have been drawn.

The diagram 3.4 A the demand curve is perfectly inelastic and as a consequence post-tax price \( p_1 \) is higher than the pre-tax price \( p_0 \) by the full amount of the tax. Note that the quantity bought and sold remain unchanged. Diagram C, on the other hand, depicts the other extreme case of a perfectly elastic demand curve. In this case price does not rise at all, only the quantity bought and sold decreases. In diagram B we have depicted the intermediate case of less than perfectly elastic demand curve. In this case the post-tax price is higher than the original price but by less than the full amount of the tax.

In the diagram 3.4 B we have drawn two demand curves with different elasticities. \( D_1D_1 \) is more elastic than \( DD \). Consequently, rise in price due to the tax is greater in case of \( DD \) than \( D_1D_2 \). This leads us to the conclusion that more elastic the demand curve, less is the increase in post-tax price paid by the consumers and greater is the fall in the net-of-tax price received by the producers and vice versa. In the extreme case of a perfectly elastic demand curve, price does not rise at all and as a result the entire tax-incidence is borne by the producers. On the other hand, in case of a perfectly inelastic demand curve, price rises by the full amount of the tax and as a result the entire tax burden is borne by consumers.

3.6 PROBLEMS OF AGRICULTURE

Agriculture is a problem industry. Food is one of the basic necessities of life. Yet over the last two centuries or so, in most economies the percentage of people engaged in agriculture has been declining steadily and at the same time farm prices have been falling relative to non-farm prices. As a consequence, people who have remained in agriculture have been receiving incomes well below national averages. Governments, therefore, often feel compelled to intervene in a number of ways. In order to understand working and the implications of these schemes it is essential to bear in mind certain feature of agriculture which lies at the roots of its problem.

Features of the Supply of Agricultural Products

Compared to the supply of non-farm products, the supply of farm products taken as a whole is very inelastic for the following reasons.

In the first place, for agricultural production land is the most basic factor whose supply is almost fixed in all economies. Therefore, the possibility of increasing agricultural production by bringing more land under the plough is very limited, especially in the short run.

Secondly, time-pattern of agricultural production is inelastic in the sense that natural processes take their own time to complete. We cannot shorten or lengthen these processes much. Therefore, output cannot be increased or decreased during a given time period (say a year) by cultivating the same land greater number of times. In contrast, by using the same equipment more or less intensively, industrial output can be substantially increased or decreased during a given time period.

Thirdly, in the event of low prices (1) most of the farmer’s costs continue any way and they do not save much by reducing output and (2) farmer’s own efforts to increase output may in fact intensify as they make a desperate effort to maintain their family incomes. Because of these factors the supply of agricultural products is quite inelastic.

Another important feature of the supply of agricultural products is that their production is subject to large fluctuations due to natural factors completely beyond human control such as rainfall, floods, pests, frost, winds, etc. When conditions are exceptionally favourable production is much above the planned level, and, on the other hand, bad conditions cause output to fall much below it.
Thus, the supply of agricultural products is not only inelastic but also subject to violent year-to-year fluctuations due to its heavy dependence on natural factors beyond human control.

Features of Demand for Agricultural Products

The demand for most agricultural products is generally quite inelastic with respect to price changes as well as income changes. Most agricultural products are the basic necessities of life which have hardly any substitutes and whose consumption cannot be increased or decreased much in response to price changes. As a result the demand for them is quite-inelastic. Secondly, this is also established fact that as our incomes increase we expand out food consumption less than proportionately. Thus, not only price-elasticity but also income-elasticity of demand for agricultural products coupled with violent fluctuations in their output (because of agriculture’s heavy dependence on nature) have certain far-reaching implications not only for the fanners but for the entire economy as well. We proceed to examine these in the following pages.

Short-term Fluctuations in Agricultural Prices and Incomes of Farmers

On the one hand, agricultural production is quite inelastic and, on the other hand, it is also subject to violent year-to-year fluctuations due to factors beyond human control. At the same time, demand for agricultural products is also quite inelastic. The combined effect of these factors is to make agricultural production and prices (and farm incomes) fluctuate in opposite directions as shown in diagram below.

In the diagram 3.5, the supply curve shows the different quantities farmers would plan to produce at different prices if their plans materialise. The demand curve DD shows the quantities that purchasers would offer to purchase at different prices. If production plans materialise, then p0 would be the equilibrium price and q0 would be the equilibrium quantity supplied as shown in diagram above. Suppose between good and bad years actual production fluctuates between q2 and q1. In a bad year when output is q2 market price rises to p2 and in a good year when output is q1 price falls to p1. Thus, as a result of fluctuations in output, between q2 and q1 market price fluctuates p2 and p1.

Diagrams 3.5 and 3.6 bring out clearly the effect of the elasticity of demand on price fluctuations. As compared to the demand curve in diagram 3.5, the demand curve of diagram 3.6 is much flatter (more elastic over the relevant range). The supply curves in the two diagrams and range of fluctuations
in output are identical. As a consequence of the greater elasticity of the demand curve the range of price fluctuations in diagram 3.6 (between $P_2P_1$) is much shorter than what it is in diagram 3.5. The reason for this contrast is the difference between the elasticities of the two demand curves.

Earlier in the context of measurement of elasticity of demand we had noted that when elasticity of demand is less than one, total outlay of consumers falls in case of a fall in the price and increases in case of a rise in price. The expenditure of consumers on farm products becomes the income of farmers. It is a paradoxical situation that when nature is unexpectedly kind and produces a bumper crop, farmers find their incomes shrink, and, on the contrary, when nature is unkind and produces a scanty crop, farmers find themselves richer. Thus, in a free-market economy farm income and production tend to fluctuate in opposite directions. Interests of the farmers and those of the society at large seem to be at variance. It is for this reason that governments often feel compelled to intervene in the situation to bring about some measures of stability in agricultural prices and farm incomes.

**Agricultural Stabilisation Programmes**

Agricultural stabilisation programmes have two objectives, namely, (1) to reduce or eliminate price fluctuations and (2) to reduce or eliminate fluctuations in farm incomes. As the discussions will reveal, these objectives are not always consistent.

**1) Stabilisation Programmes through Producers’ Association**

A persual of the diagram 3.6 will show that one method of eliminating fluctuations in prices and farm incomes could be to restrict the supply actually coming to the market to the average level of production inspite of fluctuations in production. This means that in a good year when production is $q_1$, the excess of production over the average level (i.e., $q_0 q_1$) will have to be stored unsold. On the other hand, in a bad year when production is $q_2$, the shortfall below the average level, (i.e. $q_2 q_0$ will have to be made good by sales out of the unsold stocks accumulated in good years. In this way if actual sales could be restricted to the average level of production (i.e., $q_0$) price level could be stabilized at $p_0$ and farm incomes at $q_0 p_0$ inspite of fluctuations in production. However, such a policy can be implemented by some collective agency of farmers such as a producers ‘Cooperative or producers’ Association and not be individual farmers.

**Market Stabilization through Government Sales and Purchases**

In practice market stabilization programmes are undertaken by governments through their sale and purchase operations. For this purpose a government has first to determine the average level of prices which, in its opinion, would prevail if production was always at its average level if there were no fluctuations in production. Having determined the appropriate price level, government buys in the open market at the pre-determined price and adds to its stocks whenever production during any year is above the average level. On the other hand, it sells out of its accumulated stocks at the predetermined price whenever production is below its average level.

However, while this policy succeeds in stabilizing the price level, it will not stabilize farm incomes. The simple reason for this is that once the government undertakes to buy or sell at a certain price, individual farmers are faced with perfectly elastic demand curves. Whatever the output produced, they will be able to sell it at the price fixed by the government. It is at once evident that if price is held constant and farmers sell their total output every year, their incomes will fluctuate in proportion to fluctuations in production as shown in diagram 3.7.

In a bad year when production is $q_2$, farm income would be equal to $q_2 p_2$ (i.e., the area of the rectangle $Qq_2 Aq_2$) but when government also sells $q_2 q_0$ quantity at $p_0$ price; farmers’ income would actually equal $q_2 p_0$ (i.e., the area of rectangle $Qq_2 Hq_0$). In a good year, in the absence of government intervention market price would have fallen to $p_1$ and farmer’s income would have been equal to $p_1$.
× q\textsubscript{1} (i.e., area of rectangle oq\textsubscript{1} Bp\textsubscript{1}) but with government purchases price is maintained at p\textsubscript{0} and farmer’s income equals q\textsubscript{1} × p\textsubscript{0} (i.e., equal to the area of the rectangle oq\textsubscript{1} Cp\textsubscript{0}). Thus, government policy succeeds maintaining the price level but fails to stabilize farm incomes. In the absence of government intervention bumper crops are associated with high incomes and bad crops are associated with high incomes. Thus, stable prices cause farm incomes to vary directly with production and free-market prices cause them to vary inversely with production.

How can a government stabilize farm incomes? You would recall that total outlay on a good remained unchanged when quantity sold varied inversely proportionate to the change in price. This implies that between good and bad years the government should vary the market price in such a manner that total farm income remains constant at the appropriate level, whatever may be amount production during any year.

Such a policy, if successfully implemented, will lead to (1) smaller price fluctuations than if prices were determined by free market forces of supply and demand, (2) stabilization of farm incomes and (3) no financial burden to the government as it will be buying cheap and selling dear. However, the problems with such a scheme arise from uncertainly and political pressure. In the first place, government do not know exactly the average level of production over any period and the appropriate level of farm incomes to be maintained. Very often under pressure from the farmers, governments err in the direction of stabilizing farm incomes at too high a level by fixing prices at a high level. Over a period, such a policy will result in accumulation of unsold stocks which will have to be disposed of by destroying, dumping in foreign market or sold at home at low price. In any case the tax-payer will have to bear the burden of the costs if price is fixed too high. On the other hand, if the government succeed in sticking to the appropriate level of prices and farm incomes, this policy may even be profitable because most of the time government will be buying cheap and selling dear.

**Long-term Problem of Agriculture**

Long-term problem of agriculture is related to changes in productivity and shifts in the pattern of demand resulting from changes in real incomes due to increases in productivity.

Productivity has been steadily increasing over time in all spheres of production. In fact in agriculture it has increased at a rate faster in industry. Increase in productivity causes the supply curve to shift rightward. Increase in productivity also means increase in real incomes. What happens to the pattern of demand when real incomes increase? As already explained above, when people grow richer they tend to spend less than proportionately on farm products, and more than proportionately on non-farm products. As a consequence, the demand curve for farm products shifts less than proportionately to the increase in real incomes. Evidently, a shift of the supply curve (due to increased agricultural productivity) that outstrips the demand curve (due to higher real incomes) inevitably results in a downward trend of prices as shown in the diagram 3.8.

In the diagram 3.8, D\textsubscript{0} and S\textsubscript{0} are respective demand and supply curves relating to an earlier period. Then with the passage of time, due to increase in productivity, the supply curve shifts to S\textsubscript{1}, and then to S\textsubscript{2}. Increase in productivity means a proportionate increase in real income as will Increase in real incomes leads to increase in real demand. However, in case of farm products increase in demand is less than proportionate to the increase in real incomes. Consequently, the shift of the demand curve...
from \( D_0 \) to \( D_1 \), is less than the shift of the supply curve from \( S_0 \) to \( S_1 \). Similarly, the shift of the demand curve from \( D_1 \) to \( D_2 \) is less than the shift of the supply curve from \( S_1 \) to \( S_2 \). \( D_1 \) and \( S_1 \), intersect at B thus determining \( Op_1 \) as the equilibrium price which is lower than \( Op_0 \). \( D_2 \) and \( S_2 \) intersect at C and thus determine \( Op_2 \), as the equilibrium price which is lower than even \( Op_1 \). What needs to be noted carefully is that the shift of the supply curve outstrips the shift of the demand curve and consequently the price falls. Lower farm prices mean lower farm incomes.

The crux of problem is that due to increase in productivity supply of agricultural products increases at a rate faster than the increase in their demand. This is a problem entirely different from the short-term problem of fluctuating farm prices and farm incomes. In the long run farm incomes can be maintained only through the transfer of surplus resources from agriculture to industry and other fields.
TOPIC 2

CONSUMER THEORY
LESSON 4

THEORY OF CONSUMER’S DEMAND

Every consumer has limited income but there is a large number of goods and services that he would like to purchase for his consumption. In quantitative terms one’s income may be small or large but it is never sufficient to purchase all the goods and services that one would like to purchase. Perforce everyone has to make a rational choice of what to have and in what quantities and what not to have. His choice of spending his limited income on different goods and services would be rational when he spends it in such a manner that he gets maximum total satisfaction. The theory of consumer’s demand, therefore, explains the economic principles underlying the allocation of the consumer’s limited income over various goods and services in a manner that leads to the maximization of his total satisfaction. Therefore, you will study the economic principles a rational consumer should follow while spending his limited income over various goods and services so as to maximize his total satisfaction.

There are various alternative approaches to the theory of consumer’s demand out of which, we shall discuss the two alternative approaches - one is known as the “Utility Analysis” and the other as the “Indifference Curve Analysis”. The utility analysis is associated with the name of Alfred Marshall, a British economist and therefore is also known as ‘Marshallian Utility Analysis.’ J.R. Hicks, another British economist propounded “Indifference Curve Analysis”, as alternative to the marshallian utility analysis, to explain the consumer’s behavior. The utilitarian analysis assumes that utility derived by a consumer from the consumption of a commodity can be measured in quantitative terms. But the indifference curve analysis refutes the basic assumption that utility can be measured and explains that quantitative measurability of utility is not necessary to explain the consumer’s behavior.

4.1 MARSHALLIAN UTILITY ANALYSIS

Nobody ever offers to pay a price for something which has no utility for him. I purchase a book because it has utility for me. A vegetarian does not purchase meat simply because it has no utility for him. Price after all involves a sacrifice on the part of a consumer and nobody will sacrifice anything unless he gets some benefit in return.

According to the Marshallian utility analysis, the utility of a commodity for any consumer can be measured by the maximum amount of money he is willing to offer for a unit of the commodity rather than go without it. Suppose, you are willing to offer for an orange only 50 paise and no more, then the utility of that orange for you is worth 50 paise. Suppose for an orange your friend might offer to pay a rupee rather than go without it. The utility of an orange to your friend is worth one rupee. The utility of any good for any consumer can be measured indirectly by the maximum amount of money he is willing to offer for a unit of the good rather than to go without it. This is only an indirect way of measuring utility.
The Law of Diminishing Marginal Utility

As explained above, the utility of the same good may be different to different persons, and may even be different to the same persons in different circumstances. But one important aspect of utility is that at any given time, all the units of commodity that a consumer adds to his stock, do not give equal utility to him. Suppose the first orange that you consume gives you utility worth 50 paise, the second orange will give you utility worth less than 50 paise, and the third one still less and so on. This tendency of the marginal utilities of successive units of a good to diminish, when a consumer adds more to his stock at any given time, is known as the ‘Law of Diminishing Marginal Utility,’ and is considered to be universal true.

The Law of Diminishing Marginal Utility states that as a consumer consumes (acquires) more of a good at any given time, its marginal utility (or what is the same thing - the extra utility added by successive units) tends to diminish. This means that as you consume more oranges at any given time, utility derived from the successive oranges would diminish. Your total utility will not doubt increase but the total utility will increase at a diminishing rate. Let us examine the important law with the help of a simple example. Imagine a man is consuming oranges one by one and telling you exactly how much utility he gets form each orange. Table 4.1 below records his statement about the utility of each orange separately as he consumes 6 oranges, one by one:

<table>
<thead>
<tr>
<th>No. of Oranges</th>
<th>Marginal Utility</th>
<th>Total Utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2nd</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>3rd</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>4th</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>5th</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>6th</td>
<td>(–)1</td>
<td>(–)9</td>
</tr>
</tbody>
</table>

Marginal utility means the utility of an “additional” unit. The first orange is the marginal orange and the utility from the first orange is the marginal utility. The second orange is the marginal orange and the utility from it is the marginal utility. “Marginal” is not fixed, it is moving. As all the units are identical, every unit consumed should be considered as the marginal unit and the satisfaction from that unit should be termed as marginal utility. It is clear from Table 4.1 that marginal utility of oranges to a consumer is going down. Marginal utility can decline to zero and can even become negative. Negative utility means that the consumer does not anticipate positive satisfaction but hopes to get only negative satisfaction.

Total utility is the utility derived from the consumption of all the units. It is the sum of marginal utilities.

The table 4.1 shows that the total utility goes on increasing, but at a decreasing rate, so long as the marginal utility is positive. When marginal utility becomes negative, the total utility also starts diminishing. Total utility is maximum when the marginal utility is zero. The same phenomenon can be shown with the help of the diagram 4.1.

In the diagram 4.1 the quantity of oranges are measured along the X-axis and utility along the Y-axis. The marginal utility curve (MU) has a downward or negative slope additional units of oranges.
give the consumer less and less utility. The consumer hopes to get only zero utility at point N from the fifth orange and negative utility from the sixth orange. The marginal utility curve declines and cuts through the X-axis at N. The total utility curve (TU), on the other hand, slopes upwards to the right to indicate that total utility increases with the consumption of additional units up to point L. The rate of increase in total utility is not constant but declines steadily. The total utility curve reaches a maximum point at L and then declines.

The relationship between marginal utility and total utility can be summarized as follows:

(i) When marginal utility declines but is positive. Total utility increases but at diminishing rate.
(ii) When marginal utility reaches zero. Total utility has reached maximum; and
(iii) When marginal utility becomes negative: total utility declines from the maximum point

This, in substance, is the famous law of diminishing marginal utility. This law is based on the following assumptions:

(i) different units of a commodity are homogeneous or identical in all respects i.e., in size, quality, taste etc.;
(ii) there is no time interval between the consumption of two units of a commodity i.e., consumption of the different units of a commodity should be continuous;
(iii) tastes, fashions etc., of the consumer remain the same.

Exceptions to the Law of Diminishing Marginal Utility

The law of diminishing marginal utility is a basic law and is applicable to all people and all things. Really speaking, there are no exceptions to this law. Some, however, have spoken, of a few exceptions, as given below:-

(i) The law, according to them, does not apply to money. It is argued that the more money one has, the greater will be the desire to acquire still more money. This exception is sought to
be proved with reference to misers who are supposed to have unlimited desire to accumulate and hoard money. It is however, wrong to argue that the utility of the first rupee is the same as that of the hundredth rupee. If a person has only one rupee, he will be very careful while spending it. But if he has one hundred rupees he may not exercise any care while spending one rupee out of the 100 rupees. It means that the marginal utility of the hundredth rupee is less than the marginal utility of the first rupee. Even the miser has to spend some money on food and other items of necessity and not on acquiring additional wealth. This indicates that the utility of food and other items to the miser is greater than that of money which he spends to buy them.

(ii) It is argued that, in the case of liquor, the more a person drinks, the more he likes to have additional quantity of liquor. In other words, it is argued that the marginal utility of liquor is said to be rising and not falling. This is clearly wrong. Even for a drunkard, marginal utility of liquor will diminish and will be negative eventually. Had it not been so a drunkard would have continued to drink and get more utility; instead he does stop after a certain stage.

(iii) Another exception relates to hobbies such as collection of rare stamps and coins, pictures by famous artists etc. It is argued that the more stamps one collects, the greater is the desire to collect still more. People spend large amount of money to secure a rare stamp or a famous picture. Apparently, the law of diminishing marginal utility does not apply to hobbies pursued by some people. This however, is not correct. A stamp collector does not actually spend increasing amounts of money in acquiring one more stamp of the variety he already has. Rather, he is willing to spend large amount of money to add a new and rare stamp to his collection. When a collector acquires additional stamps of the same variety, the marginal utility from his additional collection will definitely diminish. In other words, the law of diminishing utility will apply to hobbies too.

In fact there are no real exceptions to the law of diminishing marginal utility. The marginal utility which a consumer gets from the additional units of a commodity eventually keeps on diminishing. Therefore, it is said to be universally true.

The law of Demand and the Law of Diminishing Marginal Utility

(Derivation of Demand Curve)

The law of diminishing marginal utility is the basis of law of demand which explains the inverse relationship between price and quantity of a commodity. According to the principle of diminishing marginal utility, a person gets less and less utility from additional units of a commodity, naturally he is prepared to buy more units only at a lower price. We can express the same idea in another way also. Marginal utility of a commodity diminishes as a person has more of it; accordingly and therefore, an additional unit will not be demanded unless it is available at a lower price. The marginal utility curve has a negative slope and therefore, the demand curve based on marginal utility curve also has a negative slope. Marshal goes one step further. He measures the marginal utility of a commodity in terms of money which a person is willing to pay; naturally, the marginal utility curve itself becomes the demand curve. This is explained in Table 4.2 and diagram 4.2.
TABLE 4.2
Marginal Utility Schedule for Oranges
(in money)

<table>
<thead>
<tr>
<th>No. of Oranges</th>
<th>Marginal Utility (Rs.)</th>
<th>Price the consumer is willing to pay (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st orange</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2nd orange</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>3rd orange</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>4th orange</td>
<td>0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>5th orange</td>
<td>0.30</td>
<td>0.30</td>
</tr>
</tbody>
</table>

The above table shows that the marginal utility of every additional orange is declining and therefore, the consumer will be prepared to buy additional units of oranges only if the price of orange declines in the market. In other words, a consumer buys more of a commodity if its price falls in the market. When we represent this table on a diagram we can get the diagram 4.2. DD is the marginal utility curve. If we represent price instead of marginal utility on Y-axis, DD curve can be called demand curve of the commodity.

Therefore, the downward sloping curve can be taken as marginal utility curve for oranges; it is also the demand curve for oranges.

Marshall derives the demand curve form the law of diminishing marginal utility on the basis of the following three basic assumptions:

(i) The utility of a commodity is measurable quantitatively: The assumption is basic to the law of diminishing marginal utility. We assume that utility can be calculated by adding marginal utilities; and that marginal utility of unit can be found out through subtraction - as for example the marginal utility of the 5th unit of a commodity is equal to total utility for 5 units minus total utility for 4 units.

(ii) The utility of money remains constant: The utility of a commodity is measured by Marshall in terms of money which is the measuring rod used in economics analysis. Like every measuring rod, money should have constant value. For instance, in table 4.2 we have said that the consumer gets or hopes to get utility worth of one rupee form the first orange and, therefore, he is willing to pay Rs.1 for it. He hopes to get from the second orange utility worth of 75 paise and, therefore, he is willing to pay 75 paise to buy it. In all these cases money measures utility, and as such it must have constant value or utility to the consumer. This assumption implies that whatever be the volume of money with the consumer, its value or marginal utility will remain the same to him. In practice, however, money like any other commodity is also subject to the law of diminishing marginal utility.

(iii) Each commodity is an independent commodity: Marshall assumes away the interrelationship between goods and considers each commodity as an independent commodity and studies demand for it accordingly. In practice, this is not proper. Most of the commodities are related to each other either as substitutes or complements and therefore, the demand for one commodity will depend upon the price and availability of other related commodities. We can not properly study the demand for potatoes in isolation, without relating it to the demand for other vegetables in the market.

Given all these assumptions, the law of diminishing utility is the basis for deriving the law of demand in Marshallian demand theory.
Law of Equi-Marginal Utility and Consumer’s Equilibrium

In economic analysis, we assume that every consumer is rational and he spends his income in a rational manner with the object of maximizing his satisfaction.

The income of every consumer is limited but the goods and services that he would like to have for consumption are numerous. Income is limited in the sense that it is impossible for my consumer to purchase, with his given income, all the goods and services he would like to purchase. In quantitative terms a person’s income may be less or more, but it is always insufficient for his innumerable wants. It is, in these circumstances of limited income and numerous wants, that a consumer is forced to choose between different goods and services rationally. Every consumer spends his limited income over various goods and services in such a way that he gets the maximum possible satisfaction in the given circumstances. Within the given conditions of his limited income, his tastes and the given market prices of different goods and services, when a consumer has selected that bundle of different goods and services which gives him the maximum possible satisfaction, we say that the consumer is in equilibrium. The notion of equilibrium simply emphasizes’s the fact that any deviation from this position would make the consumer worse off, in terms of total satisfaction and certainly not better off. It means that he would be best off in equilibrium. Law of equi-marginal utility states that consumer will reach the stage of equilibrium, i.e., maximum total satisfaction when the marginal utilities of the various commodities that he consumes are equal.

At any given time a number of commodities complete for the limited income of the consumers. In terms of utilities, different goods offer different opportunities for him. For each rupee of his income the consumer always selects the best of the available opportunities. When each rupee of a consumer’s income has been spent in its best available use, his total satisfaction (or utility) is maximized and the consumer is said to be in equilibrium. In order to elaborate this point let us take an example. Suppose the daily income of a consumer is Rs. 15 and with this income he wants to purchase his daily supplies of goods X, Y and Z, all of which sell at Rs. 1 per unit. Table 4.3 given below gives the marginal utility schedules of the three goods in question.

<table>
<thead>
<tr>
<th>Unit of Goods</th>
<th>Marginal Utility Schedule of X (MUx)</th>
<th>Marginal Utility Schedule of Y (MUy)</th>
<th>Marginal Utility Schedule of Z (MUz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18 (1)</td>
<td>10 (5)</td>
<td>9 (7)</td>
</tr>
<tr>
<td>2</td>
<td>16 (2)</td>
<td>9 (6)</td>
<td>7 (11)</td>
</tr>
<tr>
<td>3</td>
<td>14 (3)</td>
<td>8 (9)</td>
<td>5 (15)</td>
</tr>
<tr>
<td>4</td>
<td>12 (4)</td>
<td>7 (10)</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>8 (8)</td>
<td>6 (12)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5 (13)</td>
<td>5 (14)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

The marginal utilities of different units of the three goods offer the different opportunities of spending his money to the consumer. In order to maximize his total satisfaction the consumer will look for the best available opportunity for each rupee of his income. The three goods offer three different opportunities in terms of utility for the first rupee of his income. The consumer can spend his first rupee on any of the three goods. If he spends the first rupee on X, then he will obtain 18 units of utility; if he spends it on Y, then he will get 10 units of utility; and if he spends it on Z, then he will get only 9 units.
of utility. Out of these three alternative opportunities for his first rupee, which one do you think he will choose? Naturally, he will choose to spend his first rupee on X and not on Y or Z. If you examine the marginal utility schedules of the three goods carefully, you will find that for the first four rupees the best opportunities of spending are offered by the first four units of X which give him 18, 16, 14 and 12 units of utilities. Having spent first four rupees on the first four best opportunities, the next best opportunity is offered by the first unit Y, which offers 10 units of utility for the fifth rupee of the consumer. According to the next available opportunities, the consumer will spend sixth rupee on the second unit of Y or seventh rupee on the first unit of Z. In this way the consumer proceeds step by step and spends each rupee of his income to its best available use. If a rupee spent on Y gives him greater utility than a rupee worth of X or Z, the consumer will spend his rupee on Y and so on. One by one the consumer exhausts all the best available opportunities and ultimately ends up in a situation where the last rupee brings the same utility i.e., 6, whether spent on X or Y or Z. If the last rupee brings in the same increment of utility, when spent on any good, total utility for a given income is maximized and we say that the consumer is in equilibrium. In the example given above, the consumer will spend his income (Rs. 15) on the purchase of 6 units of X, 6 units of Y and 3 units of Z. If we add the marginal utilities which the consumer gets from the 6 units of X, 6 units of Y and 3 units of Z, he will get the maximum total utility, i.e., 139 as follows:

Total utility from X = 18 + 16 + 14 + 12 + 8 + 5 = 73
Total utility from Y = 10 + 9 + 8 + 7 + 6 + 5 = 45
Total utility from Z = 9 + 7 + 5 = 21
Total utility from X, Y and Z = 139

If the consumer spends his income on any other combination of X, Y and Z, his total utility will be less than 139. Suppose he spends his income on the purchase of 7 units of X, 5 units of Y and 3 units of Z. In this case, his total utility will be 76 + 40 + 21 = 137, which is less than the maximum he can obtain. Therefore, the fundamental equilibrium condition that has to be satisfied if a consumer is to be best off in terms of total utility, would be that he gets the same marginal utility for his last rupee when spent on any good. In the above example, the last rupee brings in 5 units of utility, whether spent on X, Y or Z. In other words, the consumer will be in equilibrium if

\[ \frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z} \]

where \( MU_x, MU_y \) and \( MU_z \) are the marginal utilities of X, Y and Z commodities.

In the above example we have assumed the same price i.e., Rs. 1 per unit of the three goods. But in the real world different goods have different prices. However this does not affect our conclusion at all. By dividing the marginal utilities of the different goods by their respective prices, we find out ratios of marginal utilities to respective prices. These ratios of marginal utilities to prices are nothing but marginal utilities per rupee when spent on different goods. If we substitute \( MU_x, MU_y \) and \( MU_z \) for marginal utilities of the goods X, Y, Z respectively and \( P_x, P_y \) and \( P_z \) for their respective prices, then the equilibrium condition can be expressed either by the equality of

\[ \frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \frac{MU_z}{P_z} \]

or by the equality of marginal utility per rupee when spent on X, Y and Z.

**Limitations of the Law of Equi-marginal Utility**

The law of equi-marginal utility is an important principle since it guides consumers how to spend their limited income on different goods so that they can get maximum satisfaction. But in practice, consumers may find it difficult to apply this principle. First of all, it is really difficult for consumers to know
the marginal utilities of different goods. Secondly, consumer are normally ignorant and cannot compare
the marginal utilities of different goods. In other words, they may not know which goods give them
greater satisfaction and which less. Thirdly, most consumers acquire certain habits—as for example, smoking
beedies and cigarettes or drinking liquor. In such cases, they will buy and consume these goods even
though they know that they can buy better goods and get more utility. Many a time, a worker will spend
his daily wages on liquor though his wife and children may be starving. He knows food is more essential
for his family but buys liquor instead, because he has become a victim of his habit.

Thus for various reasons, a consumer may find it difficult to spend his income according to the
law of equi-marginal utility.

Weaknesses of the Utilitarian Analysis

1. *Utility cannot be measured:* The utilitarian approach to the theory of demand is based on the
   assumption that utility can be measured in quantitative terms. In order to determine the quantities
   of goods which an individual will buy at given prices, this theory implies that we must first
   know how much utility a consumer gets from each unit of different goods. But there exists
   no scientific method for measuring utility. Utility has been defined as the quality which makes
   commodities desirables to consumers. Utility is not an inherent or intrinsic quality of goods.
   It is purely a subjective phenomenon which depends upon the psychological ability of a person
   to appreciate a good. Such a purely subjective phenomenon, as the concept of utility is, cannot
   be measured in quantities. Utility actually is not a quantity but only an index of one’s scales
   of preferences. As utility cannot be measured, the utilitarian explanation of theory of demand
   is arbitrary.

2. *Assumption of independent utilities is not valid:* According to the law of diminishing marginal
   utility, marginal utility and hence total utility from a good, depends upon the stock of the good
   in question alone and not at all on the stocks of other goods. This means that the total utility
   that a consumer gets form oranges depends upon the total stock of oranges alone and not on
   the stock of any other good. The law of diminishing marginal utility assumes that the utility
   from the stock of a good is completely independent of the stocks of other goods. But this
   assumption of independent utility on which the law of diminishing marginal utility is based,
   is true only in the case of completely independent goods. Most of the goods are related to
   each other either as substitutes or as complements. Tea and coffee are also substitutes (rival
   in consumption) whereas, car and petrol are complements in the sense that one is useless without
   the other. If you increase consumption of tea, marginal utility of tea for you will diminish but
   with this the marginal utility of coffee too will diminish, without there being any change in
   its stock or consumption. On the other hand, if you own two cars in place of one, and if your
   stock of petrol remains unchanged, the marginal utility of the second car will no doubt be less
   than that of the first car, but without there being any change in your stock of petrol, the marginal
   utility petrol will increase. Thus in the case of related goods their marginal utilities increase
   or decrease, not because of any change in their stock alone but also because of changes in
   the stock of the other related goods. This is a very serious criticism against the law of diminishing
   marginal utility. The utilitarian approach to the theory of consumer’s demand, which derives
   its logical strength form the law of diminishing marginal utility, thus suffers from this weakness.

3. *Marginal utility of money is assumed constant:* The utilitarian approach also assumes that the
   marginal utility of money is constant. What is meant by the marginal utility of money being
   constant? Constant marginal utility of money implies that the law of diminishing marginal utility
   does not apply to one’s stock of money (income). One’s stock of money is one’s income. This
   means that one’s stock of money (income) increases or decreases, the marginal utility of money
   remains unchanged. If marginal utility of money remains constant, this would mean that a
consumer’s demand for goods is completely independent of changes in his income. A fall in the price of one of the two goods X and Y, disturbs the equality between \( \frac{MU_x}{P_x} \) and \( \frac{MU_y}{P_y} \) ratios by making \( \frac{MU_x}{P_x} \) greater than \( \frac{MU_y}{P_y} \). Equilibrium is resorted by reducing \( MU_x \) (by increasing the stock of X) to the extent that the new \( \frac{MU_x}{P_x} \) ratio once again becomes equal to \( \frac{MU_y}{P_y} \), but if marginal utility of money remains constant, even when money stock (income) increases or decreases, the equilibrium condition will not be disturbed because nothing happens either to the utility of the good or the utility of money and therefore, more of no good will be demanded. From this it follows that one’s demand for goods is responsive to price changes but not to income changes. On the very face of it, this is a very absurd conclusion. You know it well that an important factor determining one’s demand for goods is one’s income. Higher the income, other things remaining constant, larger will be demand for most of the goods (except in case of inferior goods).

### 4.2 Indifference Curve Analysis

The indifference curve analysis of demand was originally propounded by Slutsky but later on was scientifically developed and popularized by J.R. Hicks. The analysis was developed as an alternative to the utility analysis of consumer’s demand. The basic defect of the utility analysis is that it is based on the cardinal number system which assumes that the utility of a commodity is measurable in quantitative terms. Utility of a commodity can be added and subtracted and can be measured in terms of money. We have told you earlier that utility, being a subjective phenomenon cannot be measured quantitatively. Therefore, Hicks developed an alternative approach, known as ‘Indifference Curve Analysis’, which can explain the consumer’s behaviour without measuring the utility which a consumer gets from the consumption of a commodity. Indifference curve analysis is based on the ordinal number system, in which we do not measure the utility in quantitative terms. It assumes that a consumer can express clearly his scale of preferences for any two or more goods. In other words, a consumer, without measuring the satisfaction, can say whether the various combinations of two commodities, say X and Y, give him more or less or equal satisfaction as compared to other combinations. The combinations giving him more satisfaction will rank higher in his order of preferences and he will be indifferent among those combinations which give him equal satisfaction. Let us take an example. Suppose there are two commodities X and Y and the consumer knows that the different combinations A, B, C, D, and E of two commodities X and Y, as given below in table 4.9, give him same satisfaction. Since the consumer is getting the same satisfaction from each of the combinations, he will be indifferent in choosing any of them. He can choose the 1st of these five combinations, i.e., 1 unit of X and 25 units of Y or the 4th combination i.e., 4 units of X and 13 units of Y or any other combination, i.e., 2nd or 3rd or 5th combination of X and Y gives commodities, because each combination of X and Y equal satisfaction. The consumer simply says that each of these five combinations of X and Y gives him the same satisfaction, but he does not say how much satisfaction he gets from each of the combinations. If we plot these various combinations of X and Y on a diagram, as shown in diagram 4.3, we will get a curve which is known as indifference curve.

<table>
<thead>
<tr>
<th>Combination</th>
<th>Commodity X (Units)</th>
<th>Commodity Y (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st (A)</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>2nd (B)</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3rd (C)</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>4th (D)</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>5th (E)</td>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>

**TABLE 4.4**

Indifference Schedule
We represent commodity X on horizontal axis and Y on the vertical axis. Five different combinations, as given in table 4.4 are represented by points A, B, C, D and E on the diagram and by joining these points, we get a curve which is known as an indifference curve. All these combinations are alike to him as each gives him same satisfaction and therefore, the consumer will have no reason to prefer one combination to any other. In other words, the consumer is indifferent in choosing any of these combinations. An indifference curve may, therefore, be defined as the diagrammatic representation of all combinations (or collections) of the two commodities which give equal satisfaction to a consumer or among which the consumer is indifferent and has no reason for preferring one combination to any other combination.

Assumption of the Indifference Curve Analysis

Indifference curve analysis is based on the following assumptions:

1. **Rationality**: The consumer is assumed to be rational. Given his income and prices of the commodities, he aims at maximization of his satisfaction. He has full knowledge of the various combinations of two commodities which give him more or less or equal satisfaction i.e., he fully knows his scale preferences.

2. **Independence of Scale of preferences**: A consumer’s scale of preference is independent of his income and the prices of the commodities and other consumers.

3. **Consistency or Transitivity of Choice**: The consumer is consistent in his choice. For instance, if he chooses commodities A over B, he will not choose B over A at any other time. Similarly, if combination A is preferred to B and B is preferred to C then A is a preferred to C.

4. **The Principle of diminishing marginal rate of substitution**: Marginal Rate of Substitution (MRS) is the rate at which a consumer can exchange a small amount of one commodity for a very small amount of another commodity without affecting his total satisfaction. In other words, MRS of X for Y (MRS\text{xy}) will be the quantity of Y which will just compensate the consumer for the loss of marginal unit of X, MRS\text{xy} can be expressed as the ratio between the change in commodity X (\Delta X) and change in the commodity, Y(\Delta Y) without affection the consumer’s level of satisfaction. It can be expressed as MRS\text{xy} = \Delta y/\Delta x. In the example given in table 4.5, as we move form the first combination to the second, we find that the consumer adds one unit of X and gives up some units of Y, but gets the same satisfaction. Between the first and second combination –1 unit of X substitutes 5 units of Y; between the second and third combinations –1 unit of X substitutes 4 units of Y and so on. This is given in the table 4.5.
Marginal Rate of Substitution

<table>
<thead>
<tr>
<th>Commodity X (Units)</th>
<th>Commodity Y (Units)</th>
<th>Marginal Rate of Substitution of X for Y (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>IX = 5Y</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>IX = 4Y</td>
</tr>
<tr>
<td>3</td>
<td>16</td>
<td>IX = 3Y</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>IX = 2Y</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

We find that the consumer substitutes X for Y but continues to get the same satisfaction. But for every increase of 1 unit of X, the consumer gives up lesser and lesser quantity of Y. Therefore, this is called the law of diminishing marginal rate of substitution. This follows from the law of diminishing marginal utility. As the consumer is substituting more and more of X for Y, the marginal utility which he gets from the additional units for X is declining and therefore he will be prepared to forego lesser amount of Y in exchange for X. The 3rd unit of X and therefore, the consumer less satisfaction as compared to what he has got from the 2nd unit of X and therefore, the consumer will be prepared to forego lesser amount of Y (4 units) to obtain 3rd units of X, as compared to what he was prepared to forego (5 units of Y) to obtain 2nd unit of X. The indifference curve analysis is based on the assumption of the operation of the law of diminishing marginal rate of substitution.

Properties of Indifference Curves

We can recognize indifference curves form their features (or characteristics or properties). Generally they have three properties-

(i) They always slope downward form left to right;

(ii) They are generally convex to the point of the origin of the two axes; and

(iii) They never intersect or touch each other.

(i) *Indifference Curves always slope downward form left to right*: Li other words, indifference curves are negatively sloped. Every indifference curve is based on the based on the assumption that the various combinations of two commodities give equal satisfactions to a consumer. In order to remain at the same level of satisfaction, the consumer will have to reduce the consumption of one commodity if he wants to increase the consumption of another commodity. In the example given earlier, if the consumer adds second unit of X he will have to give up some units of Y. If he adds second unit of X without giving up some units of Y, he will have more satisfaction, which is inconsistent with the assumption of indifference curve. In terms of a diagram, this means that a indifference curve will slope downward form left to right. This is explained in the diagram 4.4.
In the diagram 4.4, as the consumer increases the consumption of X from 1 units to 2 units, he has to reduce the consumption of Y from 25 units to 20 units, so that he remains at the same level of satisfaction.

An indifference curve can not be of any other shape, except that of the downward sloping form left to right.

(i) An upward sloping demand curve, as shown in the figure 4.5 (I) is impossible as it implies that more units of both the commodities represent the same level of satisfaction. In the figure, combination B consists of $2x + 10y$ i.e. more of both the commodities X and Y, as compared to combination A ($1x$ and $5y$). Therefore combination-B will give more satisfaction as compared to the combination A.

(ii) Similarly, horizontal or vertical indifference curve, as shown in the diagram 4.5 (II) and 4.5 (III), is also an impossibility since difference combinations with more of one commodity and the same quantity of another commodity can not yield the same level of satisfaction to the consumer. In the diagram 4.5 (II), The combination – B ($2x + 10y$), consists of more of X and same amount of Y, as compared to combination – A ($1x + 10y$), and therefore, the consumer will have more satisfaction from B as compared to A. Likewise, in the diagram 4.5 (III), combination B ($2x + 10Y$) consists of more of Y and same amount of X, as compared to combination A($2x + 5y$), and therefore, the consumer will have more satisfaction from B as compared to A.

From the above, it follows that an indifference curve can never be upward sloping or horizontal or vertical. It will always slope downward from left to right, because it is based on the assumption that the various points on an indifference curve, showing different amounts of two commodities give the same level of satisfaction to the consumer.

(ii) Indifference Curves generally are Convex to the point of origin of the two axes: An indifference curve is relatively steep at first, but becomes flatter as it extends to the right. In other words, an indifference curve is convex to the point of origin of the two axis as shown in diagram 4.6. In the diagram O is the point of origin of two axis
- OX and OY and the indifference curve IC is convex towards the point O. The convex slope of the indifference curve means that as we move on it from left to right, its slope diminishes. This is because of the operation of the principle of diminishing marginal rate of substitution about which you have already studied in detail. In the Table 4.6, as the consumer adds more of one commodity – X, he will be prepared to forego lesser and lesser amount of the other commodity – Y, for each successive unit of Y. In other words, the marginal rate of substitution of X for Y (MRS\(_{xy} = Δy/Δx\)) keeps on declining. Since an indifference curve is based on the diminishing marginal rate of substitution, it is of convex shape.

Indifference curve can never be concave, as given in diagram 4.7, because such curves represent increasing marginal rate of substitution. In diagram 4.7 we find that AA\(_1\) = A\(_1\)A\(_2\) = A\(_2\)A\(_3\) but BB\(_1\) < B\(_1\)B\(_2\) < B\(_2\)B\(_3\). This is an example of increasing marginal rate of substitution. It shows that with increasing amount of X, the consumer is willing to give up more and still more units of Y. This is possible only if we assume that (a) marginal utility of X increases when the consumer has more of it; and that (b) marginal utility of Y decreases as he has less of it. This is clearly absurd. A concave indifference curve therefore is an impossibility.

The indifference curves are generally convex to the point of origin. But there are two exceptions (a) If the two commodities are perfect substitutes of each other, the marginal rate of substitution between these two commodities will be constant. In this case, the indifference curve will be a straight line making a 45° degree angle on the X and Y axis, as shown in the diagram 4.8. It shows that for one unit of X, the consumer is prepared to give one unit of Y, (b) If the two commodities are perfect complements of each other, as for example gasoline and a car, the indifference curve will consist of two straight lines with a right angle bent which is convex to origin, as shown in figure 4.9. Perfect complementary goods are those goods, which are used by the consumer in a certain fixed ratio. They can not be substituted for each other and therefore, the marginal rate of substitution between them will be zero.

However, perfect substitutes and perfect complementary goods are normally not found in practical life. They indicate more an imaginary situations, that the real one. Therefore, we may say that the indifference curves are generally convex to the origin.
(iii) **Indifference Curves never intersect each other**: Each in difference curve represents only one level of satisfaction. Different indifference curves represent different levels of satisfaction. One satisfaction level may be higher or lower than the other, but cannot be higher and lower as well as equal to the other at the same time. This is clearly absurd but this is what happens when two indifference curves intersect each other. Let us assume that two indifference curves intersect each other at A as shown in diagram 4.10 below:

In diagram 4.10 we have given two intersection indifference curves IC₁ and IC₂. On IC₁ we have taken two combinations represented by A and B – both represent the same level of satisfaction because both of these combinations are on the same indifference curve IC₁. On IC₂ we have taken two combinations again viz. A and C, both of which represent the same level of satisfaction as these are on the same indifference curve IC₂. Now we find that A = B and A – C; and therefore B = C. This is absurd as both represent different combinations of two commodities X and Y. B shows 4 units of X and 13 units of Y whereas C shows 4 units of X and 9 units of Y. Since B shows the same amount of X but more of Y as compared to C combination, therefore, the consumer will get more satisfaction from B combination as compared to C combination. Obviously two indifference curves representing two different levels of satisfaction can never intersect or touch each other.

**Consumer’s Equilibrium through Indifference Curve Analysis**

When the consumer spends his income on different goods in such a way that he gets maximum satisfaction, he is said to have reached equilibrium position. According to the Marshallian utility analysis which was discussed earlier, a consumer reaches equilibrium position when the ratios of the marginal utilities of different commodities to their respective prices are equal. We shall now discuss how we can find out consumer’s equilibrium with the help of indifference curves analysis.

In order to explain the equilibrium of a consumer with the help of indifference curve analysis, we require the following data:

(a) Consumer’s different scales of preferences for the two goods, each scale is being represented by one indifference curve.

(b) The income of the consumer. It is assumed that he spends his income fully on both the goods and does not save anything.

(c) The prices of the two commodities are given in the market. It is assumed that the prices remain constant.

In other words, we must know scales of preference (which is also called an indifference map) and the price line of the consumer.

(i) **Scale of Preferences of the Consumer or Indifference Map**

There are various combinations of two commodities which give equal, more or less satisfaction to a consumer. The combination giving him more satisfaction will rank higher in his order of preference than the combinations giving him lower satisfaction. And if certain combination give him the same satisfaction all such combinations will find the same place in his order of preference. Proceeding in this way, we can thus arrange various combinations of the goods in order of a consumer’s preferences - combinations giving more satisfaction finding accordingly higher places, combinations giving lower satisfaction finding accordingly lower places and all combinations giving the same satisfaction finding...
the same place in his order to preferences. This kind of arrangement (in terms of higher, lower and equal levels of satisfaction) of all possible combinations of two goods constitutes what economists call a consumer’s scale of preferences or an indifference map. A consumer’s scale of preferences is a sort of map which shows how different combinations of various goods are arranged by him in order of higher, lower and equal levels of satisfaction.

In the Table 4.4 we took the example of 5 combinations of commodities X and Y, i.e. 1X + 25Y, 2X + 20Y, 3X + 16Y, 4X + 13Y, and 5X + 11Y, each of which give equal satisfaction to the consumer and therefore, the consumer is indifferent in choosing any one of them. On the basis of these combinations, we had drawn indifference curve in the diagram 4.3. All points on this indifference curve, showing different combinations of two commodities X and Y which yield equal satisfaction to the consumer. There may be many other combinations of two commodities X and Y which may give more or less satisfaction to the consumer as compared to the 5 combinations given above. Different combinations of X and Y, which give different levels of satisfaction to the consumer can not be shown by one indifference curve, but for this we have to draw different indifferent curves. In order to explain it, we take a simple as given in Table 4.6.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th></th>
<th>B</th>
<th></th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Indifference Curve I</td>
<td>Indifference Curve II</td>
<td>Indifference Curve III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Y</td>
<td>X</td>
<td>Y</td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>1</td>
<td>18</td>
<td>1</td>
<td>25</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>13</td>
<td>2</td>
<td>16</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
<td>3</td>
<td>16</td>
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<td>20</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>4</td>
<td>13</td>
<td>4</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

When the various combinations given in the table are shown on a diagram, we can draw three indifference curves I, II, III, as given in the diagram 4.11. Any combination of X and Y given in the column (A) gives equal satisfaction to the consumer and therefore, can be shown by one indifference curve I. Similarly, any combination given in column (B) gives equal satisfaction to the consumer and therefore, can be shown the indifference curve II. The indifference curve III shows the combinations given in the column (C). Any combination given in the column (B) gives more satisfaction to the consumer as compared to any combination of X and Y given in the column (A), and therefore, the indifference curve II is higher than the indifference curve I. Similarly, any combination of X and Y given in the column (C) still gives higher satisfaction as compared to any combination given in columns (B), and therefore the indifference curve III is higher than the indifference curve II. Thus while one indifference curve shows one level of satisfaction different indifference curves show different levels.
of satisfaction. A higher indifference curve will show greater satisfaction as compared to the lower indifference curve. In the diagram 4.11 we have drawn only three indifference curves, I, II, III, on the basis of the different combinations of X and Y given in the table 4.6. There may be many more combinations of X and Y which can be shown by drawing different indifference curves. The diagrammatical representations of all possible indifference curves relevant to a consumer is called his scale of preference or his indifference map. Every consumer has his own indifference map, showing his tastes and preferences between the different combinations of two commodities. So long his tastes and preferences remain unchanged, his indifference map will be the same. If the consumer’s tastes and preferences undergo a change, then and indifference map corresponding to new tastes and preferences will have to be drawn.

(ii) Budget Line or Price Line

We have explained that a higher indifference curve shows a higher level of satisfaction than a lower one. Since the objective of the consumer is to have maximum satisfaction, he will try to reach the highest possible indifference curve. But while a consumer tries to have a combination of two goods which gives him maximum satisfaction, but he is to work under two limitations: firstly he has to pay the prices of the goods and secondly, he has a limited money income. Therefore, how much a consumer can purchase, depends upon the prices of the goods and his money income.

On the basis of his given money income and given market prices of goods, we can draw a line on a diagram which is called the price line or budget line showing the limit upto which a consumer can reach. Suppose a consumer gets Rs 20. per week. He wants to spend this income on the purchase of rice and wheat which he needs. Suppose the market prices of rice and wheat are Rs.2 and Rs. 1 per kg. Respectively. If he spends his total income, i.e., Rs.20 on the purchase of wheat he can buy 20 kgs. of wheat and if he spends his -total income on the purchase of rice, he can buy 10 kgs. of rice. With this information his budget line equation can be given on

\[ 20 = P_x X + P_y Y \]

Symbolically \( M = P_x X + P_y Y \)

Where \( M = \text{income}, \ P_x = \text{Price of} \ X, \ X \text{being wheat} \)

\( P_y = \text{Price of} \ Y, \ Y \text{being Rice} \)

Let us draw a diagram.

In the diagram 4.12 wheat is measured along the X-axis and rice along the Y-axis. If the consumer spends all his money income (i.e., Rs.20) on wheat alone, he can purchase 20 kgs. Or OB amount of wheat and if he chooses to spend his entire income on rice, then he can purchase 10 kgs. or OA amount of rice. We join points A and B. The slope of the line AB shows the market rate of exchange between rice and wheat or wheat for rice. Such a line is usually referred to as the price line or the budget line relevant for a consumer with given money income and given prices of goods. The price line or the income line may be defined as the line which shows all the possible combinations of two goods which a consumer with a given money income can choose from, at the given prices. The slope of price line (OA/OB) is equal to the ratio of the prices of two commodities (prices of X/price of Y). A price line is drawn of the basis of the given money income of the consumer and the price of the commodities. Therefore, a change in the consumer’s income or the price/ prices of the commodities will cause a change in the price line. Suppose the prices of the gods remain constant but the money income of the consumer increases, the
price line will shift upward to the right parallel to itself and if the consumer’s money income declines, the price line will shift downward to the left parallel to it. This is shown in the diagram 4.13:

When the money income of the consumer increases from Rs.20 per week to say Rs.24, the price line AB moves upward parallel to itself and takes the position represented by the line A1B1. Similarly A2B2 and A3B3 represent the price or the budget lines relevant to the consumer when his money income is Rs.28 and Rs.32 per week. If the consumer’s income declines to, say, Rs.16 per week, the price line AB moved downward to the left parallel to itself and takes the position represented by line A4B4.

If the money income of the consumer remains constant, but there is a change in the price of a commodity, it will result into a change in the price line of the consumer, as is explained in the diagram 4.14. Suppose the price of wheat falls from Rs.1 per kg. to 0.50 paise per kg. When the price of wheat was Rs.1 per kg. The consumer with the given income of Rs.20 could buy OB amount of wheat (i.e., 20 kgs. of wheat) if he decided to spend the entire income on the purchase of wheat. But when the price falls to 0.50 paise per kg., the consumer with the same income can buy OB1 amount of wheat (i.e., 40 kgs. Of wheat). Therefore his price line will shift to right to become AB1. On the contrary, if the price of wheat rises from Rs.1 per kg. to Rs.1.25 per kg. He can buy a maximum amount of 16 kgs. Of wheat i.e. OB2 amount of wheat. Therefore the price will shift to the left and becomes AB2.

The function of the price line or the income line is to show the area of choice open of the consumer. Let us take diagram 4.12. The consumer will not like to choose a point say R, below the price line because any such combination of the two goods, represented by any point below the price line will
not exhaust his entire money income. Some of his money income will remain unspent in that case. The consumer cannot choose any point say T, which is to the right of the price line because he has not enough money to reach to such point. Therefore, the consumer has to choose a position along the price line.

**Consumer's Equilibrium**

We can find out consumer i.e., the combination of wheat and rice which given the consumer maximum satisfaction, by combining the indifference map (i.e., scale of preferences) and the price line of the consumer i.e., by combining the diagrams 4.11 and 4.12. This is done in diagram 4.15.

The diagram 4.15 shows the price line AB based on the consumer’s limited income (i.e., Rs. 20) and given market prices of the two goods (wheat Re. 1 per kg. and Rice Rs. 2 per Kg.) and indifference curves IC₁, IC₂, IC₃, IC₄, IC₅ and IC₆, show his scale of preferences or indifference map of the consumer. His aim is to reach the highest possible indifference curve but in doing so he will have to act within the limits imposed by his limited income and the market prices of the two goods as depicted by the price line AB. His area of choice is restricted to the triangle OAB. He can choose any point inside the area OAB but this he will not do so simply because in that case his entire income will not be utilized. He cannot move to any point beyond AB because his income does not permit him to do so. He will therefore choose a point along the price line AB only. But AB represents a number of combinations. Which one maximizes his satisfaction?

Suppose in the process of trial and error the consumer selects the point D on the price line which also lies on indifference curve IC₂. Having selected D, he finds that by moving to point E on the price line he could be better off because E lies on indifference curve IC₃. He will therefore reject point D in favour of E. But at E he again finds that point P, which lies on indifference curve IC₄ is also open to him. Therefore, he rejects E also in favour of P. Now having reached P he feels as if he is at the top of a hill from where any movement in either direction leads him only to a lower level. The consumer will therefore, stick to position at P. At P, price line just touches the indifference curve IC₄ (is tangential to it) and does not cut it. He is maximizing satisfaction at P. He purchases OK of rice and OM of wheat (i.e., 6 kgs. of rice and 8 kgs. of wheat).

Now we are in a position to state the conditions in which a consumer would be maximizing satisfaction within the limits imposed by his monetary income and the market prices. We can say that the consumer will be maximizing satisfaction when he selects the point where the price line is tangent to the indifference curve. This is the point of maximum satisfaction attainable under the given conditions because any deviation from this position leads the consumer to a lower level of satisfaction. We hope you remember that the slope of an indifference curve at any point measures the marginal rate of substitution between the two goods. At the point of tangency (at point P in the above diagram) the slopes (OA/OB) of the indifference curve and the price line are the same. This simply means that at the point of tangency the marginal rate of substitution (MRSₓᵧ) of the consumer, as indicated by his indifference curve, is equal to the price ratio of the two goods (Pₓ/Pᵧ). We can, therefore, also express the equilibrium by saying that the consumer will be in equilibrium when his marginal rate of substitution between the two goods is equal to the price ratio between the two goods.
The tangency between the price line and the indifference curve or in other words, the equality between the marginal rate of substitution between the two commodities and their price ratio, is a necessary but not a sufficient condition for consumer’s equilibrium. The another condition for consumer’s equilibrium is that at the point of equilibrium, the indifference curve must be convex to the origin, or, in other words, the marginal rate of substitution of X for Y must be falling at the point of equilibrium, otherwise it will not be a stable equilibrium. This can be explained with the diagram 4.16. In the diagram the price line AB is tangent to the indifference curve IC₁ at F and therefore F should be the consumer’s equilibrium position. But F can not be a position of stable equilibrium because the satisfaction would not be maximum there. At point F, the indifference curve is concave to the point of origin, or, in other words, the marginal rate of substitution of X for Y is increasing. It means, that if the consumer moves in either direction – left or right, on the price line, he can reach a higher indifference curve and can have greater satisfaction. In the diagram, by moving on the price line AB, the consumer can reach at point P. Since at P, price line is tangent to indifference curve IC₂ and therefore, the consumer will have more satisfaction. At P, the price line AB is not only tangent to indifference curve IC₂ but IC₂ is also convex to the origin. Therefore, P represents a consumer’s stable equilibrium position.

Thus, there are two conditions which are required to be fulfilled for a consumer to be in equilibrium position:

(a) The price line must be tangent to an indifference curve, or marginal rate of substitution of X for Y must be equal to the price ratio between the two commodities.

(b) Indifference curve must be convex to the origin at the point of tangency.

**Effect of the Changes in the Consumer’s Income and Prices of Goods**

So far we have discussed how a consumer decides which goods to buy and in what amounts, when his monetary income and prices of the goods are given. But the monetary income of the consumer and the prices of goods do not remain constant. The changes in consumer’s money income and the prices of goods will affect the consumer’s equilibrium position.

(i) **Effects of the Changes in Income on Consumer’s Demand: Income Effect**

Let us first analyse the effects of the changes in the monetary income of the consumer on consumer’s equilibrium assuming that the prices of goods remain constant.

What happens if the consumer has more or less money income with all other conditions remaining the same? Assuming that the prices of the two goods remain the same, a higher monetary income enables a consumer to go to a higher budget line and choose a combination of the two goods on a higher indifference curve. In other words, a higher monetary income enables the consumer to buy a larger quantity of one commodity or both commodities. The changes in demand for a commodity due to a change in monetary income of the consumer is known as the income effect on demand for that commodity.

In the diagram 4.17 we measure wheat on the X-axis and rice on the Y-axis. Suppose the consumer’s monitory income is Rs.20 per week and the price of wheat and rice is Rs. 1 arid Rs.2 per kg. respectively.
If he spends his entire income on the purchase of wheat, he can buy OB amount (20 kgs.) of X and alternatively, if he spends his entire income on the purchase of rice, he can buy OA amount (10 kgs.) of rice. AB, therefore, is his price line. This price line is tangent to the IC₁ at point P. Therefore, this would be his equilibrium position. The consumer is spending his entire income (i.e., Rs. 20/-) in such a way that he purchases OM (i.e. 8 kgs.) amount of wheat and OK (i.e., 6 kgs.) of rice. Now suppose his monetary income increases to Rs. 24 per week, the prices of goods remaining the same. Therefore, as explained earlier, his price line will shift upwards to the right parallel to the original price line AB. A₁B₁ is the new price line. Now consumer can move to a higher indifference curve. What will be his equilibrium position? The new price line A₁B₁ is tangent to the IC₂ at P₁. Therefore P₁ will now be consumer’s equilibrium position. Previously when the consumer’s monetary income was Rs. 20/- per week, he was buying OM (i.e., 8 kgs.) amount of wheat and OK (i.e., 6 kgs.) amount of rice. Now his monetary income has increased to Rs.24/- per week, prices of goods remaining constant, he buys OM₁ (i.e. 10 kgs.) amount of wheat and OK₁ (i.e.7 kgs.) amount of rice i.e. more of both wheat and rice. The shift in the consumer’s equilibrium position form P to P₁ is called income effect which is positive. If we join P and P₁ we get a curve which is called Income Consumption Curve (ICC). The income consumption curve usually slopes upwards to the right.

We would like to tell you here that income effect can be positive as well as negative. If the increase in monetary income leads to an increase in the demand of a commodity the income effect is positive. But if the increase in monetary income results in a fall in the demand for a commodity, the income effect will be negative. Normally, income effect is positive. But while discussing the law of demand we have told you that in case of inferior goods the income effect is negative, i.e., the increase in the consumer’s monetary income (or real income due to the fall in the price of the inferior commodity) will result in the decline in the demand for an inferior good and vice versa.

**Case of Inferior Goods**

Inferior goods are those goods which consumers demand when they have low incomes. When consumers have more monetary income, they would shift form inferior goods to superior ones. In other words, with increase in monetary income, the demand for inferior goods declines. The negative income effect, in case of inferior goods, can be explained with the help of a diagram 4.18.

In the diagram we measure X commodity which is an inferior commodity, on the X axis and Y commodity (which is not inferior) on the Y axis. AB is the price line. The consumer is at equilibrium at point P. He buys OM amount of the X commodity. Suppose his income increases and therefore the price line shifts upwards. A₁B₁ is the new price line which touches the IC₂ at point P₁ and therefore P₁ is the new equilibrium point. Now, the consumer buys OM₁ amount of the commodity X which is less than what he was buying earlier when he was at equilibrium point P. Previously he was buying OM amount of X but now he is buying OM₁ amount of X. In other words he buys less of X to the extent of MM₁ even though his income has increased. MM₁ is the negative income effect. Suppose the consumer’s income increase further and price lines shifts upward and becomes A₂B₂ and P₂ becomes his new equilibrium position. The consumer now buys OM₂ amount of X which is less than what he
was buying when he was at equilibrium point P₁. In other words, as a result of further increase in his income, the consumer buys less of X, to the extent of M₁M₂. Again the income effect is negative. This negative income effect has taken place because we have assumed that the commodity X is an inferior commodity. Here you find that the income consumption curve (ICC) slopes backward to the left.

The income effect may also take place due to the changes in the price of a commodity, assuming the monetary income of the consumer remaining constant. A fall in the price of a commodity or commodities will result in an increase in the real income or the purchasing power of the consumer which will increase the demand for the commodity. We shall discuss this in detail below.

(ii) Effects of Price Changes on Consumer’s Demand: Price Effect

We have explained the effects of the changes in the money income of the consumer on his equilibrium position, assuming the prices of goods remaining constant. Let us now examine the effects of the changes in the price of one commodity on consumer’s equilibrium, assuming that the price of the other commodity and the consumer’s tastes and money income remain constant.

A change in the price of one commodity, say X, keeping the price of the other commodity, say Y, and consumer’s money income constant, will result into a change in the price line. As already explained in the diagram 4.14. This will lead a change in the consumer’s equilibrium position.

If the price of X alone falls, the price line will shift to the right and this will enable the consumer to reach on a higher indifference curve. On the other hand, if the price of X increases, the price line will shift to the left and therefore the consumer’s equilibrium position will lie at a lower indifference curve. The total effect of the change in the price of a commodity on its quantity demanded is called the price effect. This can be shown by the diagram 4.19.
Given the consumer’s money income at Rs. 20, and price office at Rs. 2 per kg. and price of wheat at Rs.1 per kg. The price line AB is tangent to the indifference curve IC₁ at P and therefore, P will be the consumer’s equilibrium position. The consumer will purchase OM amount of wheat and OK amount of rice. Suppose the consumer’s money income and the price of rice remain constant, but the price of wheat falls from Rs. 1 per Kg to 0.50 paise per kg. Therefore, with the same money income, the consumer can now buy OC amount (i.e. 40 Kgs.) of wheat. Therefore, his price line will shift to the position of AC. The consumer can now reach on a higher indifference curve IC₂. The new price line AC is tangent to the indifference curve IC₂ at point P₂. Therefore, the P₂ will be the new equilibrium position. Instead of OM amount of wheat, the consumer now buys OM₂ amount of wheat. If we join points P and P₂, we get a curve, which is called Price Consumption Curve (PCC). The Price Consumption Curve traces the price effect. It shows how the changes in price of a commodity will affect the consumer’s purchases of that commodity, assuming that the price of the other commodity and the consumer’s tastes and monetary income have remained constant. In the figure 4.24, the demand for wheat has increased form OM to OM₂. In this case, the MM₂ i.e. increase in quantity demanded, is the price effect.

**SEPARATION OF INCOME AND SUBSTITUTION EFFECTS**

The effect of a price changes is in reality the result of the actions of two different forces and can legitimately be looked at in two parts, i.e., income and substitution effects.

(a) **Income Effect:** Firstly, as the price of one goods falls (price of other good and monetary income of the consumer remaining the same) the consumer becomes better off than before roughly by the amount of the saving which he would he able to make if he continues to purchase the old quantities of both the goods. Suppose the price of wheat falls from Rs. 1 per kg. to 75 paise per kg. and the price of rice stays at Rs. 2 per kg. At the old prices the consumer was purchasing 6 kgs. of rice and 8 kgs. of wheat. If after the price fall the consumer continues buying 6 kgs. of wheat then he will save Rs. 2, because at the lower price 8 kgs. of wheat will now cost him Rs. 6 instead of Rs. 8 as previously. This saving in money i.e., Rs. 2 is comparable to an increase in the consumer’s money income which he can spend on either or both goods. Thus income effect can be defined as the change in the quantity of a commodity demanded due to change in its price, given the money income as constant. This is called the income effect of a price change. The effect of a price rise will be just the opposite.

(b) **Substitution Effect:** Secondly, the fall in the price of one good makes it cheaper relatively to the other good whose price has remained constant (or whose price has fallen but not to the same extent to which the price of other good has fallen) and therefore the consumer will tend to substitute the cheaper good for the dearer one, and as a result the demand for the cheaper good will tend to increase. A change in the demand for a commodity as a result of a change in the relative price of two commodities (one commodity becoming cheaper as compared to the other commodity) is called the substitution effect.

Any change in the relative prices of two commodities brings about a change in the slope of the price line. The consumer remains on the same indifference curve. In other words, he remains on the same level of satisfaction. But because of the changes in the relative prices of the two commodities, consumer rearranges his purchases by substituting cheaper commodity in place of the relatively dearer one. This will result in a change in the quantity of the two commodities bought and therefore, his equilibrium position will shift on the same indifference curve. In other words, the substitution effect implies a movement form one point to another on the same indifference curve.

Thus price effect may be defined as the extent of the change in the demand of a commodity as a result of the changes in price of that commodity. The price effect is composed of two separate effects i.e. income effect and substitution effect and the resultant effect of price changes on the demand for
goods (i.e., price effect) will be the net effect of these two forces. This can be shown by a diagram 4.20.

In the diagram 4.20 we measure wheat along the X-axis and rice along the Y-axis. At the old price line AB, the consumer was in equilibrium at point P and has purchased OM of wheat and OK of rice. As a result of the fall in the price of wheat, (from Rs. 1 per kg to 0.50 paise per kg.) the consumer can now purchase (with the same money income) OC amount of wheat if he spends his entire income on purchase of wheat, but since the price of rice is unchanged, he will keep on purchasing only OA amount of rice if he spends his entire income on the purchase of rice. Now AC becomes the new price line. At the new prices the consumer attains equilibrium at point P2 and starts buying OM2 of wheat and OK2 of rice. If we join points P and P2, we get a curve which is called Price Consumption Curve (PCC). You will notice that at the new prices the consumer starts buying more of wheat (OM2 is greater than OM) and less of rice (OK2 is less than OK).

This increase in the demand of wheat (i.e., price effect), as a result of the fall in its price, has taken place because of two effects i.e., income effect and substitution effect. Let us now find out how much of this increase in the demand for wheat is due to income effect and how much is due to substitution effect. In order to bifurcate income effect and substitution effect, we draw a price line ED which is parallel to the old price line AB and which is tangential to the indifference curve IC2 at P1. Because ED has been drawn parallel to the old price line, therefore, this too represents the old price ratio between the two goods. ED only shows that had the money income of the consumer increased, as indicated by the price line, and prices kept constant, the consumer would have attained equilibrium at P1. But as prices have actually changed the consumer cannot afford to stay at P1 and has to move to P2 where the new price line AC is tangential to indifference curve IC2.

Thus in diagram 4.20 the movement from P to P1 is due to the substitution effect and the movement from P1 to P2 is due to the income effect. You will notice that substitution effect acts in favour of wheat and against rice and consequently consumption of wheat increases by MM1 and consumption of rice falls from OK to OK1. But the income effect acts in favour of consumption of both the commodities, i.e, wheat and rice increases (amount of wheat increase by M1M2 and rice by K1K2) We can summaries it, as a result of the fall in the price of wheat, its demand has increased by MM2 (price effect). Out
of this increase, the increase to the extent of MM\textsubscript{1} is due to substitution effect and increase to the extent of M\textsubscript{1}M\textsubscript{2} is due to income effect.

Thus we see that the effect of a change in the price of a good can legitimately be looked upon as consisting of two separate effects namely, the income effect and the substitution effect and the total price effect on demand is the sum of these two effects. As far as the substitution effect is concerned, it is always negative. Normally income effect is positive i.e., it will tend to increase the demand for good. But in case of inferior goods, income effect is negative. However in case of an inferior good, if the good in question plays a fairly small part in the consumer’s total budget so that the negative income effect is not very strong, the demand for the good will increase due to the relatively stronger positive substitution effect. Only in case of an inferior commodity, on which a consumer spends a major portion of his total income, the negative income effect may be stronger than the positive substitution effect and, therefore, the demand for that commodity will fall. Such type of goods are called Giffen goods, after the name of Sir Robert Giffen. Thus there is a difference between an inferior good and a Giffen good. A Giffen good is necessarily an inferior good, but all inferior goods need not be Giffen goods. A Giffen good means an inferior good on which the consumer spends a major portion of his income so that the negative income effect is more that the positive substitution effect, with the result that the price effect becomes negative. In other words, in case of a Giffen goods, a fall in its price will reduce its demand and a rise in the price will increase its demand. This can be explained with the help of diagram 4.21. Suppose commodity X is a Giffen good which is represented On X-axis. With a given monetary income (line AC) and prices of the two commodity X (Giffen good) and Y the consumer is at equilibrium point P on indifference curve IC\textsubscript{1}. The consumer buys OM quantity of X. Suppose the price of X rises and the consumer’s price line shifts to AB. Price line AB is tangent to indifference curve IC\textsubscript{2} at P\textsubscript{2}. At this new equilibrium point P\textsubscript{2}, the consumer buys OM\textsubscript{2} amount of X. Thus as a result of the rise in the price of X (Giffen good), the consumer increases the consumption of X from OM to OM\textsubscript{2}. In other words, the demand for X has increased to the extent of MM\textsubscript{2}. This is price effect. This price effect is composed of income effect and substitution effect. In order to find
out these we again draw an imaginary price line ED, which is parallel to the price line AB. The price line ED is tangent to the indifference curve IC\(_1\) at P\(_1\). This shows the substitution effect which is equal to MM\(_1\). The substitution effect induces consumer to buy less of commodity X to the extent of MM\(_1\) since price of X has increased. But the income effect acts in opposite direction and is greater than the substitution effect. The income effect here is M\(_1\). Therefore, the net effect i.e. price effect is MM\(_2\), i.e. with the rise in the price of X, its quantity demanded increased by the amount MM\(_2\).

Thus if a good is Giffen good, a fall in its price reduces its quantity demanded and a rise in its price will increase the quantity demanded. In other words, in case of a Giffen good, there is a direct relationship between its price and quantities demanded, i.e., both vary in the same direction. It means that in case of Giffen good, the law of demand does not operate. If a commodity is a Giffen good, its demand curve will slope upward from left to the right. Such a situation is also referred to as Giflen’s Paradox. However, a Giffen good is rarely found.

To sum up, the effect of a change in the price of a good can be stated in the form of the following three propositions:

1. More of a good will be demanded when its price falls, in all cases when the commodity is not an inferior one, because both the income effect and the substitution effect are positive and act in favour of an increase in the amount of the good demanded.

2. Even in case of an inferior good, so long as the proportion of total income of the consumer spent upon the inferior good is small, so that the negative income effect is small, the demand for the good will increase after a fall in its price because of the stronger positive substitution effect.

3. Only in the case of a Giffen good i.e., an inferior good which plays an important part in the budgets of its consumers, so that the negative income effect out weights the positive substitution effect, fall in the price will diminish the amount demanded.

### Derivation of Individual’s Demand Curve

**Price Consumption Curve and Demand Curve**

We can derive a demand curve with the help of the indifference curve analysis. What is the difference between Marshall’s demand and the price consumption curve (PCC) which Hicks has popularized? The conventional price-quantity demand curve tells us as to how much quantities of a commodity, a consumer will demand at different prices of a commodity. The PCC explains the same thing how a change in the price of a commodity brings about a corresponding change in the consumption or demand of the commodity. Further the demand curve and the PCC are based on the same assumptions, viz.,

(a) There is no change in the preferences, tastes etc., of the consumer.

(b) The monetary income of the consumer remains the same.

(c) ‘The price of one commodity alone changes.

(d) The price of all other goods are constant.

Under these assumptions, normally consumers generally demand more at lower prices and less at higher prices.

The basic difference between the demand curve and the PCC is their shape and this essentially follows form the fact that they have been constructed in different ways. The conventional demand curve is drawn with quantity of a commodity demanded on the horizontal axis and the price of that commodity on the vertical axis. The PCC, however, is drawn with one commodity on the horizontal axis and other commodity or monetary income on the vertical axis.
As a result in case of the usual demand curve the price of the commodity is clearly mentioned on the vertical axis and quantity demanded on the horizontal axis i.e., the various prices and the corresponding quantities which will be demanded at those prices. On the other hand, the PCC does not mention the price of commodity directly; instead, the slope of the budget line indicates the ratio of prices between the two goods. The PCC does not directly sell us the different quantities demanded at different prices.

The essential function of the conventional demand curve is to show the price effect. It cannot show separately the income effect and the substitution effect. On the other hand, the PCC shows separately the income and substitution effects of a fall in the price of a commodity.

The comparison between Marshall’s demand curve and Hicks’ PCC brings out clearly that each has some merits of its own. The demand curve establishes a direct relationship between the price and the quantity demanded while the PCC helps in dividing the price effect into income and substitution effects. It is, however, possible to derive the usual demand curve from the PCC. This is shown in diagram 4.22 given below:

![Diagram 4.22]

In the top portion of the diagram 4.22, the price consumption curve for wheat has been constructed. In the top portion, the X-axis represents the quantity of wheat and the Y-axis represents the monetary income of the consumer. The monetary income is Rs. 20 which is constant. When the price of wheat is Rs. 1 per kg., the price line is AB, which is tangent to the IC₁ at P. Therefore P is the consumer’s equilibrium position. The consumer buys OM amount of wheat (i.e., 8 kgs.). When the price of wheat falls to 0.50 per kg., the price line shifts to AC which is tangent to IC₂ at P₁ becomes the new equilibrium position of the consumer. The consumer now buys OM₁ amount of wheat (i.e., 24 kgs.) By joining these two points P and P₁, we can draw the price consumption curve (PCC). The PCC shows that consumer demands OM (8 kg.) and OM₁ (24 kg.) amounts of wheat when the prices are Rs. 1 and 0.50 paise respectively. This price-quantity relationship has been represented in the lower portion of the figure. In the lower portion of the figure, the horizontal axis represents the quantity of wheat demanded and
the vertical axis represents the price of wheat. Point D shows that the demand for wheat is OM (8 kg.) when the price is Rs. 1 per kg. Point D₁ shows that when the price is 0.50 paise per kg. The demand for wheat is OM₁ (24 kg.). By joining these point D and D₁ we get a curve, which is known as the demand curve. This demand curve shows the different quantities of wheat demanded by a consumer at different prices. This is how a demand curve can be derived form the price consumption curve.

Evaluation of the Indifference Curve Analysis

Let us now assess to what extent the indifference curve analysis is free from the defects of the Marshallian utilitarian analysis. In the first place, in order to know what quantities of a good a consumer will buy at given market prices the utilitarian analysis implies that we must know how much utility the consumer derives form each unit of a good. But according to the indifference curve analysis we need only know that a consumer prefers such and such sets of goods to such and such sets. We need not know by how much one set is preferred to the other. Thus according to the indifference curve analysis quantitative measurement of utility is not necessary in order to explain the consumer’s behaviour.

Secondly, the utilitarian analysis implies that the utility which the consumer derives form each commodity purchased, depends upon the stock of that commodity alone, and the total utility of the whole collection of goods is simply the sum of these separate utilities. We have already explained to you the implications of this assumption with examples. Indifference curve analysis admits interdependence of utilities. If utility of one good is partly influenced by the utility of another good it will be reflected in the marginal rate of substitution.

Finally, the utilitarian analysis ignores income effect by assuming marginal utility of money as constant. With the help of indifference curve technique the income effect and the substitution effect are brought out very clearly.

Limitation of Indifference Curve Analysis

The indifference curve analysis has two important limitations. The first limitation relates to the assumption that consumers are familiar with their preference schedules, as for example between apples and oranges, coffee and cigarettes, shirts and shoes and so on. For each pair of goods, the consumer is supposed to have full knowledge of all the different combinations and of all the marginal rates of substitution, of the total satisfaction to be realised, etc. It is possible to argue that a consumer may know that 8 cups of coffee and 16 cigarettes, will give him as much satisfaction as 10 cups of coffee and 14 cigarettes because these are the combinations which he may buy often. But he cannot really compare the desirability of 10 cups of coffee and 5 cigarettes with that of 6 cups of coffee and 8 cigarettes. Thus the basic limitation of the indifference curve approach is its assumption that an average consumer knows about all possible combinations of any two goods.

Secondly, the indifference curve analysis deals with only simple cases of consumer’s choice between two goods and his expenditure on them. In practice, these situations may not be of much significance. For one thing, consumer often buy more than two goods. If they buy three goods, geometry fails altogether. Lastly, the indifference curve technique can handle goods between which there is some rate of substitution. The analysis fails in the case of complementary goods between which there is no substitution.

Despite these limitations, the indifference curve analysis has become very popular not only in the theory of demand but also in the theory of production, international trade etc.