UNIT 2

DEMAND, SUPPLY AND ELASTICITY

Unit Objectives

After completing this unit, you will be able to:

- ☐ understand, analyze and interpret the demand and supply concepts with schedules, graphs and equations;
- ☐ Recognize the factors affecting demand and supply, and then appreciate the law governing them;
- ☐ understand equilibrium price and quantity; and
- ☐ understand the essence of different elasticities of demand and supply.

Main Contents
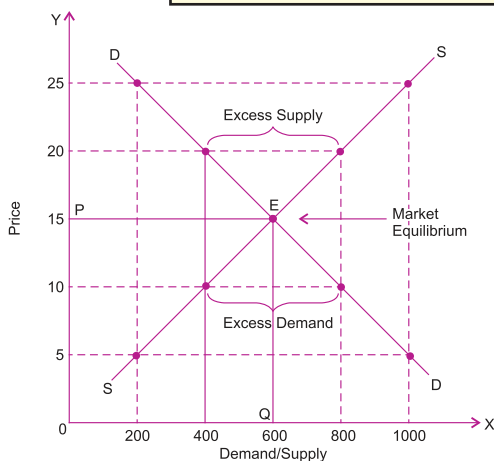
INTRODUCTION

Having learnt about the concept and meaning of economic as a subject and its nature, scope, different systems and various other fundamentals in the previous unit, we carry forward our exploration and understanding of the vast field of economics by focusing on two very powerful tools, namely, theory of demand and theory of supply, in the present unit. One knowledge about the basic elements of demand and supply will help us in a better analyses and explanation of the various changes in the economic environment around us, particularly, the working of a market economy.

In this unit we begin with the study of the concepts, laws, determinants and other aspects of demand and supply; examine the effects of changes in the market equilibrium; and finally learn about the concepts of elasticity of demand and supply, which basically represent a quantitative relationship between changes in demand/supply and changes in price of a commodity.

2.1 THEORY OF DEMAND

At the end of this section, you will be able to:

- ☐ define concept of demand;
- ☐ examine the law of demand;
- ☐ construct and interpret the demand schedule, graph and function; and
- ☐ describe the basic determinants of demand.
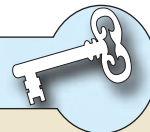
Key Terms and Concepts

- ➥ Demand
- ➥ Demand schedule
- ➥ Demand curve
- ➥ Price demand
- ➥ Income demand

- ➥ Cross demand
- ➥ Joint demand
- ➥ Composite demand
- ➥ Direct demand

Start up Activity

When price of a commodity increases, some individuals stop buying it, some reduce the amount they used to buy, others continue buying the same amount. Why individuals respond differently? Do you think there are commodities, which we continue consuming the same amount even if its price increasing?

Demand

The words demand, desire and want are often interchangeably used to express what an individual needs and what he would like to acquire. However, in economics, the term *demand* has a specific meaning. It refers to the amount of commodity which an individual buyer is willing and able to buy at a given price and during a given period of time. As such demand is different from a mere desire. Human wants are unlimited, and therefore, desires are many. But only a desire that is backed up by the capacity to pay the price for the commodity and the willingness to buy it, is termed as a demand. We may say demand refers to an effective desire. A desire becomes an effective desire or demand only when it is backed by the following three factors:

- *ability to pay for the good desired,*
- *willingness to pay the price of the good desired, and*
- *availability of the good itself.*

Moreover, demand for a good is always expressed in relation to a particular price and particular time, for example, you may be interested in buying a particular shirt at a price of Birr 200, but you would not demand it at all if it is priced at Birr 700. Similarly, an individual may be willing to buy a room heater at a price of Birr 1000 during a cold, but he/she may not be interested in buying it at this price during a hot season.

From the above discussion, we may define demand as follows:

Demand for a commodity is the amount of it that a consumer is willing to buy at various given prices and a given moment of time.

> **Note:**
> - A commodity refers to any good produced for sale in the market.
> - Demand and quantity demanded are two different concepts. Whereas *demand* refers to the relationship between the price of a commodity and its quantity demanded, other things being same the q*uantity demanded* refers to a specific quantity which a consumer is willing to buy at a specific price.

Demand Schedule

A demand schedule is *a tabular statement that states the different quantities of a commodity that would be demanded at different prices*. Demand schedules are of two types:

> i   Individual demand schedule.

> ii   Market demand schedule.

i   ***Individual demand schedule*** is *a tabular statement which shows the quantity of a commodity demanded by an individual household at various alternate prices per time period*.

Table 2.1:   Individual Demand Schedule

Price (Per kg)	Quantity Demanded
10	4
15	3
22	1

The above demand schedule shows the different quantities of mangoes demanded by an individual at different prices. At Birr 10 per kg consumer demands 4 kg mangoes but at Birr 22 per kg consumer demands 1 kg mangoes.

ii   ***Market demand schedule*** is a tabular statement which shows the different quantities of a commodity demanded by different households or consumers in a market at various alternate prices per time period.

Table 2.2:   Market Demand Schedule

Price (Per kg)	X`s Demand	Y`s Demand	Market Demand (X+Y)
10	4	6	10
15	3	4	7
22	1	2	3

The above demand schedule shows the different quantities of mangoes demanded by different consumers at different prices. At Birr 10 per kg X demands 4 kg whereas Y demands 6 kg, so market demand at Birr 10 per kg is 10 kg. But at Birr 22 per kg X demands 1 kg whereas Y demands 2 kg, so market demand at Birr 22 per kg is 3 kg.

Demand Curve

A demand curve conveys the same information as a demand schedule. But it shows the information graphically rather than in a tabular form. Demand curves also are of two types

    i   Individual demand curve

    ii   Market demand curve

i   ***Individual demand curve*** refers to the curve which expresses graphically the relationship between different quantities of a commodity demanded by an individual at different prices per time period.
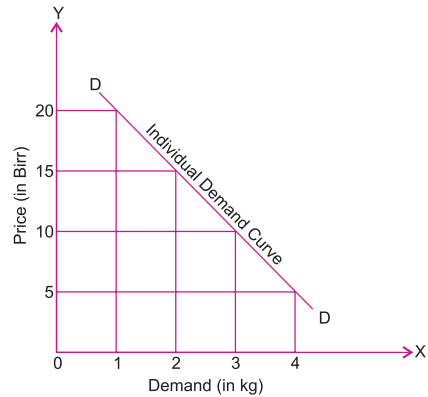
Figure 2.1: Individual Demand curve

The above demand curve shown in Figure 2.1 shows the different quantities of a commodity demanded by an individual at different prices.

ii   **Market demand curve** refers to the curve which express graphically the relationship between different quantities of a commodity demanded by different households or consumers at different prices per time period. It shows the demand of a whole market for a commodity.

Figure 2.2: Individual and market demand curves

The above market demand curve shows the horizontal summation of individual demand curves. It expresses the relationship between different quantities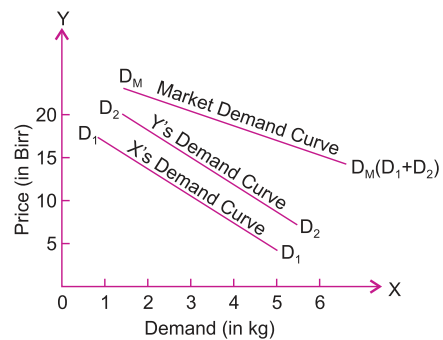 of a commodity demanded by X and Y at different prices. Market demand is obtained by horizontally summing individual demands at each price.

Demand Function

All the above factors influencing the demand for a commodity can be briefly expressed in the following functional relationship:

$$D_x = f(P_x, P_y, P_z, Y, T) \qquad\qquad (2.1)$$

Where, D_x stands for the demand for a commodity X,

P_x shows the price of commodity X,

While P_y and P_z refer to the prices of other substitutes and complementary goods. Y represents the income level of the consumers, while T is an indicator of their tastes and preferences. The word f shows the functional relationship between the demand for x and the other variables P_x, P_y, P_z, Y, T etc. In simple words, this functional relationship shows that the demand for commodity X depends upon the price of X, the prices of other goods, Y and Z, the income of the consumers and their tastes and preferences.

Law of Demand

Law of demand expresses the functional relationship between the price of a commodity and its quantity demanded. Price and demand are observed to be inversely related. In other words, all other factors remaining constant, more of a commodity is demanded when price falls and less of it is demanded when price rises, provided other factors remain the same. For example, if the price of apples rises, people will buy less of them and vice-versa.
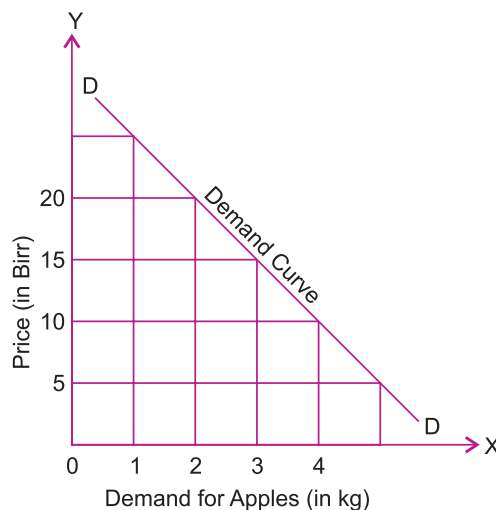
Figure 2.3: Demand curve

In Figure 2.3, we observe that when the price of apples is Birr 20 per kg, the demand is 2 kg. But when the price of apples falls to Birr 10 per kg, the demand for apples rises to 4 kg.

Statement of the Law:

The law of demand states that, other things being equal, at a higher price consumers will purchase less of a commodity, and at a lower price, consumers will purchase more of it.

Or

A rise in the price of goods leads to a fall in quantity demanded and vice-versa, assuming all other determinants of demand are kept constant.

Assumptions of the Law of Demand

Law of demand depends on the basic assumption of other things being equal (ceteris paribus). By other things we mean factors other than price which affect the demand for a commodity. For example, prices of related goods, tastes and preferences of consumer, income of the consumer, population, etc. For the law to operate correctly, there should be no change in any of these determinants.

We may summarize the assumptions of the law of demand as follows:

- *There should be no change in prices of related goods,*
- *Tastes and preferences of the consumer should remain constant,*
- *There should be no change in the income of the consumers,*
- *The size of the population should remain constant,*
- *Distribution of income and wealth should be equal,*
- *There should be perfect competition in the market.*

Exceptions to the Law of Demand

There are some situations when the law of demand does not operate. With an increase in price, more quantity of a commodity is purchased and vice-versa. In these situations demand curve is upward sloping. These are known as *exceptions to the law of demand*. Main exceptions are as follows:

○ *Giffen Goods:* *is a good for which an increase in the price raises the quantity demanded. Economists use the term Giffen good to discribe a good that violates the law of demand. (The term is named for economist Robert Giffen, who first noted this possibility) Giffen goods are very rare.*

> **Note:**
>
> Giffen goods are a special category of inferior goods.

○ *Prestige Goods:* *Some consumers measure the utility of a commodity entirely by its price. For example diamond is considered as a prestige good in the society, the higher the price of diamonds, the higher the prestige value of them. When the price of diamonds goes up their prestige value will go up and , as a result, quantity demanded by consumers will rise.*

○ *Expectation of People about the Future:* *This assumption relates to the changes in the expectations of the people regarding prices of the commodities in the future. For example, if rainfall in any year does not occur in adequate quantity and there is widespread drought, the expectations of the people will be that the prices would rise in the future. Therefore, even if the prices of food grains are higher at present, they would demand greater quantities since they will be expecting even higher prices in future.*

○ *Necessities:* *There are some commodities which are necessities of life – for example, food grains, salt, medicines, etc. A minimum quantity of these commodities has to be purchased by the consumer irrespective of their price. The law of demand does not hold good in case of these commodities.*

Basis of the Law of Demand Or Why Does the Demand Curve Slope Downwards?

Demand curve normally slopes downwards to the right. It is also known as the *negative slope of the demand curve*, indicating an inverse relationship between the price of the commodity and its demand. There are several reasons for this inverse relationship as given below:

○ *Law of diminishing marginal utility:* *According to this law, if a consumer increases the consumption of a commodity in a given time period, the utility from consumption of each successive unit goes on diminishing. Due to this reason, the consumer will purchase the additional unit of commodity only when he can pay less for it. Therefore, with a fall in price more units of a commodity will be demanded and with a rise in price, fewer units of a commodity will be demanded.*

- **Income effect:** *When the price of a commodity falls, a consumer can buy more of the commodity with the same amount, indicating an increase in his real income. Similarly, a rise in the price leads to a fall in real income of the consumer, and hence he buys less of a commodity. This is called income effect.*

- **Substitution effect:** *When the price of a commodity falls, it becomes relatively cheaper than its substitutes. So people who are consuming the other goods would now start consuming the commodity whose price has fallen, and as a result, its demand increases. This increase in demand is called the substitution effect of price change.*

- **Change in the number of consumers:** *A fall in the price of a commodity increases the number of households who demand it in the market and a rise in the price of commodity reduces this number.*

- **Different uses of a commodity:** *At a lower price, a commodity will be in high demand for being put to different uses. Conversely, at a higher price, its use will be limited to a few essential uses only and hence the total demand will go down. For example, electricity could be used for various purposes like lighting lamps, heating rooms and operating TV, refrigerator, air conditioners etc. Suppose the price of electricity rises from Birr 1 per unit to Birr 2 per unit. Then its consumption will be restricted to only essential purposes like the lighting of lamps and operating of fans etc. As a result, the total demand for electricity will decrease. On the other hand, a fall in the price of electricity will encourage its use for different purposes and hence, the total demand for electricity will increase.*

Determinants of Demand

An individual's demand for a commodity is determined by a number of factors. Some of these important factors are as follows:

- **Price of the Commodity:** *The price of a commodity is the most important factor which affects the demand for a commodity. Other things remaining the same, if price increases, quantity demanded decreases, and if price decreases, quantity demanded increases.*

- **Income of the Consumer:** *Income of the consumer is also an important factor affecting the demand for a commodity. Generally when income increases, demand also increases, and when income decreases, demand also decreases. This is true in the*

Note:

The concepts of normal goods/inferior goods are explained in detail in coming sections.

case of normal goods. However, in the case of inferior goods, with an increase in income their demand decreases and vice-versa.

○ **Prices of Related Goods:** *Changes in the prices of related goods also affect the demand for a commodity. Related goods may be of two types:*

  ★ Substitute goods, and   ★ Complementary goods.

  ✎ **Substitute Goods:** *Substitute goods are those goods which can be used in place of each other to satisfy a given want. That is why they are also called competitive goods. Coffee and tea, pens and pencils, butter and oil, etc., are examples of substitute goods.*

  ✎ **Complementary Goods:** *Complementary goods are those goods which are used together to satisfy a given want. If two goods are complementary goods, a decline in the price of one would directly change the demand for other commodity and vice-versa. For example, cars and petrol are complements of each other. If the price of car increases, its demand will decrease and thus will lead to a decrease in the demand for petrol and vice-versa.*

○ **Tastes and Preferences:** *The amount demanded of a commodity also depends on consumer tastes and preferences. If a consumer is accustomed to certain commodities, he will demand that commodity and this leads to increase in the demand for that commodity.*

○ **Future Expectation of Changes in the Price:** *If there is an expectation of increase in the price of a commodity in the near future, consumers will start demanding more of it. Contrary to that, if the price of that commodity is likely to fall in near future, consumers will start demanding less of that commodity.*

○ **Climate:** *The demand for a commodity is also affected by climate. For example, demand for woolen clothes increases in cold seasons. On the other hand demand for coolers, cotton clothes etc., increases in hot seasons.*

○ **Population and Number of Households:** *Changes in population or number of households also affect the demand for goods. For example, with the increase in number of households the demand for consumer goods will also increase.*

○ **Distribution of Income and Wealth:** *If the distribution of income and wealth in a society is unequal, the demand for such commodities will be more which are generally demanded by the rich people. On the other hand, if there is equal distribution of income and wealth in the society, the demand for such commodity will be less which are specially used or demanded by the rich people.*

Demand mainly depends upon three factors, namely

- *Price of the commodity;*
- *Price of related goods.*
- *Income of the consumer, and*

On the basis of the above three factors, demand can be classified into three types:

i   Price Demand,

ii   Income Demand, and

iii   Cross Demand.

i   *Price Demand:* Price demand indicates, other things being equal, the relationship between the price of a commodity and its quantity demanded.

$$D_x = f(P_x) \qquad (2.2)$$

Where, D_x = Demand for commodity X, P_x = Price of commodity X.

There is inverse relationship between price of a commodity and its demand. In other words, when price of a commodity falls, its demand rises, and when price of a commodity rises, its demand fails.
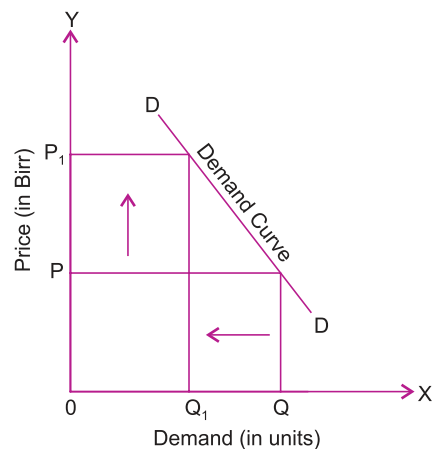
Figure 2.4: Demand curve

The above demand curve clearly indicates the inverse relationship between price of a commodity and its demand. When price is OP, demand is OQ. When price rises to OP_1 demands falls to OQ_1. The fall in demand (QQ_1) is due to rise in price (PP_1).

ii   *Income Demand:* Income demand indicates, other things being equal, the relationship between the income of consumer and demand for a commodity.

$$D_x = f(Y_d) \qquad (2.3)$$

Where, D_x = Demand for commodity X, Y_d = disposable income of consumer.

Generally, the demand for a commodity changes in the same direction as change in income, with a higher level of income leading to a larger demand, and with

a smaller income resulting in a fall in demand. However, an increase in income does not always and invariably lead to an increase in the demand for all the commodities. Thus, it is the nature of the commodity on which its demand depends. On the basis of nature, goods can be classified into two types:

★ Normal Goods (Superior Goods),

★ Inferior Goods.

a *Normal goods* refer to those goods whose income effect is positive – i.e., all other factors remaining the same, as income increases, demand also increases and vice-versa. For example, cheese, butter, chocolates, biscuits, etc.
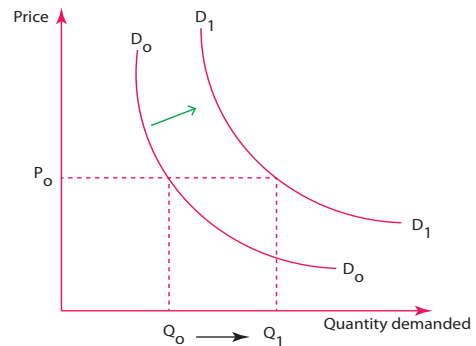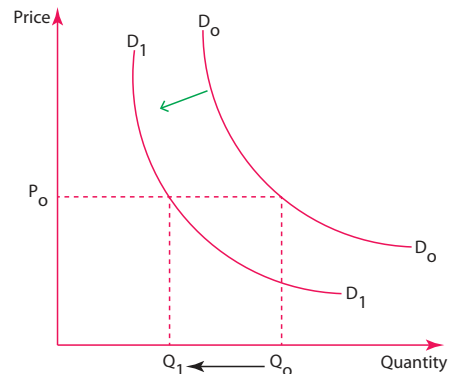
Figure 2.5: Income expanding path for normal goods

The above demand curve show change in demand due to increase in income, keeping other factors unchanged, for normal good. When income of a consumer increases, his/her demand curve shifts to the right from D_O to D_1 for normal goods.

b *Inferior goods* refer to those goods whose income effect is negative – i.e., all other factors remaining the same, as income increases, demand decreases and vice-versa. For example, some chinese shoes, coarse cloth, leftover food etc.

Not all goods are normal goods. If the demand for a good rises when income falls, the good is called an inferior good. An example of an inferior good might be bus rides. As your income falls, you are less likely to buy a car or take a cab, and more likely to ride the bus. If income increases, the demand for inferior goods decreases.

Figure 2.6: Income expanding path for inferior goods

The above graph shows the effect of increase in income on demand of inferior goods, assuming other factors unchanged. Consumption of the inferior good decreases from D_O to D_1 due to increase in income of a consumer.

The reason for the fall in the demand for inferior goods due to increase in income is that previously the consumer was not able to afford superior goods. When the income of consumer rises, she/he shifts from inferior to superior goods. As a result, demand for inferior goods falls.

iii   ***Cross Demand:*** Cross demand indicates, other things being equal, the relationship between the price of a commodity and demand for related goods (substitute goods or complementary goods).

$$D_x = f(P_y) \hspace{5cm} (2.4)$$

Where, D_x = Demand for commodity X, P_y = Price of commodity Y.

Related goods are of two types:

a   Substitute goods,   b   Complementary goods.

a   *Substitute goods refer to those goods which can be used in place of each other to satisfy a given want*. That is why they are also called competitive goods. For example, tea-coffee, pen-pencil, butter-oil, etc., are good substitutes for each other. Substitutes are two goods which an increase in the price of one leads to an increase in the demand for the other. For example, butter and margarine are substitutes. A rise in the price of butter causes an increase in the demand for margarine.
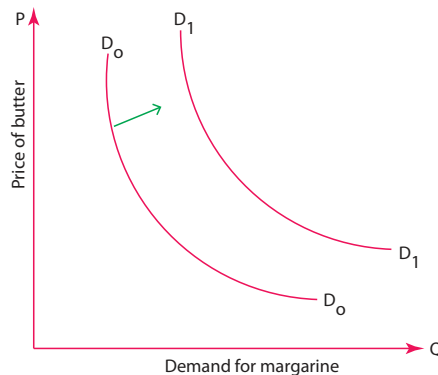
Figure 2.7: Shift in demand curve due to increasing price of substitute goods

The above graph explains the effect of price increase of butter on demand for margarine. When the price of butter increases, the demand for margarine a substitutes to butter increases from D_O to D_1 assuming other factors remain unchanged.

b   *Complementary goods are those goods which are used together to satisfy a given want.* For example, pen-ink,   car-petrol,   etc.,   are good complements of each other. Complements are two goods for which an increase in the price of one leads to a decrease in the demand for the other. Complements are often pairs of goods that are used together, such as gasoline and automobiles, and computers and software.
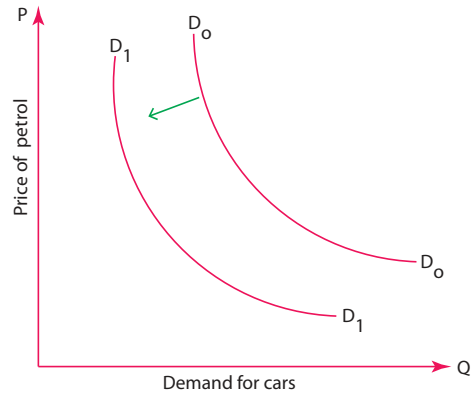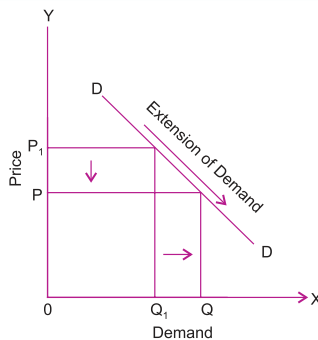

Figure 2.8:   Shift in demand curve due to change in price of a complementary goods

The above demand curves explain the relationship between the demand of cars and the price of a complement (petrol). When the price of petrol increases, the demand for cars decreases.

Difference between Movement along a Demand Curve (or change in quantity demanded) and Shift in the Demand Curve (or change in demand)

○ *Movement along a demand curve or change in quantity demanded: Other things being equal, if the quantity demanded increases or decreases due to fall or rise in the price of a commodity alone, it is known as movement along a demand curve or change in quantity demanded. Here the movement is – either upward or downward – along the same demand curve. Change in quantity demanded occurs due to change only in the price of the commodity itself. Downward movement along the demand curve is called extension of demand, while the upward movement as contraction of demand.*


Figure 2.9: Extension of demand
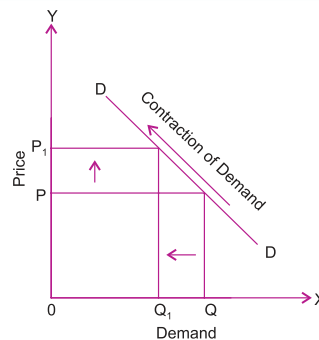
Figure 2.10: Constraction of demand

○ *Shift in the demand curve or change in demand: If more or less of a commodity is demanded, at the same price, due to change in factors other than the price of the commodity concerned (such as change in income, or taste or prices of other related goods, etc.), it is called shift in the demand curve or change in demand. In this situation, there is an either rightward shift or leftward shift in the demand curve itself. Here the rightward shift in the demand curve indicates increase in demand while the leftward shift indicates decrease in demand.*

a) *Increase in demand*　　　b) *Decrease in demand*
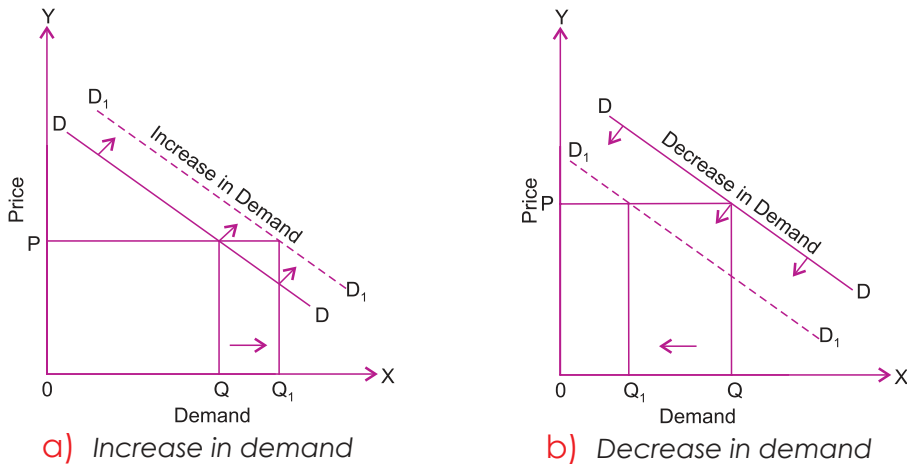
Figure 2.11: Increase and Decrease in demand

Activity 2.1

1　State the law of demand and discuss its assumptions and exceptions.

2　Explain why demand curves always slope downwards from left to right. Are there any exceptions to this?

3　An open class room discussion on questions such as:

　a　Do we always buy that what we need?

　b　Do we always buy that what we wish to have?

　c　What are the various factors which stop us from purchasing all that we need or we desire to have?

　d　Does a consumer always buy more of a commodity with an increase in his/her income? If no, give a few examples of goods/commodities where a consumer buys less of a commodity with a rise in his/her income.

　e　Can say that, with a decrease in the price of a commodity, a consumer normally buys more of it?

4   Consider a market determined by a group of households, near your place of residence.

Individually or in a group, go to each of these households and collect information regarding the various quantities of milk they would like to buy at alternative prices. Prepare an individual as well as market demand schedule from the collected information.

5   List the various goods/commodities for which you feel that an increase in their prices will not significantly decrease the quantity demanded of them.

6   Suppose there are three consumers in a particular market. Leta, Abera and Shemsia. Their demand schedules are given in the following table:

Price	Leta	Abera	Shemsia
10	19	17	19
8	21	23	24
6	30	33	27
4	35	34	30
2	36	35	32
1	40	38	36

a   Draw market demand schedule.

b   Suppose Abera drops out of the market. Draw the new market demand schedule.

c   Suppose Abera stays in the market and another person, Marta, joins that market whose quantity demand at any given price is half that of shemsia.

Derive the new market demand schedule.

2.2 THEORY OF SUPPLY

At the end of this section, you will be able to:

- ☐ define concept of supply;
- ☐ examine the law of supply;
- ☐ describe the basic determinants of supply;
- ☐ construct and interpret the supply schedule graph and function; and
- ☐ identify the differences between individual and market supply.

Key Terms and Concepts

- ↜ Supply
- ↜ Supply schedule
- ↜ Supply curve
- ↜ Market supply curve

Start up Activity

Consider a given market and discuss about it in the assumption of absence of law of supply. How do hoarding practices affects the market?

Supply

Just like 'demand', the term 'supply' has a specific meaning in economics. In ordinary language the term supply is often misused and confused with the term 'stock'. *Stock* is the total volume of a commodity produced during a period less the quantity already sold out. We can also say it is the total volume of a commodity which can be brought into the market for sale at a short notice. On the other hand *supply* means the quantity which is actually brought into the market. Many times the producers do not offer all of their stock for sale in the market, and they use practices like hoarding etc. with the objective of earning maximum profits. For example, at the time of harvest, a large part of agricultural product is kept back in cold storage and is taken out during the off-season for sale at better prices. Similarly, a part of industrial product is usually kept back in go downs and is offered for sale in the market at the time when it can fetch higher prices. We may thus say, *stock is potential supply*, and *supply* may be less or, at the most, equal to the stock of commodity.

In economics we define supply as follows:

> *Supply of a commodity refers to various quantities of it which producers are willing and able to offer for sale at a particular time at various corresponding prices.*

Note that supply shows a relationship between quantity supplied and price of a commodity, whereas quantity supplied refers to a specific quantity which a producer is willing to sell at a specific price.

Supply Schedule

A supply schedule is *a tabular statement that states the different quantities of a commodity offered for sale at different prices*.

Supply schedules are of two types:

    i   Individual supply schedule.

    ii   Market supply schedule.

i   **Individual supply schedule** *is a tabular statement which shows the different quantities of a commodity offered for sale by an individual firm at different prices per time period.*

Table 2.3:   Individual supply schedule

Price (Per kg)	Quantity Supplied
5	15
8	20
12	28

The above supply schedule shows the different quantities of a commodity supplied by an individual firm at different prices. At Birr 5 per kg, the firm supplies 15 kg, but at Birr 12 per kg, the firm supplies 28 kg of the commodity.

ii   **Market supply schedule** *is a tabular statement which shows the sum of the quantities supplied by all the sellers.*

Table 2.4:   Market demand schedule

| Price (per kg)	Supply of Firm (X)	Supply of Firm (Y)	Market Supply (X+Y)
5	15	12	27
8	20	18	38
12	28	25	53

The above supply schedule shows the different quantities of a commodity supplied by different firms at different prices. At Birr 5 per kg, firm X supplies 15 kg, whereas firm Y supplies 12 kg, so market supply at Birr 5 per kg is 27 kg. But at Birr 12 per kg, firm X supplies 28 kg, whereas firm Y supplies 25 kg. So market supply at Birr 12 per kg is 53 kg.

Supply Curve

A supply curve conveys the same information as a supply schedule. But it shows the information graphically rather than in a tabular form.

Supply curves also are of two types:
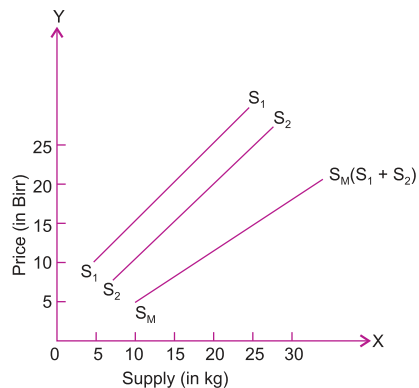
    i   Individual supply curve.
    ii   Market supply curve.

i   **Individual supply curve** refers to *the curve which expresses graphically the relationship between different quantities of a commodity supplied by an individual firm at different prices per time period.*
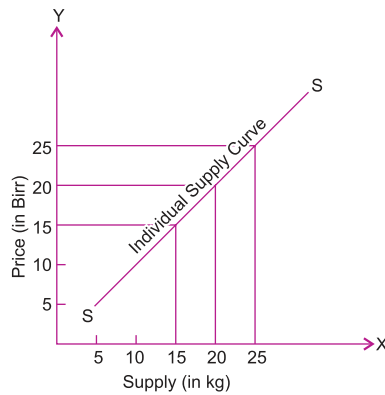
Figure 2.12:   Individual supply curve

The above supply curve shows the different quantities of a commodity supplied by an individual firm at different prices.

ii   **Market supply curve** is found by adding horizontally the individual supply curves.

Figure 2.13:   Indivdual and market supply curves

The above supply curve shows the horizontal summation of individual supply curves. It expresses the relationship between different quantities of a commodity offered for sale by X and Y at different prices. Market supply is obtained by horizontally summing individual supplies at market price.

Supply Function

All the above factors influencing the supply of a commodity can be briefly expressed in the following functional relationship:

$$S_x = f(P_x, P_y, P_F, B, Z) \hspace{3cm} (2.5)$$

Where, S_x stands for the supply of a commodity X and

P_x shows the price of this commodity X, while P_y is the price of related goods.

P_F represents price of factors of production, B represents objectives of firm and Z refers to other relevant factors. The world f shows the functional relationship between supply of X and factors affecting its supply i.e., P_x, P_y, P_F, B, Z etc.

Law of Supply

The Law of supply expresses the functional relationship between the price of a commodity and its quantity supplied. Price and supply are observed to be directly related. In other words, more of a commodity is supplied when price rises and less of it is supplied when price falls, provided that other factors remain the same. For example, if the price of apples rises, quantity supplied by sellers also rises and vice-versa.
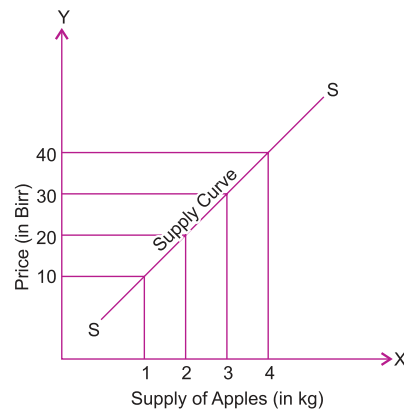
Figure 2.14:   Supply curve

In the above diagram, we observe that when the price of apples is Birr 10 per kg, the quantity supplied is 1 kg. But when the price of apples rises to Birr 40 per kg, the quantity supplied rises to 4 kg.

Statement of the Law

> *The law of supply states that there is a direct relationship between the price of a commodity and its supply.*
>
> > *Or*
>
> *Other things being equal, the supply of a commodity increases with an increase in its price and decreases with the fall in price.*

Assumptions of the Law of Supply

Law of supply depends on the basic assumption, 'other things being equal (*ceteris paribus*)'. By other things we mean factors other than price which affect the supply of a commodity. For example, price of related goods, price of factors of production, objectives of firm, production technique etc. For the law, to operate there should be no change in any of these other determinants. We may summarise the assumptions of the law of supply as follows:

- *There should be no change in the prices of related goods,*
- *There should be no change in the prices of factors of production,*
- *There should be no change in the goals of the firm,*
- *There should be no change in the state of technology,*
- *The income of the buyers and sellers should remain constant.*

Exceptions to the Law of Supply

There are some situations when the law of supply does not operate. With an increase in price, less of a commodity is supplied and vice-versa. These are known as exceptions to the law of supply. The main exceptions are as follows:

- *Future Expectations About Change in Prices: Law of supply will not apply if there is an expectation about change in prices of a commodity in the near future.*
- *Agricultural Products: The law of supply does not apply in the case of agricultural products because their supply is governed by natural factors such as flood, drought, rainfall etc.*
- *Perishable Commodities: The supply of perishable commodities like milk, fruits, vegetables etc. is not affected by their prices. Producers try to sell more perishable commodities even when their prices decline.*
- *Good of Auction: Since supply of auction goods is limited, the law of supply does not operate in their case.*
- *Artistic Goods: Law of supply does not apply in the case of artistic goods since the supply of these goods cannot be changed.*

Basis of the Law of Supply or Why does the Supply Curve Slope Upwards?

A supply curve normally slopes upwards to the right. It is also known as the *positive slope of the supply curve*, indicating a direct relationship between the price of the commodity and its supply. There are several reasons for this direct relationship, as given below:

- *Expectations of Profit: If prices are high, profit expectation increases with the result that producers increase their output or production. Conversely, if the prices are low, profit expectation reduces with the result that producers reduce their output or production.*
- *Change in Stock: An increase in the price of a commodity induces the sellers to dispose of at least a part of their stock. Conversely, if there is a decrease in the price of the commodity, sellers retain some of the stocks.*
- *Entry and Exit of Firms: If, due to rising prices there are high profits, new firms enter into the market and add to the supply of the commodity. Conversely, if there is a decline in price or loss, inefficient firms withdraw from the market and stop producing that commodity.*

Determinants of Supply

Supply of a commodity is determined by a number of factors. Some of these important factors are as follows:

- **Price of the Commodity:** *The price of a commodity is the most important factor affecting its supply. Generally, the relationship between price and quantity supplied is direct – i.e., supply is more when price is more and vice-versa.*

- **Changes in Factor Prices:** *Change in factor prices have a strong influence on the supply of a good in the market. An increase in the prices of factors of production leads to an increase in the cost of production. As a result the producers will not be able to sell the same amount at the prevailing market prices. Since their production cost has gone up, the only way the same amount can be offered is at a higher price.*

- **Price of Related Goods:** *An increase in the price of other, related goods induces the firms to produce more of those other goods, leading to a reduction in the supply of the goods whose price has remained unchanged.*

- **Objectives of the Firm:** *Generally, the main objective of a firm is to maximise its profit. Profit is maximum when the difference between income and expenditure is maximum. However, besides this objective there are other objectives which a firm may pursue, such as objectives of maximum sales, maximum employment, more production, etc. In such a situation, if a firm aims at some other objective such as more employment besides the objective of maximum profit, then volume of output or supply will increase, even when profit declines.*

- **State of Technology:** *If there is change in the technique of production leading to fall in the cost of production, supply of a commodity will increase. On the other hand, supply of those commodities will be less whose production depends on old technology.*

- **Other Factors:** *Beside the main factors discussed above, there are many other factors which affect the supply of a commodity such as fiscal policy of the government, the prices which are likely to prevail in the near future, etc.*

Difference Between Movement along a Supply curve (or change in Quantity Supplied) and Shift in the Supply Curve (or change in Supply)

⭕ *Movement along a supply curve (or change in quantity supplied): Other things being equal, if the quantity supplied increases or decreases due to rise or fall in the prices of the commodity alone, it is known as movement along a supply curve or change in quantity supplied. In this, we move along the same supply curve either upwards or downwards. Upward movement along the supply curve is extension of supply (that is, more quantity supplied at a higher prices) while the downward movement is contraction of supply (that is, less quantity supplied at a lower prices).*
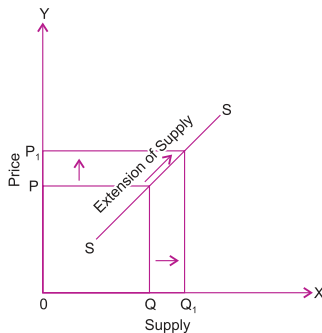

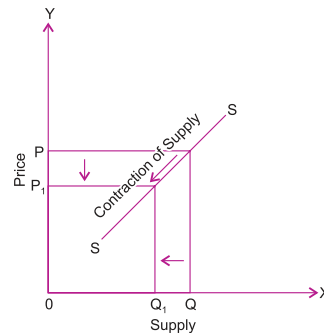
Figure 2.15:   Extension of supply   Figure 2.16:   Contratction of supply

⭕ *Shift in the supply curve (or change in supply): If more or less quantity of a commodity is supplied at every alternative price due to changes in factors other than the price of the commodity concerned, it is known as shift in the supply curve or change in supply. In this situation, supply curve itself shifts either to right or to the left. Rightward shift of supply curve indicates increase in supply, while leftward shift indicates decrease in supply.*
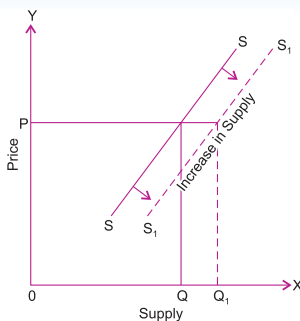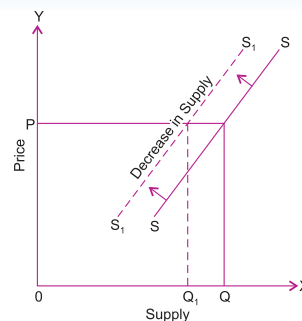
a) *Increase in supply*   b) *Decrease in supply*

Figure 2.17:   An increase and decrease of supply

Thus, movement along the supply curve is caused by a change in the commodity's own price. In this situation, supply curve remains the same. On the other hand, a shift in the supply curve is caused by a change in something other than the commodity's own price. A shift in the supply curve may be caused by change in the prices of other goods, change in the prices of factors of production, change in technique of production or change in the goals of the producer.

Activity 2.2

1. Why does the supply curve slope upward to the right?
2. How are movements along the supply curve different from shift of supply curve?
3. If possible, go to a producer/seller of some commodity and collect information regarding the various quantities of it which he/she may be able and willing to supply at alternative prices. Prepare an individual supply schedule from the collected information and also draw the respective supply curve.
4. List some goods/commodities whose supply in the market has increased in recent times mainly because of advancements in technology.

2.3 MARKET EQUILIBRIUM

At the end of this section, you will be able to:

- define market equilibrium;
- compare and contrast mathematical equation and graphical representation of market equilibrium;
- show how the changes in demand and supply on equilibrium price and quantity; and
- identify the concepts of price ceiling and price floor.

Key Terms and Concepts

- Price ceiling
- Price floor
- Equilibrium
- Market equilibrium
- Equilibrium price
- Equilibrium quantity

Start up Activity

Observe the situation of your local market and list down the items that are most expensive and cheap in the market and give your rational for the differences.

In previous sub-units, we have discussed consumers' demand for goods in a market and firms' supply of goods in a market separately. Demand and supply

curves respectively tell us how much consumers demand and how much producers supply at different prices. But they do not tell us what the actual price of a good will be. We now come to the important question: How do the forces of demand and supply interact to determine market prices? We explain how forces of demand and supply help in attaining 'equilibrium', and how the 'equilibrium price' is determined. We also consider the effects of shifts in demand and supply on the equilibrium price, in this sub-unit.

The Concept of Equilibrium

In the methodologies of economics, the concept of *equilibrium* occupies an important place. It is employed in almost every theory of economics in the fields of price, income, and growth.

The word *equilibrium* means a state of balance. In the physical world, when two opposing forces that impinge on an object are in balance, and the object is held still by them, the object is said to be *in equilibrium*. In other words, when the object under the pressure of forces working in opposing directions has no tendency to move in either direction, the object is in equilibrium. In the same way, a system is said to be in equilibrium when its important variables show no change, and when no forces are acting on them to change their values. For example, upon reaching equilibrium, a consumer has no inclination to re-allocate his or her money expenditure. Similarly, a firm is said to be in equilibrium when it has no tendency to change its level of output by either increasing or contracting it.

In actual economic activities, equilibrium may never be actually realised. The central feature of equilibrium analysis in economics is the concept that economies tend toward equilibrium when no new forces are acting on them.

Market Equilibrium

In the context of price determination, *equilibrium refers to a situation in which the quantity demanded of a commodity equals the quantity supplied of the commodity*. It refers to the balance between opposite forces of demand and supply and is termed as market equilibrium.

Equilibrium Price

The price at which the quantity demanded of a commodity equals quantity supplied is known as 'equilibrium price'. The price of commodity in a market is determined by its demand and supply. At equilibrium price, demand and supply are in equilibrium.

Equilibrium Quantity

The equilibrium price is the price at which the consumers are willing to purchase the same quantity of a commodity which producers are willing to sell. *The amount that is bought and sold at equilibrium price is called the 'equilibrium quantity'.*

Market Equilibrium – An Illustration

With a view to understanding how the forces of demand and supply operate in a market to determine an equilibrium price and quantity, let us consider an imaginary market having a large number of buyers and sellers of a commodity, say oranges.

Table 2.5 shows the imaginary market's demand/supply schedule of oranges at different prices.

Table 2.5: Market Demand and Supply Schedule of Oranges

Price (Birr per kg)	Demand (kg)	Supply (kg)	Trend
25	200	1000	Excess supply
20	400	800	Excess supply
15	600	600	Equilibrium
10	800	400	Excess demand
5	1000	200	Excess demand

In the above schedule there is one price at which market demand is equal to market supply. This price is Birr 15 per kg because, at this price, quantity demanded is equal to quantity supplied, that is, 600 kg of oranges. Thus equilibrium price is determined as Birr 15 per kg. It is the only price at which the maximum number of buyers and sellers are satisfied. So long as market demand and supply remain unchanged, the price will neither tend to rise nor fall below this equilibrium price.

In Case of Excess Demand

Excess demand for a product means that the consumers want more than what the producers are willing to supply. If at a given price of a commodity, demand is in excess of supply, competition among buyers will push the price up to the point at which demand becomes equal to supply. Suppose the actual price of oranges prevailing at a particular time in the market is Birr 10 per kg. At this price, demand for oranges is for 800 kg, whereas supply is 400 kg, that is, there

is excess demand of 400 (= 800 – 400) kg. This will create competition among buyers to buy oranges which are in short supply and push the price up till it reaches the equilibrium price of Birr 15 per kg, where demand becomes equal to supply (= 600 kg of oranges).

In Case of Excess Supply

Excess supply of a product means that the consumers want less than what the producers are willing to supply. If at a given price, the quantity supplied of a commodity exceeds the quantity demanded, competition among sellers will push the price down to the point at which demand becomes equal to supply. Suppose at a particular time, price of oranges prevails at Birr 20 per kg at which the demand is for 400 kg against a supply of 800 kg, i.e., there is excess supply of 400 kg. Competition among sellers to sell their oranges will push down the price till it reaches Birr 15 per kg. Ultimately the price will settle at Birr 15 per kg at which demand is 600 kg oranges and supply is also 600 kg. This indicates demand and supply are holding each other in balance and the equilibrium price has been reached. Note that in the above illustration, the equilibrium price is Birr 15 per kg and the equilibrium quantity is 600 kg.

Graphical Presentation of Market Equilibrium

Determination of equilibrium price and equilibrium quantity can also be illustrated graphically with the help of a market demand curve and market supply curve.
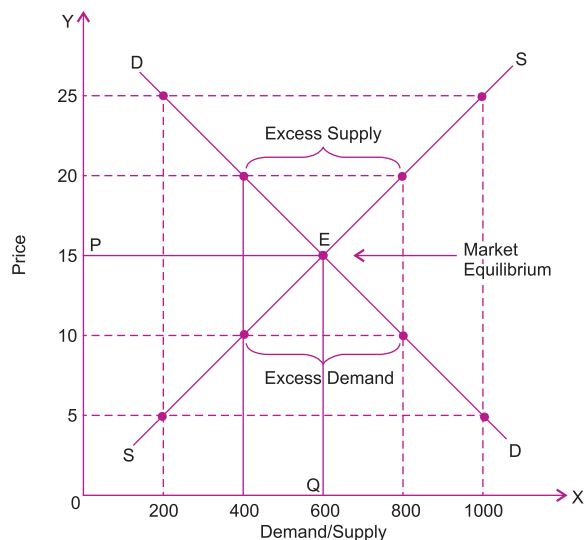
Figure 2.18:   Market equlibrium

The market demand/supply schedule of the previous illustration has been shown in the above graph in which DD is the demand curve and SS is the supply curve.

Both the curves intersect each other at point E where equilibrium price is OP (Birr 15) and quantity demanded and supplied are equal to OQ (600 kg). Thus OP (Birr 15) will be equilibrium price and OQ (600 kg) will be equilibrium quantity. In short, graphical equilibrium price of a commodity is the point of intersection of demand curve and supply curve. The situation of excess demand and excess supply have also been represented in the graph.

Mathematical Analysis of Market Equilibrium

We can find out the equilibrium price and equilibrium quantity through a mathematical analysis of market equilibrium, too. For this purpose, we formulate the market demand function and market supply function from the given data (if not given in ready form) and then equate the two. The process is better illustrated through the following examples:

Example 1: Let there be 5000 identical buyers of a commodity X in a market with an individual demand function of $D_X = 8 - P_X$, and 1000 identical sellers of commodity X with an individual supply function of $S_X = 20 \ P_X$, where D_X is quantity demanded, S_X is quantity supplied and P_X is price of the commodity X. For calculating the equilibrium price and equilibrium quantity, we formulate the market demand and market supply functions for the commodity X.

Solution:

Market demand function = Number of buyers × Individual demand function
$$= 5,000 \times (8 - P_X) = 40,000 - 5,000 \ P_X$$
Market supply function = Number of sellers × Individual supply function
$$= 1000 \times 20 \ P_X = 20,000 \ P_X$$
On equating the two market functions, we get:

$\quad$ $40,000 - 5,000 \ P_X = 20,000 \ P_X$ or $25,000 \ P_X = 40,000$

$\therefore \ P_X = \dfrac{40,000}{25,000} = 1.6$

Hence, equilibrium price of commodity X is Birr 1.6. On substituting the value of P_X in either of the two functions, say market demand function, we get:

Equilibrium quantity = $40,000 - 5,000 \ P_X$

> **Note:**
>
> We will get the same value for the of equilibrium quantity if we substitute the value of P_X in market supply function.

$\quad$ $= 40,000 - 5,000 \times 1.6 = 40,000 - 8,000 = 32,000$ units

Example 2: Assume in a market individual supply function of a commodity A is given by $S_A = 2P_A - 3$ and individual demand function is $D_A = 12 - 4P_A$.

There are 200 suppliers of commodity A with identical supply function and there are 8,000 buyers of the commodity A with identical demand function. Where; S_A is quantity supplied, D_A is quantity demanded and P_A is price of commodity A. Find market equilibrium price and quantity demanded.

Solution:

Market demand function = Number of buyers × Individual demand function

$$= 8,000 \times (12 - 4P_A) = 96,000 - 32,000P_A$$

Market supply function = Number of sellers × Individual supply function

$$= 200 \times (2P_A - 3) = 400P_A - 600$$

at equilibrium: market demand = market supply

$$96,000 - 32,000P_A = 400P_A - 600$$
$$96,000 + 600 = 400P_A + 32,000P_A$$
$$96,600 = 32,400P_A$$
$$P_A = 2.98 \text{ (approximately)}$$

Hence, equilibrium price of commodity A is Birr 2.98. On substituting the value of P_A in either of the two functions, say market demand function, we get:

Equalibrium quantity = $400 \times 2.98 - 600 = 1192 - 600 = 592$

Demand and Supply Curves do not Intersect each other – Is it possible?

A situation may arise when there are prospective consumers and producers of a commodity but still it is not produced. Why? It happens when the price at which producers are ready to produce is so high that the consumers are not willing to buy even a single unit of the commodity. In other words, in graphic terms, the demand curve and supply curve do not intersect each other at any positive quantity. As a result the product will not be produced. This shows the industry (of the product) is not economically viable.
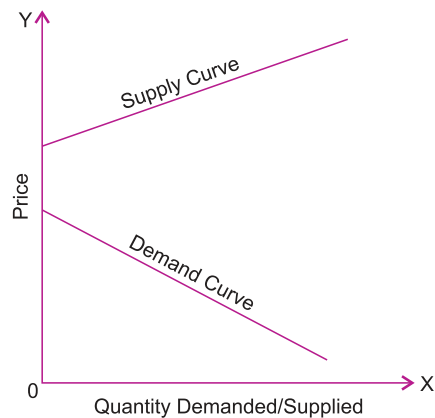
Figure 2.19: Non crosing demand and supply curves

Thus *a non-viable industry is one whose demand and supply do not intersect each other at any positive quantity*. It is an industry in which costs are too high for any positive output to be produced.

Effects of changes in Demand and Supply on Equilibrium Price and Equilibrium Quantity

By now we understand that equilibrium price and equilibrium quantity are determined at a point where demand equals the supply or where demand and supply curves cut each other. So far, we have assumed the supply and demand curves remain unchanged. But a shift in one or both of them causes the point of equilibrium to change. Let us recall that a rightward shift in the relevant curve means that more is demanded or supplied at a given price, while a leftward shift means less is demanded or supplied at that price. Now we shall study how a shift either in the demand or in the supply curve (that is, change in demand or supply) affects equilibrium price and quantity in the market. We discuss the effects of these shifts (changes) under various heads.

Effects of Change in Demand (or Shifts in the Demand Curve) when Supply Remains Constant

There can be two situations of change in demand.

i   *Effect of Increase in Demand:* Under the conditions of stable supply curve, if there is increase in demand (that is, a rightward shift of the demand curve), both equilibrium price and equilibrium quantity increase. When demand curve shifts to the right (DD to D_1D_1), the equilibrium price (OP to OP_1) and equilibrium quantity (OM to OM_1) both increase. This is shown in Figure 2.20.
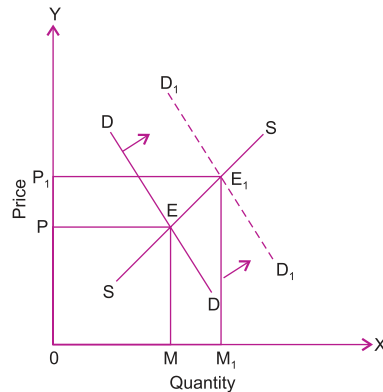
Figure 2.20:   Effect of increase demand

ii *Effect of Decrease in Demand:* Under the conditions of stable supply curve, if there is decrease in demand (i.e., a leftward shift of the demand curve), both the equilibrium price and equilibrium quantity decreases. When demand curve shifts to the left (DD to D_1D_1), both the equilibrium price (OP to OP_1) and equilibrium quantity (OM to OM_1) decrease. This is shown in Figure 2.21.
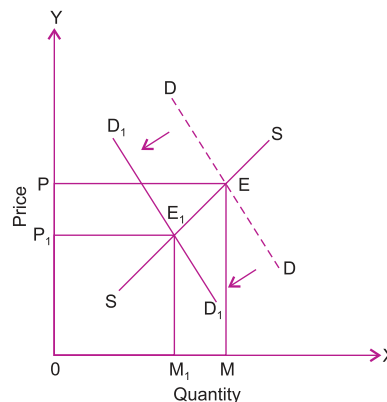
Figure 2.21:   Effect of decreasing demand

In brief, with the same supply curve:

★ the effect of increase in demand is higher equilibrium price and larger equilibrium quantity, and

★ the effect of decrease in demand is lower equilibrium price and smaller equilibrium quantity.

Effects of Change in Supply (or Shifts in the Supply Curve) when Demand Remains Constant
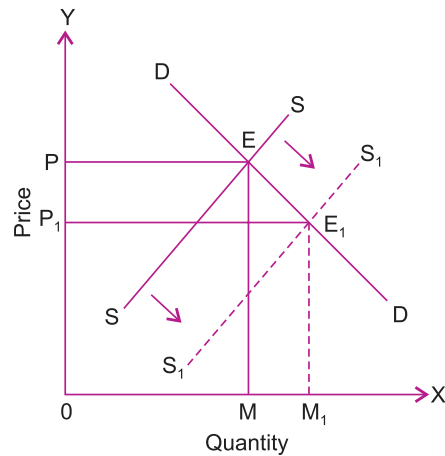
i **Effect of Increase in Supply:** Under the conditions of stable demand curve, if there is increase in supply (that is, a rightward shift of the supply curve), equilibrium price decreases and equilibrium quantity increases. When supply curve shifts to the right, price falls (OP to OP_1) but equilibrium quantity increases (OM to OM_1), as shown in Figure 2.22.

Figure 2.22: **Effect of increase in supply**

ii **Effect of Decrease in Supply:** Under the conditions of stable demand curve, if there is a decrease in supply (that is, a leftward shift to the supply curve), equilibrium price increases and equilibrium quantity decreases. When supply curve shifts to the left price rises (OP to OP_1) but equilibrium quantity decreases (OM to OM_1), as shown in Figure 2.23.
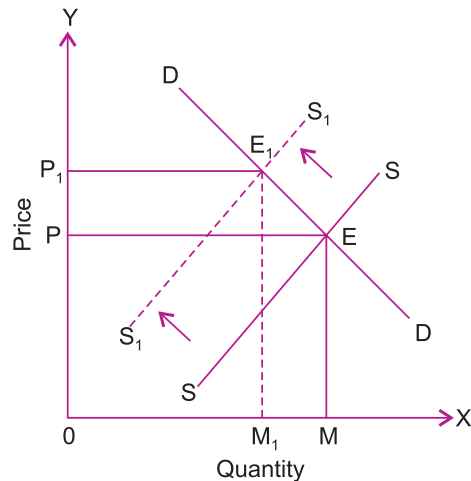
Figure 2.23: **Effect of decrease in supply**

In brief, with the same demand curve:

★ the effect of increase in supply is lower equilibrium price and larger equilibrium quantity, and

★   the effect of decrease in supply is higher equilibrium price and smaller equilibrium quantity.

Effect of Simultaneous Change in Demand and Supply (Simultaneous Shifts in Demand and Supply Curves)

Although there are various possibilities, we discuss below the two main possibilities:

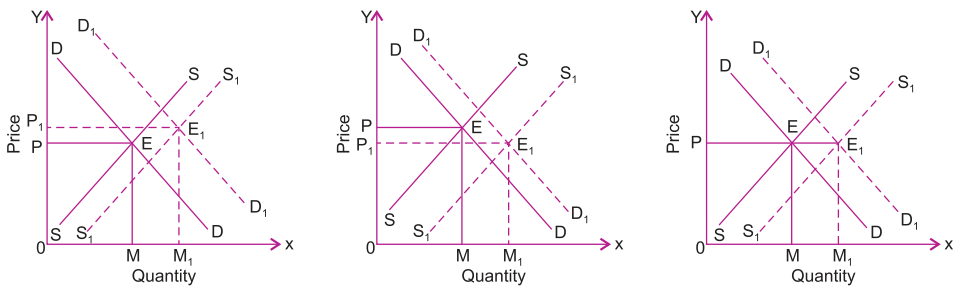i   ***When Both Demand and Supply Increase:*** If both demand and supply increase (that is, both demand curve and supply curve shift to the right), the equilibrium quantity would certainly rise. But the equilibrium price may rise, fall or remain unchanged. It depends on the comparative increase in demand and supply.

   a   If the increase in demand is greater than the increase in supply, the equilibrium price rises. (Figure 2.24A)

   b   If the increase in demand is smaller than the increase in supply, the equilibrium price falls. (Figure 2.24B)

   c   If the increase in demand and increase in supply are equal, the equilibrium price remains unchanged. (Figure 2.24C)

A)   *When increase in demand is greaterthan increase in supply*

B)   *When increase in demand smallerthan increase in supply*

C)   *When increasing demand and increase in supply are equal*

Figure 2.24:   When supply and demand increase at various ratios

ii   ***When Both Demand and Supply Decrease:*** If both demand and supply decrease (that is both demand curve and supply curve shift to the left), the equilibrium quantity would certainly fall. But the equilibrium price may rise, fall or remain unchanged.

   a   If the decrease in demand is greater than the decrease in supply, the equilibrium price falls. (Figure 2.25A)

   b   If the decrease in demand is smaller than the decrease in supply, the equilibrium price rises. (Figure 2.25B)

c If the decrease in demand and decrease in supply are equal, the equilibrium price remains unchanged. (Figure 2.25C)
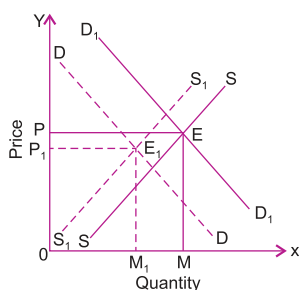
A) *When the decrease in demand is greater than the decrease in supply*
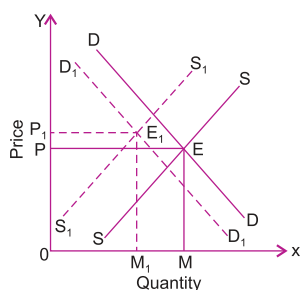
B) *When the decrease in demand is smaller than the decrease in supply*

C) *When the decrease in demand and decrease in supply are equal*

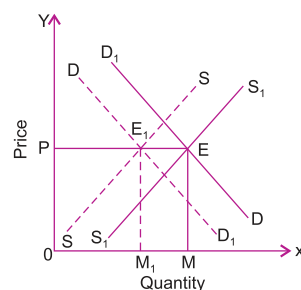**Figure 2.25:   When demand and supply decrease at different ratios**

The above discussion makes it clear that the effect of changes in demand and supply on the equilibrium price depends on the strength of the relative changes in demand and supply. The only certain thing is that the equilibrium price in all circumstances is determined at a point where demand curve intersects the supply curve.

We summarise below the main causes of changes in demand and supply.

Note:

It is possible that the demand curve shifts rightward and supply curve leftward. In that case, equilibrium price will definitely increase but quantity may increase or decrease. Similarly, if demand curve shifts leftward and supply curve rightward, equilibrium price will decrease, but quantity may increase or decrease.

Table 2.6:   Effect of Changes in Demand and Supply

Changes in demand and supply	Effect on equilibrium price	Effect on equilibrium quantity
Increase in demand	price rises	quantity increases
Decrease in demand	price falls	quantity decreases
Increase in supply	price falls	quantity increases
Decrease in supply	price rises	quantity decreases
Increase in both (i.e., demand and supply)	price may rise, fall or remain unchanged	quantity increases
Decrease in both (i.e., demand and supply)	price may rise, fall or remain unchanged	quantity decreases

2.3   MARKET EQUILIBRIUM

Activity 2.3

1   Prepare a graphical presentation of market equilibrium from the following data:

Price (Birr)	Demand (units)	Supply (units)
1	500	100
2	400	200
3	300	300
4	200	400
5	100	500

Also, read the equilibrium price and equilibrium quantity from the graph, and identify the market trends.

2   Prepare a demonstration (on chart paper or on your personal computer) that depicts, through diagrams, the impact of the following changes on market equilibrium:

a   An increase in supply when demand remains constant Figure 2.22.

b   A decrease in supply when demand remains constant Figure 2.23.

c   An increase in demand when supply is constant Figure 2.20.

d   A decrease in demand when supply is constant Figure 2.21.

Effects of Government Intervention on Market Equilibrium

Government may intervene in the market in many ways; one of the more prominent ways is of price control. In the interest of consumers and producers, the government executes the policy of price control by intervening in the market. This policy of price-control may have two variants:

★   maximum price and

★   minimum price.

In both the situations decisions are taken on the basis of demand and supply analysis.

Maximum Price Fixation (Price Ceiling)

Sometimes the supply of a commodity is so short that it creates shortages in the market and common consumers are unable to get the commodity from the market. Competitive prices are so high that they become out of reach for common consumers, only the rich can purchase and consume the commodity. In such a situation government comes forward and fixes the maximum price for the commodity. This process is known as *price ceiling*. We discuss the consequences of price ceiling with the help of Figure 2.26.
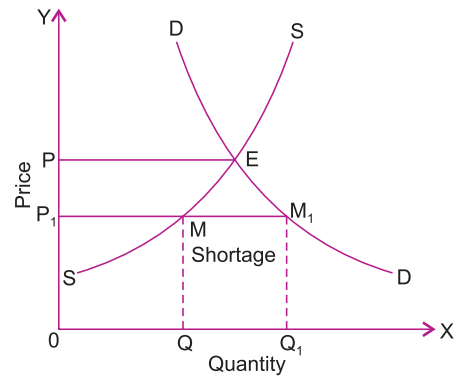
Figure 2.26:   A price celling

In the diagram demand curve DD intersects the supply curve SS at point E which gives OP as the equilibrium price. If at this stage, the government feels that this free market equilibrium-price is too high for the common and poor consumers then the government fixes the maximum price at OP_1 below the level of equilibrium price (that is, OP). At this OP_1 price the quantity demanded is equal to OQ_1 while the quantity offered for supply will only be equal to OQ. Thus, it is revealed that supply is less than the demand and it leads to the situation of shortages. We may conclude, *price ceiling causes shortages*.

Minimum Price Fixation (Price Floor)

Whenever government feels that the competitive price determined by the forces of demand and supply in a free market is not fair from the producers' point of view, government announces a minimum price to protect the interests of the producers. This is also termed as *support price* or *price floor*. It is very common with governments these days to protect the interests of the farmers. We discuss the consequences of price floor with the help of Figure 2.27.
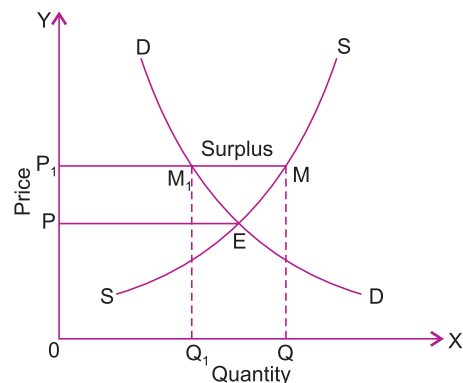
Figure 2.27:   A price floor

The intersection of demand curve DD and supply curve SS at the point E, gives the equilibrium price OP in the above diagram. If the producers feel that this free market price is low, they exert pressure on the government to enhance this price through legislation. In view of producers' interests government declares OP_1 as the minimum support price, which is above the level of equilibrium price. At this OP_1 price the demand for the commodity is OQ_1 while the supply is equal to OQ. Clearly the supply in this situation is greater than the demand. This creates the situation of surplus in the market which is equivalent to M_1M in the diagram. Thus, we may conclude *price floor causes surplus*.

2.4 ELASTICITY OF DEMAND AND SUPPLY

At the end of this section, you will be able to:

- ☐ define the concept of elasticity;
- ☐ identify and explain types of elasticity;
- ☐ calculate and derive the formula of price elasticity of demand;
- ☐ assess the determinant of price elasticity of demand;
- ☐ construct and compute the price elacticity of demand equation and graphical representation;
- ☐ analyze the relationship between price elasticity and total revenue;
- ☐ define the concept of income elasticity;
- ☐ calculate and drive the formula of income elasticity of demand;
- ☐ define the concept of cross-price elasticity demand; and
- ☐ calculate and drive the formula of cross-price elasticity of demand.

Key Terms and Concepts

- ┅ Elasticity
- ┅ Point elasticity
- ┅ Arc elasticity
- ┅ Elastic demand
- ┅ Inelastic demand
- ┅ Unitary elastic

Start-up Activity

How does your family respond to a price increase in a market? Does it continue purchasing the same amount of goods and services it used to while prices of goods and services rises up? Does it respond similarly to all goods and services it consumes? Do you think there are goods or services we shall be forced to consume the same amount as before even if prices goes up?

Elasticity is a measure of responsiveness of one variable to another. In economics, the concept of elasticity is very crucial and is used to analyse the quantitative relationship between price and quantity purchased or sold. Accordingly, we have the concepts of elasticity of demand and elasticity of supply. In the present sub-unit, we study these concepts, their determinants and the measurement of various types of elasticities.

Elasticity of Demand

It is price elasticity of demand which is usually referred to as elasticity of demand. But, besides price elasticity of demand, there are various other concepts of demand elasticity. As we know, demand for a good is determined by its price, incomes of the people, prices of related goods, etc. Quantity demanded of a good will change as a result of the change in the size of any of these determinants of demand.

Definition:

> **Elasticity of demand** *refers to the degree of responsiveness of quantity demanded of a good to a change in its price, or change in income, or change in prices of related goods.*

Accordingly, there are three kinds of demand elasticity: *price elasticity*, *income elasticity*, and *cross elasticity*. Price elasticity of demand refers to the responsiveness of the quantity demanded of a good to a change in its price. Income elasticity of demand refers to the sensitiveness of the quantity demanded to a change in income. Cross elasticity of demand means the degree of responsiveness of the demand of a good to a change in the price of a related good, which may be either a substitute for it or a complementary with it.

Price Elasticity of Demand

Price elasticity of demand means degree of responsiveness of demand to change in price. It indicates how consumers react to changes in price. The greater the reaction, the greater will be the elasticity, and the lesser the reaction, the smaller will be the elasticity. Price elasticity of demand is a measure of how much the quantity demanded of a good responds to a change in the price of that good, computed as the percentage change in quantity demanded divided by the percentage change in price.

For example, demand for commodities like clothes, fruit etc. changes when there is even a small change in their price, whereas demand for commodities which are

basic necessities of life, like salt, food grains etc., may not change even if price changes, or it may change, but not in proportion to the change in price.

$$\text{Price elasticity of demand } (e_p) = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} = \frac{\% \Delta Q_d}{\% \Delta P}$$

Determinants of Price Elasticity of Demand

There are many factors which determine the price elasticity of demand. The main factors are:

○ *Availability of substitutes: The most important determinants of the price elasticity of demand is the number and kind of substitutes available for a commodity. If a commodity has many close substitutes, its demand is likely to be elastic. Even a small fall in price will induce more people to buy this commodity rather than its substitutes. For instance, coffee and tea may be considered as close substitutes for one another. When the price of coffee falls, but the price of tea does not, many consumers will buy more coffee and less of tea since coffee has become relatively cheap. On the other hand, if a good has no or weak substitutes, the demand for it would be inelastic. This is the case with milk, salt and sugar which do not have good substitutes. Thus, when the price of milk increases, the quantity demanded will not decrease much, and, similarly, when the price falls, the quantity demanded will not increase much. In general, a commodity with close substitutes tends to have an elastic demand, and one with weak substitutes has an inelastic demand.*

○ *Nature of the commodity: One of the important determinants of price elasticity of demand is nature of the commodity, that is, whether it is a 'necessary' or a 'luxury' or a commodity of 'comfort'. Demand for necessities, such as food items, is generally inelastic. These goods are essential for existence. On the other hand, 'luxuries' and 'comforts' are not essential for existence and their consumption can be dispensed with or postponed. Thus, their demand changes by large amounts due to small changes in price. For example, a fall in the price of air conditioners, colour TV sets, and so forth may bring about a large increase in the quantities demanded of these goods. Generally the demand for necessities is inelastic and the demand for luxuries and comforts is elastic.*

○ *Proportion of income spent: Elasticity of demand for a commodity depends upon the proportion of her/his income which the consumer spends on it. The smaller the proportion of income spent on a commodity, the smaller will be the elasticity of demand and vice-versa. The demand for soap, salt, matches, etc., is highly inelastic since the consumer*

spends a very small proportion of his income on them. On the other hand, the demand for clothes, furniture, etc. is likely to be elastic since the consumer spends a large fraction of his income on these goods.

○ ***The number of uses of a commodity:*** *Elasticity of demand depends also upon the number of uses a commodity can be put to. The greater the number of uses to which a commodity can be put to, the greater will be its price elasticity of demand. Electricity, for example, can be used for lighting, cooking, heating, etc. If electricity is very expensive, it might be used for lighting only. As the price of electricity falls, it might be used for less important uses like cooking and heating. Accordingly, the demand for electricity will change greatly with a change in its price and, therefore, it is relatively elastic.*

○ ***Time factor:*** *The elasticity of demand depends on the size of the time period – short period or long period. Price elasticity is generally low for short periods as compared to long periods. This is for two reasons. Firstly, it takes time for consumers to adjust their tastes, preferences and habits. Secondary, new substitutes may be developed in the long run. Therefore, if the price of a commodity rises, the demand for it will be inelastic in the short-run as the substitutes may not be available. But in the long-run, demand will be elastic as the consumers may switch over to new substitute.*

○ ***Postponement of consumption:*** *Elasticity of demand depends on the possibility of postponement of consumption as well. Demand for a commodity is elastic if its consumption can be postponed. The consumption of clothing may be postponed and, therefore, a rise in its price may lead to a large fall in its demand. But the consumption of food items cannot be postponed. Therefore, their demand is inelastic.*

○ ***Price range:*** *Price elasticity of demand depends upon the range of prices. Demand for a commodity tends to be inelastic at very high and very low prices, and elastic within the moderate range of prices. At a very high price of the commodity, the demand for it will come from rich persons only. A rise or fall in its price will not affect its demand much, as it would still be out of reach for most of the people. If, on the other hand, the price of the commodity is very low, all those who want to buy it would have already purchased this commodity. A further fall in the price of the commodity, therefore, will not lead to much increase in amount demanded. However, the demand for the commodity is elastic within the moderate range of prices, as the commodity will be within the reach of a large number of consumers.*

○ *Habits of the consumers:* *Price elasticity of demand depends also upon whether or not the consumers are in the habit of using a commodity. If consumers are in the habit of consuming some commodities, they will continue to consume them even at higher prices. For instance, a smoker does not reduce much the number of cigarettes smoked as the price of cigarettes goes up. The demand for such commodities is usually inelastic.*

Measurement of Price Elasticity of Demand

The measurement of elasticity of demand can be looked at from two view points:

    i   point elasticity and

    ii   arc elasticity.

i   **Point Elasticity:** *When price elasticity of demand is measured at a point on a demand curve, it is called point elasticity.* In the following Figure 2.28 if we want to know the elasticity of demand at a point R on the demand curve, we call it point elasticity. The method used for measuring point elasticity is called Point Method.
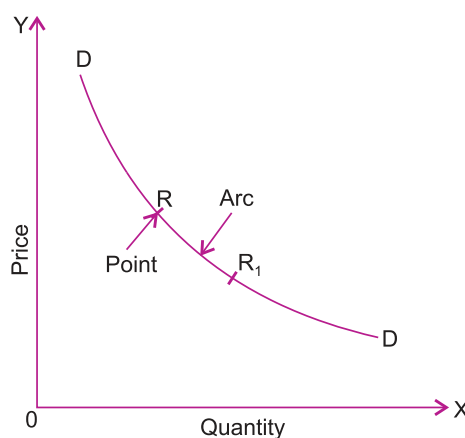
Figure 2.28:   **Point and arc elasticities**

ii   **Arc Elasticity:** *When elasticity of demand is measured over a finite range or 'arc' of a demand curve, it is called arc elasticity of demand.* For example, the measure of elasticity between point R and R_1 on the demand curve is the measure of arc elasticity.

Thus, $e_p = \dfrac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}$

$$= \dfrac{\dfrac{\text{\% change in quantity demanded}}{\text{Initial quantity}} \times 100}{\dfrac{\text{\% change in price}}{\text{Initial price}} \times 100}$$

$$= \dfrac{\dfrac{\Delta Q}{Q} \times 100}{\dfrac{\Delta P}{P} \times 100} = \dfrac{\Delta Q}{Q} \div \dfrac{\Delta P}{P}$$

$$= \dfrac{\Delta Q}{Q} \times \dfrac{P}{\Delta P} = \dfrac{\Delta Q}{\Delta P} \times \dfrac{P}{Q}$$

Thus: $|e_P| = \dfrac{\Delta Q}{\Delta P} \times \dfrac{P}{Q}$ (point price elasticity of demand) *(2.6)*

Where; e_p stands for price elasticity of demand,

Q stands for quantity (initial), P stands for price (initial),

ΔQ stands for change in quantity, ΔP stands for change in price.

Arc Price Elasticity of Demand

Arc price elasticity of demand measures price elasticity of demand between two points. The formula for arc price elasticity of demand arc is given by:

$$\text{Arc price elasticity of demand} = \overline{e}_P = \frac{\%\Delta Q}{\%\Delta P} \qquad (2.7)$$

$$\text{where}: \%\Delta Q = \frac{Q_2 - Q_1}{\dfrac{Q_1 + Q_2}{2}}, \quad \%\Delta P = \frac{P_2 - P_1}{\dfrac{P_1 + P_2}{2}}$$

$$\text{Thus, } \overline{e}_P = \frac{\dfrac{Q_2 - Q_1}{Q_1 + Q_2}{2} \times 100}{\dfrac{P_2 - P_1}{P_1 + P_2}{2} \times 100} = \frac{\dfrac{Q_2 - Q_1}{Q_1 + Q_2}}{\dfrac{P_2 - P_1}{P_1 + P_2}} = \frac{Q_2 - Q_1}{Q_1 + Q_2} \times \frac{P_1 + P_2}{P_2 - P_1}$$

by rearranging, it becomes, $\overline{e}_P = \dfrac{Q_2 - Q_1}{P_2 - P_1} \times \dfrac{P_1 + P_2}{Q_1 + Q_2}$

The arc elasticity formula is used if the change in price is relatively large. It is a more accurate measure of elasticity than point elasticity method.

Example: Consider a market for music CDs. When the price of CDs is birr 20 per unit, consumers by 6 units per year. When the price rises to birr 24 per unit consumers buy 4 CDs per year. Find price elasticity of demand for CDs using arc method.

Solution: *Given*: $P_1 =$ Birr 20, $P_2 =$ Birr 24, $Q_1 = 6$, $Q_2 = 4$

$$\overline{e}_P = \left(\frac{Q_2 - Q_1}{P_2 - P_1}\right)\left(\frac{P_1 + P_2}{Q_1 + Q_2}\right) = \left(\frac{4-6}{24-20}\right)\left(\frac{20+24}{6+4}\right)$$

$$= \left(\frac{-2}{4}\right) \times \left(\frac{44}{10}\right) = |-2.2| = 2.2$$

Remember that we ignore the minus sign when calculating price elasticity.

Mathematically speaking, price elasticity of demand is a negative number because of negative slope of the demand curve. In view of the negative slope

of the demand curve, the price and the quantity change in opposite directions from each other. Thus, while calculating price elasticity of demand by percentage method, the common practice is to ignore the negative signs, i.e., we should take only the absolute values and not their signs.

Another important feature of the price elasticity of demand is that it does not depend on the units of measurement of quantity of demand – whether kg of rice or litres of petrol – or the measure of price – whether in Ethiopian Birr or in U.S. dollars. It is a unit-free measure. Therefore, we can compare the price sensitivity of demand for different goods regardless of the units for measuring either price or quantity.

Let us calculate elasticity of demand by using the point method by taking a numerical example. Suppose the price of the commodity falls from Birr 5 to Birr 4 and quantity demanded increases from 100 units to 150 units.

In this example; *Given*: $Q_1 = 100$, $Q_2 = 150$, $P_1 = 5$, $P_2 = 4$

$\Delta Q = 150 - 100 = 50$, $P = 5$ and $|\Delta P| = |4 - 5| = 1$

$$|e_P| = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{50}{1} \times \frac{5}{100} = 2.5$$

that is, at price = Birr 5, if price decreases by 1%, quantity demand increases by 2.5%.

Geometrically, price elasticity of demand can be measured with the help of what is known as '*Point Method*'. According to this method, price elasticity of demand at any point on the demand curve can be measured by:

$$e_p = \frac{\text{Line segment below the point on the demand curve}}{\text{Line segment above the point on the demand curve}} \qquad (2.8)$$

Let us measure price elasticity of demand at point R on a linear or a straight line demand curve, AB, which is intercepted by both the axes.

$$|e_P| \text{ at point R} = \frac{\text{Lower line segment}}{\text{Upper line segment}}$$

Here, $|e_P| > 1$ because RB > RA.

$$= \frac{RB}{RA}$$
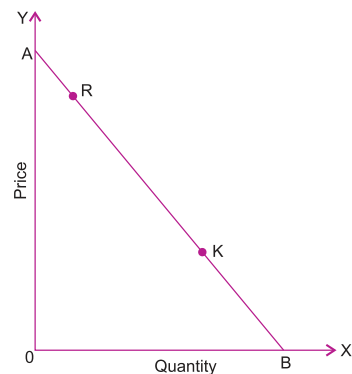
Figure 2.29: **Price elasticity of demand at a point**

Similarly, if we want to measure elasticity at any other point on the demand curve, say at K,

$$\left|e_P\right| \text{ at } K = \frac{KB}{KA}$$

Here, $\left|e_P\right| < 1$ since KB < KA.

Example: Consider the following demand curve. Assume the line segments AB, BC and CD have lengths of 3, 4 and 5 units respectively. Then, calculate price elasticity of demand at points A, B, C, and D.
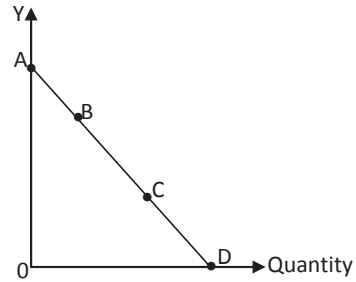
Figure 2.30:

Solution: *Given:* lengths of AB = 3 units, C = 4 units and CD = 5 units

$$e_p \text{ at point A} = \frac{AB}{po\,int\,A} = \frac{AB}{0} = \frac{3}{0} = \infty$$

note that the length of a point is zero.

$$e_p \text{ at point B} = \frac{BD}{BA} = \frac{BC+CD}{BA} = \frac{4+5}{3} = 3$$

$$e_p \text{ at point C} = \frac{CD}{CA} = \frac{CD+CD}{CB+BA} = \frac{5}{4+3} = 0.71 \ (approximately)$$

$$e_p \text{ at point D} = \frac{0}{DA} = \frac{0}{12} = 0$$

Range of Elasticities on a Linear Demand Curve

We can use the point method to illustrate elasticities at various points on a linear demand curve.

Figure 2.31:   Range of elasticities

1   At point A (where the demand curve touches the vertical axis)

$$e_P = \frac{\text{Line segment below A}}{\text{Line segment above A}}$$

$$= \frac{AB}{0} = \text{infinity } (\infty)$$

At any point above the mid-point but below A, say at E

$$\left|e_P\right| \text{ at } E = \frac{BE}{EA} > 1$$

because the lower segment is greater than the upper segment

2   At the mid-point, D

$$\left|e_P\right| \text{ at D} = \frac{BD}{DA} = 1$$

because the lower segment equals the upper

3   At any point below the mid-point but above B, say at C

$$\left|e_P\right| \text{ at C} = \frac{BC}{CA} < 1$$

because the lower segment is smaller than the upper segment

4   At point B (where the demand curve touches the horizontal axis)

$$\left|e_P\right| \text{ at B} = \frac{0}{AB} = 0$$

Types of Elasticity of Demand

Elasticity of demand is generally classified into the following five categories:

i   *Perfectly inelastic demand ($|e_p| = 0$):* When the demand of a commodity does not change at all, irrespective of any change in its price, it is said to be perfectly inelastic demand. Here elasticity of demand = 0 (Zero).
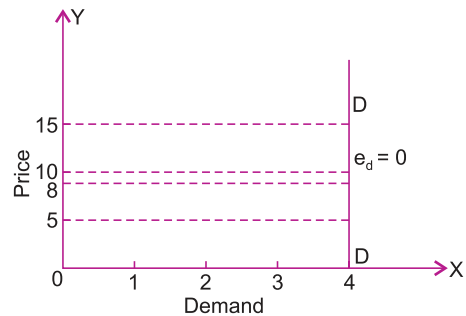
Figure 2.32:   **Perfectly inelastic demand**

The demand curve is vertical to the x-axis when elasticity of demand is perfectly inelastic.

ii   *Less than unit elastic demand ($|e_p| < 1$):* When percentage change in demand of a commodity is less than the percentage change in its price, it is said to be less elastic or less than unit elastic demand. Here elasticity of demand is less than 1.
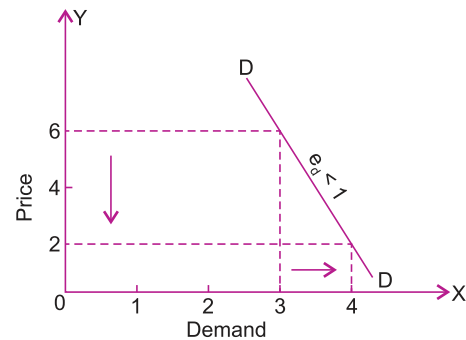
Figure 2.33:   **Less than unit elastic demand**

Price (Birr per kg)	Demand (kg)
6	3
2	4

iii   *Unit elastic demand ($|e_p| = 1$):* When percentage change in the demand of a commodity and percentage change in price are equal, it is said to be unit elastic demand. Here elasticity of demand is equal to 1.

Price (Birr per kg)	Demand (kg)
5	50
10	25
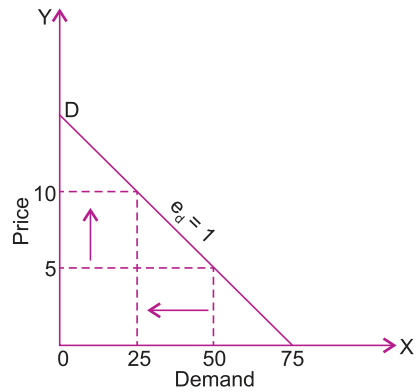
iv   *More than unit elastic demand ($|e_p| > 1$):* When percentage change in demand of a commodity is more than the percentage change in its price, it is called more than unit elastic demand. Here elasticity of demand is more than 1.

Price (Birr per kg)	Demand (kg)
3	100
4	25
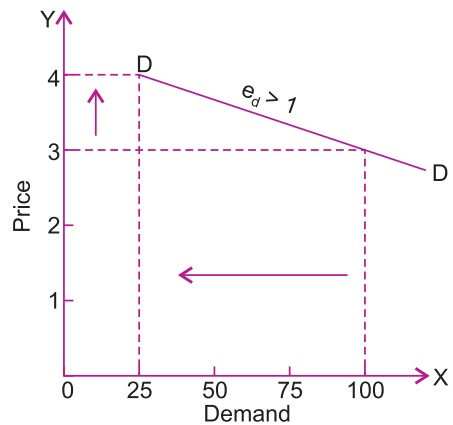
Figure 2.34:   More than unit elastic demand

v   *Perfectly elastic demand ($|e_d| = \infty$):* When demand of a commodity rises or falls to any extent without or with very little change in price, the demand for the commodity is said to be perfectly elastic or infinitely elastic demand. Here elasticity of demand = ∞.

Price (Birr per kg)	Demand (kg)
4	1
4	6
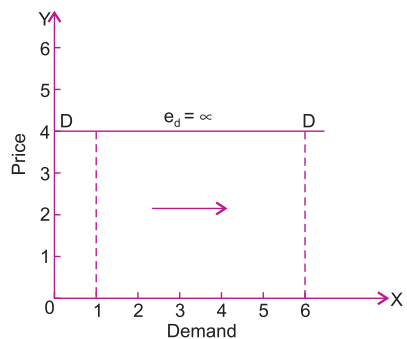
Figure 2.37:   Perfeclty elastic demand

Demand curve is horizontal when elasticity of demand is perfectly elastic.

Demand curve showing different types of price elasticities
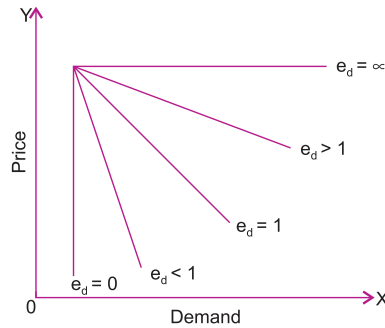
Figure 2.38:   Different levles of price elasticities

Table 2.7:   Types of Price Elasticities of Demand

Value of Elasticity of Demand	Types of Price Elasticity of Demand	Description
$|e_d| = 0$	Perfectly Inelastic	Change in price does not affect demand at all
$|e_d| < 1$	Less than Unit Elastic (inelastic)	% change in demand is less than % change in price
$|e_d| = 1$	Unit Elastic	% change in demand is equal to % change in price
$|e_d| > 1$	More than Unit Elastic (elastic)	% change in demand is more than % change in price
$|e_d| = \infty$	Perfectly Elastic	Demand changes infinitely

Price Elasticity of Demand and Total Revenue

Total revenue by definition is equal to price times quantity (TR = P × Q). If producers sell 10 units of a commodity at Birr 4 each, total revenue is Birr 40 (4 × 10). When the price of a commodity increases, it is not necessary that the total revenue of the seller will also increase. Rather, the change in total revenue (if any) depends upon the responsiveness of buyers to a change in price. We may say, the effect of a change in price on the total revenue, depends upon the price elasticity of demand for the commodity. We discuss the relationship between price elasticity of demand and total revenue under the following three heads:

i   ***When Demand is Price-Inelastic ($|e_p| < 1$):*** If the demand for a commodity is price-inelastic, the percentage decrease in quantity demanded is less than the percentage increase in price. This leads to an increase in total revenue due to increase in price. Similarly, a price decrease reduces the total revenue, in this case.

ii   ***When Demand is Price-Elastic ($|e_p| > 1$):*** If the demand for a commodity is price-elastic, the percentage decrease in quantity demanded is more than

the percentage increase in price. This leads to a decrease in total revenue due to an increase in price. On the other hand, a price decrease increases the total revenue, in this case.

iii **When Demand is Unit-Elastic ($|e_p| = 1$):** In this case, the percentage change in quantity demanded is equal to the percentage change in price. As a result, an increase or decrease in price leads to no change in the total revenue.

Table 2.8: Effects of total revenue to elasticity

Change in Price	Impact of Total Revenue		
	$\|e_p\| < 1$	$\|e_p\| > 1$	$\|e_p\| = 1$
Increase	Increase	Decrease	No Change
Decrease	Decrease	Increase	No Change

Income Elasticity of Demand

Income elasticity of demand is the ratio of proportionate change in demand to proportionate change in income. This elasticity explains as to what will be the effect on demand when income of the consumer changes provided other things (price of the commodity, tastes and preferences of the consumer, price of related goods etc.) remain constant. In other words, it explains the responsiveness in demand in relation to changes in the income of the consumer.

Income elasticity of demand can be measured as follows:

$$\text{Income Elasticity of demand } (e_i) = \frac{\text{Percentage change in demand}}{\text{Percentage change in income}} = \frac{\%\Delta Q_d}{\%\Delta Y}$$

$$e_i = \frac{\dfrac{\text{Change in demand}}{\text{Original demand}}}{\dfrac{\text{Change in income}}{\text{Original income}}} = \frac{\dfrac{\Delta Q}{Q}}{\dfrac{\Delta Y}{Y}} = \frac{\Delta Q}{Q} \times \frac{Y}{\Delta Y}$$

$$= \frac{\Delta Q}{\Delta Y} \times \frac{Y}{Q} \quad \text{(Point income elasticity of demand)}$$

(2. 9)

Where, Q stands for original demand

Y stands for original income

ΔQ stands for change in demand

and ΔY stands for change in income

The following example will further clarify the concept of income elasticity of demand:

Example: Suppose a consumer has money income of Birr 1000 and he purchases 4 kg of wheat. If his money income goes up to Birr 1200, he is now prepared to buy 5 kg of wheat. His income elasticity of demand can be found as follows.

Solution: *Given*: $Q_1 = 4$, $Q_2 = 5$, $Y_1 = 1000$, $Y_2 = 1,200$

$$\Rightarrow \Delta Q = Q_2 - Q_1 = 1 \quad \Rightarrow \Delta Y = Y_2 - Y_1 = 200$$

$$e_i = \frac{\Delta Q}{\Delta Y} \times \frac{Y_1}{Q_1} = \frac{1}{200} \times \frac{1,000}{4} = 1.25$$

> **Note:**
>
> The income elasticity of demand in the case of normal goods is positive, but in the case of inferior goods, it is negative.

The arc income elasticity of demand can be calculated using similar formula for arc price elasticity of demand.

$$\text{Arc income elasticity of demand} = \left(\frac{Q_2 - Q_1}{I_1 - I_2}\right)\left(\frac{I_1 + I_2}{Q_1 + Q_2}\right)$$

Where: I_1 = initial income, Q_1 = initial quantity demanded

I_2 = the new income, Q_2 = the new quantity demanded

Example: Suppose a consumer started consuming 12 kg of butter when his income increased to Birr 2000 – which he used to consume only 8 kg when his income was Birr 1600. The consumer's income elasticity of demand can be found using arc method as follows.

Solution: *Given:* $Q_1 = 8$ kg, $I_1 = $ Birr 1600, $Q_2 = 12$ kg, $I_2 = $ Birr 2000, $e_1 = ?$

$$\overline{e}_I = \left(\frac{Q_2 - Q_1}{I_2 - I_1}\right)\left(\frac{I_1 + I_2}{Q_1 + Q_2}\right)$$

$$= \left(\frac{12 - 8}{2000 - 1600}\right)\left(\frac{1600 + 2000}{8 + 12}\right) = \frac{4}{400} \times \frac{3600}{20} = 1.8$$

Cross Elasticity of Demand

Responsiveness in the demand for a commodity to the changes in the prices of its related goods is called cross elasticity of demand. In other words cross elasticity of demand may be defined as the ratio of proportionate change in the demand of one commodity (say x) to the proportionate change in the price of another

commodity (say y). It can be measured as follows:

$$\text{Cross Elasticity of Demand } (e_{xy}) = \frac{\%\ \text{change in demand for commodities } x}{\%\ \text{change in price of commodities } y}$$

$$= \frac{\dfrac{\Delta Q_x}{Q_y}}{\dfrac{\Delta P_y}{P_y}} = \frac{\Delta Q_x}{Q_x} \times \frac{P_y}{\Delta P_y}$$

$$e_{xy} = \frac{\Delta Q_x}{\Delta P_x} \times \frac{P_y}{Q_y} \quad \text{(Point cross price of elasticity of demand)}$$

(2. 10)

Where, Q_x = Original quantity of commodity x.

ΔQ_x = Change in quantity of commodity x.

P_y = Original price of commodity y.

ΔP_y = Change in price of commodity y.

The following example will further clarify the concept of cross elasticity of demand.

Example: Suppose the price of coffee rises from Birr 100 per kg to Birr 120 per kg. As a result, consumer demand for tea (being a good substitute for coffee) rises from 20 kg to 30 kg. Cross elasticity of demand for tea.

Solution: *Given*: $Q_{x_1} = 20$, $Q_{x_2} = 30$, $P_{y_1} = 100$, $P_{y_2} = 120$, $\Delta Q_x = 10$, $\Delta P_y = 20$,

$$e_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_y}{Q_x}$$

$$= \frac{10}{20} \times \frac{100}{20}$$

$$= \frac{5}{2} = 2.5$$

Thus, cross elasticity of demand for tea and coffee is 2.5. That is, if price of coffee increases by 1% demand for tea increases by 2.5%.

Note:

Cross elasticity of demand in the case of substitute goods (tea, coffee, oil, butter) will be positive because a change in the price of one commodity will change the demand for another commodity in the same direction, but in the case of complementary goods (car, petrol; pen, ink) it will be negative because change in the price of one commodity will cause a change in the demand for another commodity in the opposite direction.

Practical Work

1. Price per unit of a commodity increases from Birr 5 to Birr 6. As a result, the demand decreases from 100 units to 80 units. Calculate price elasticity of demand.

    Solution: *Given:* $Q_1 = 100$, $Q_2 = 80$, $P_1 = 5$ and $P_2 = 6$

    $\Delta Q = 100 - 80 = 20$

    $$e_P = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = 20 \,(5/100) = 1 \; (\textit{Point price elasticity of demand})$$

    ∴ Demand for the commodity is unit-elastic, that is, 1% increase in price causes 1% fall in quantity demand.

2. Demand for a commodity increased from 100 units to 120 units as a result of 10% fall in its price. Calculate price elasticity of demand.

    Solution: *Given:* $Q_{x_1} = 100$, $Q_{x_2} = 30$, $Q_{x_2} = 120$, fall in price = 10%

    $$e_P = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}}$$

    $$\% \text{ change in quantity demanded} = \frac{\text{change in quantity demanded}}{\text{change in quantity}} \times 100$$

    $$= \frac{120 - 100}{100} \times 100 = 20\%$$

    % change in price = 10%

    ∴ $\left| e_P \right| = \dfrac{20}{10} = 2$ (*Point price elasticity of demand*)

    ∴ Demand for the commodity is more than unit-elastic, that is, 1% fall in price cases 2% rise in quantity demanded.

3. On the basis of the given table, compare the price elasticities of two commodities X and Y.

	Commodity X		Commodity Y	
	Price	Quantity	Price	Quantity
Old	20	50	6	10
New	25	40	8	8

Solution: *In case of Commodity X:*

$$|e_P| = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$= \frac{50 - 40}{25 - 20} \times \frac{20}{50} = \frac{10}{5} \times \frac{20}{50} = 0.8$$

In case of Commodity Y:

$$|e_P| = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$= \frac{10 - 8}{8 - 6} \times \frac{6}{10} = \frac{2}{2} \times \frac{6}{10} = 0.6 \quad (\textit{Point price elasticity of demand})$$

$\therefore$ Demand for commodity X is more elastic.

4   At Birr 5 per unit, a consumer buys 40 units of a commodity and the price elasticity of his demand is 2. How much will he buy if the price reduces to Birr 4 per unit?

Solution: *Given:* $P_1 = 5$, $Q_1 = 40$, $e_P = 2$, $P_2 = 4$ and $Q_2 = ?$

$$e_p = \frac{\Delta Q}{\Delta P} \times \frac{P_1}{Q_1} = \left|\frac{Q_2 - Q_1}{4 - 5}\right| \times \frac{5}{40} = 2 = \frac{Q_2 - 40}{1} = 2 \times \frac{40}{5}$$

$$\Rightarrow Q_2 - 40 = 16$$

$\therefore$ New quantity $(Q_2) = 16 + 40 = 56$ units

The consumer will buy 56 units of the commodity, when its price reduce to Birr 4 per unit.

5   A consumers's weekly income rises from Birr 300 to Birr 320, and as a result his/her purchase of the good X increases from 25 units per week to 30 units. Calculate his income elasticity of demand.

Solution: *Given:* $Y_1 = 300$, $Y_2 = 320$, $Q_1 = 25$, $Q_2 = 30$

$$\Delta Y = Y_2 - Y_1 = 20, \quad\quad \Delta Q = Q_2 - Q_1 = 5$$

$$\therefore e_i = \frac{\Delta Q}{\Delta Y} \times \frac{Y_1}{Q_1} = \frac{5}{20} \times \frac{300}{25} = 3 \quad (\textit{Point income elasticity of demand})$$

6   Assume that the price of coffee rises from Birr 4.5 per 100 gm to Birr 5 per 100 gm and, as a result, the consumer demand for tea increases from 60 per hundred gm to 70 gram per hundred gm. Calculate the cross elasticity of demand of tea for coffee.

Solution: *Given:* $Q_{x_1} = 60$, $Q_{x_2} = 70$, $P_{y_1} = 4.5$, $P_{y_2} = 5$

$\Delta Q_x = Q_{x_2} - Q_{x_1} = 10$, $\Delta P_y = P_{y_2} - P_{y_1} = 0.5$

$$\therefore \quad e_{xy} = \frac{\Delta Q_x}{\Delta P_y} \times \frac{P_{y_1}}{Q_{x_1}} = \frac{10}{0.5} \times \frac{4.5}{60} = 1.5$$ (*point cross price elasticity of demand*)

Activity 2.4

1   Draw a linear demand curve and mark the different ranges of price elasticity of demand on it.

2   On chart paper, prepare a demonstration of mathematical formulae to compute the following:

a   % change in quantity demanded

b   Price elasticity of demand

c   Income elasticity of demand

d   Cross-price elasticity of demand

3   How do you illustrate price elasticiyt of demand using your personal experience to price changes of goods you frequently consume?

4   Outline the determinants of price ealsticity of demand and discuss how they affect level of consumption.

2.5   ELASTICITY OF SUPPLY

At the end of this section, you will be able to:

- ☐ explain the concept of elasticity of supply; and
- ☐ drive the formula and construct the graph of price elasticity of supply.

Key Terms and Concepts

- ➤ Elasticity of supply
- ➤ Inelastic supply
- ➤ Price elasticity of supply
- ➤ Unit elastic of supply
- ➤ Perfectly elastic supply

Start up Activity

Discuss on when and how sellers react to a change in price in the market in your local area.

Price Elasticity of Supply

Price elasticity of supply to change in price, indicates how sellers react to change in price. The greater the reaction, the greater will be the elasticity, lesser the reaction, the smaller will be the elasticity.

For example, if the price of wheat rises, the farmers may be tempted to sell more in the market, and keep less for themselves. On the other hand, if the price of cars rises, the car manufacturers may not probably be in a position to offer more cars for sale, because they may not be keeping stock of cars.

$$\text{Price Elasticity of Supply } (e_s) = \frac{\% \text{ change in quantity supplied}}{\% \text{ change in price}} = \frac{\%\Delta Q_s}{\%\Delta P}$$

(2.11)

Determinants of Price Elasticity of Supply

There are many factors which determine the price elasticity of supply. The main factors are:

- *Behaviour of cost of production: Elasticity of supply depends upon change in the cost of producing additional quantity of output. If an increase in output by the firms in an industry causes only a slight increase in their cost per unit or leads to a decrease in cost per unit, we would expect supply to be fairly elastic. If, on the other hand, an increase in supply leads to a large increase in cost of production, the supply would be relatively inelastic.*

- *Time element: A price change due to change in demand for a commodity may have a small response in the quantity supplied in the short-run since the production capacity may be limited. Therefore, in the short-run, supply tends to be relatively inelastic. However, in the long-run, new plants can be set up and production capacity can be expanded. Therefore, in the long-run supply tends to be elastic.*

- *Nature of the commodity: Nature of the commodity is also an important determinant of the elasticity of supply. For instance, the supply of durable products is relatively elastic. Durable goods can be stored and*

hence producers can meet the market demand by running down their stocks. Therefore, supply of such goods can be increased or decreased quickly in response to change in price. On the other hand, supply of perishable goods like milk and vegetables is relatively less elastic.

- *Availability of facilities for expanding output: The response of producers to changes in price depends on the availability of production facilities. If producers have sufficient production facilities, such as availability of raw materials, power, etc. they would be able to increase their supply in response to rises in prices of the commodities. The supply, therefore, will be elastic. But if, on the other hand, there is shortage of power, fuel and essential raw materials, the output would expand slowly in response to rises in prices of the commodities.*

- *Nature of inputs: Elasticity of supply depends on the nature of inputs used for the production of a commodity. If the production of a product requires inputs that are easily available, its supply would be more elastic. On the other hand, if it uses specialised inputs, its supply will be relatively inelastic.*

- *Risk-taking: The elasticity of supply is determined by the willingness of the entrepreneurs to take risk. If entrepreneurs are willing to take risk, the supply will be more elastic. On the other hand, if entrepreneurs hesitate to take risks, the supply will be inelastic.*

- *Expectation of future prices: If the producers expect a rise in the price of a commodity in future, producers will like to hoard the commodity to take advantage of rise in future price. The supply will, therefore, be less elastic. On the other hand, if they expect a fall in future price, they will release the goods from their stocks. The supply will be more elastic.*

Measurement of Price Elasticity of Supply

As the case with price elasticity of demand, we can measure the price elasticity of supply using different methods. However, a simple and most commonly used method is point method.

Point Method: The point method of measuring the price elasticity of supply is based on the definition of elasticity, that is, the ratio of proportionate change in quantity supplied of a commodity to a given proportionate change in its price. Thus, the formula for measuring price elasticity of supply is:

$$e_s = \frac{\dfrac{\Delta Q}{Q} \times 100}{\dfrac{\Delta P}{P} \times 100}$$

$$= \frac{\Delta Q}{Q} \times \frac{P}{\Delta P} = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} \quad (point\ price\ elasticity\ of\ supply) \quad (2.12)$$

Where, e_s stands for elasticity of supply

Q stands for initial quantity

ΔQ stands for change in quantity supplied

P stands for initial price

ΔP stands for change in price

Let us use this formula to calculate price elasticity of supply by taking examples.

Example 1: Suppose an increase in price of a ball pen from Birr 4 to Birr 5 results in increase in quantity supplied of pens from 1,000 to 1,500 units. Then find price elasticity of supply using the Arc method.

Solution: *Given:* $Q_1 = 1000$, $Q_2 = 1500$, $\qquad P_1 = 4$, $P_2 = 5$

$$\Delta Q = 1,500 - 1,000 = 500, \quad \Delta P = 5 - 4 = 1,$$

$$\therefore e_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{500}{1} \times \frac{4}{1000} = 2, \qquad (point\ price\ elasticity\ of\ supply)$$

If price increases by 1%, quantity supplied increases by 2%.

Price elasticity of supply can also be calculated using arc price elasticity fo supply formula.

Arc price elasticity of supply $= \left(\dfrac{Q_2 - Q_1}{P_2 - P_1} \right) \left(\dfrac{P_2 + P_1}{Q_1 + Q_2} \right)$

where P_1 is the initial price, Q_1 is the initial quantity supplied,

P_2 is the new price, Q_2 is the new quantity supplied

Example 2: A local producer of edible oil reduced its quantity supplied from 10,000 liters to 8,000 liters per month in response to price fall of oil from Birr 25 to Birr 20. Then find price elasticity of supply using the Arc method.

Solution: Price elasticity of supply using arc method can be found as follows.

Given: $P_1 = 25$, $Q_1 = 10,000$, $P_2 = 20$, $Q_2 = 8,000$

$$e_s = \left(\frac{Q_2 - Q_1}{P_2 - P_1}\right)\left(\frac{P_2 + P_1}{Q_1 + Q_2}\right)$$

$$= \left(\frac{8,000 - 10,000}{20 - 25}\right)\left(\frac{25 + 20}{10,000 + 8,000}\right) = \left(\frac{-2,000}{-5}\right)\left(\frac{45}{18,000}\right)$$

$$= 1$$

Note that price elasticity of supply is always a positive number varying between 0 and ∞. Also, it does not depend on the units of measurements of either quantity or price. It is a unit free measure.

Types of Elasticity of Supply

Elasticity of supply is generally classified into following five categories:

i   ***Perfectly inelastic supply (e_s= 0):***
When quantity supplied does not change at all irrespective of any change in price of the commodity, it is said to be perfectly inelastic supply. Here elasticity of supply = 0 (Zero).

Price (Birr per kg)	Supply (kg)
10	50
20	50
30	50
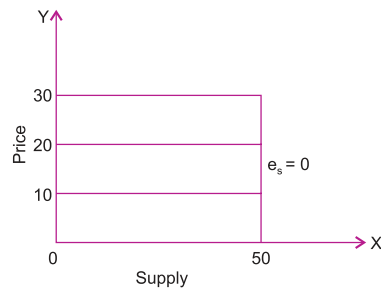
Figure 2.39:   Perfectly in elastic supply

ii ***Less than unit elastic supply (e_s< 1):***
When percentage change in quantity supplied is less than the percentage change in price, it is said to be less than unit elastic supply. Here elasticity of supply is less than 1.

Price (Birr per kg)	Supply (kg)
10	50
20	60
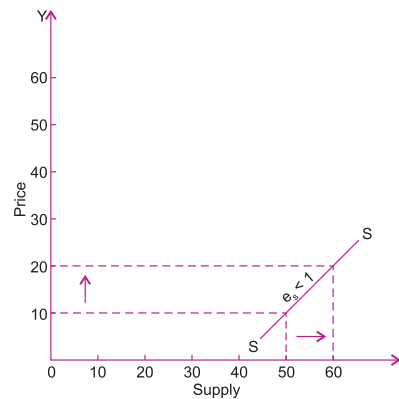
Figure 2.40:   Less than unit elasitc supply

iii **Unit elastic supply ($e_s = 1$):** When percentage change in quantity supplied and percentage change in price are equal, it is said to be unit elastic supply. Here elasticity of supply is equal to 1.

Price (Birr per kg)	Supply (kg)
10	50
20	100
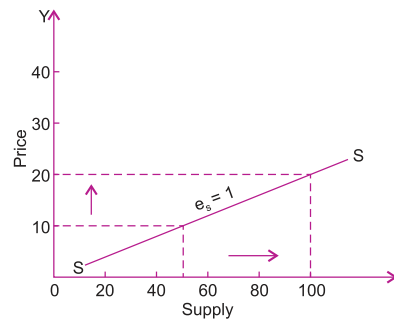
Figure 2.41: **Unit elastic supply**

iv **More than unit elastic supply ($e_s > 1$):** When percentage change in quantity supplied is more than *percentage change in price, it is said to be more than unit elastic supply. Here elasticity of supply is more than 1.*

Price (Birr per kg)	Supply (kg)
10	50
20	150
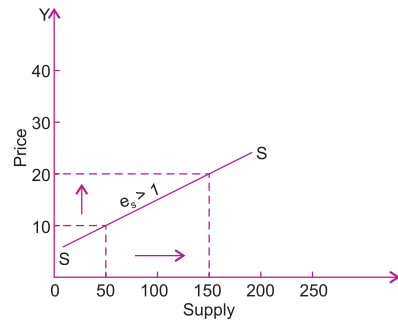
Figure 2.42: **More than unit elastic supply**

v **Perfectly elastic supply ($e_s = \infty$):** When supply of a commodity rises or falls to any extent without or with very little change in price, the supply of the commodity is said to be perfectly elastic or infinitely elastic supply. Here elasticity of supply = ∞ (infinity).

Price (Birr per kg)	Supply (kg)
20	100
20	300
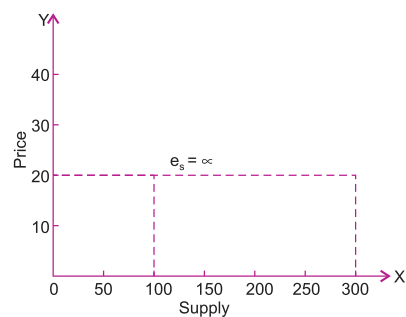
Figure 2.43: **Perfectly elastic supply**

Table 2.9: **Types of Price Elasticities of Demand**

Value of Elasticity of Supply	Types of Price Elasticity of Supply	Description
es = 0	Perfectly Inelastic	Change in price does not affect supply at all
es < 1	Less than Unit Elastic (inelastic)	% change in supply is less than % change in price
es = 1	Unit Elastic	% change in supply is equal to % change in price
es > 1	More than Unit Elastic (elastic)	% change in supply is more than % change in price
es = ∞	Perfectly Elastic	Supply changes infinitely

Practical Work

1   If price of a commodity falls from Birr 60 per unit to Birr 58 per unit, its supply decreases from 400 to 300 units. Find out its elasticity of supply.

Solution: *Given:* $P_1 = 60$, $P_2 = 58$, $Q_1 = 400$, $Q_2 = 300$

$$\Delta P = 60 - 58 = 2$$
$$\Delta Q = 400 - 300 = 100$$
$$\therefore e_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q} = \frac{100}{2} \times \frac{60}{400} = 7.5$$

∴ Supply of the commodity is highly elastic.

2   The coefficient of elasticity of supply of a commodity is 3. A seller supplies 20 units of this commodity at a price of Birr 8 per unit. How much of this commodity will the seller supply when price rises by Birr 2 per unit?

Solution: *Given:* $e_s = 3$, $P_1 = 8$, $\Delta P = 2$, $Q_1 = 20$, $Q_2 = ?$

We know that, $e_s = \dfrac{\Delta Q}{\Delta P} \times \dfrac{P_1}{Q_1}$

$$\Rightarrow e_s = \frac{Q_2 - Q_1}{2} \times \frac{8}{20} = 3$$
$$\Rightarrow Q_2 - 20 = 3 \times \frac{20}{4} \Rightarrow Q_2 - 20 = 15 \Rightarrow Q_2 = 35$$

∴ The supplier will supply 35 units at the commodity at 10 Birr per unit.

3   The quantity supplied of a commodity at a price of Birr 8 per unit is 400 units. Its price elasticity of supply is 2. Calculate the price at which its quantity supplied is 600 units.

Solution: *Given:* $e_s = 2$, $P_1 = 8$, $Q_1 = 400$, $Q_2 = 600$,

$$\Delta Q = 600 - 400 = 200, \quad P_2 = ?$$

We know that, $e_s = \dfrac{\Delta Q}{\Delta P} \times \dfrac{P_1}{Q_1}$

$$\Rightarrow 2 = \frac{200}{P_2 - P_1} \times \frac{8}{400} = \frac{4}{P_2 - 8}$$
$$\Rightarrow 2P_2 - 16 = 4 \Rightarrow 2P_2 = 20 \Rightarrow P_2 = 10$$

∴ The quantity supplied will be 600 units at a price of 10 Birr per unit.

4   When the price of a commodity falls from Birr 10 per unit to Birr 9 per unit, its quantity supplied falls by 20%. Calculate its price elasticity of supply.

Solution: *Given:* $P_1 = 10$, $P_2 = 9$, % $\Delta Q_s = 20\%$

$$e_s = \frac{\text{change in quantity supplied}}{\text{change in price}} \times 100$$

% change in quantity supplied = 20%

$$\% \text{ change in price} = \frac{\text{change in Price}}{\text{original Price}} \times 100$$

$$= \frac{(10-9)}{10} \times 100 = 10\% \Rightarrow e_s = \frac{20\%}{10\%} = 2$$

5   Calculate price elasticity of supply from the following data:

Price (Birr)	Total Revenue (Birr)
8	224
12	504

Solution: We know that

Total revenue = Price × Quantity

$$\therefore \quad \text{Quantity} = \frac{\text{Total Revenue}}{\text{Price}}$$

We calculate the units of quantity supplied for the given data, as follows:

Price (Birr)	Total Revenue (Birr)	Quantity (Units)
8	224	28
12	504	42

Given: $P_1 = 8$, $P_2 = 12$, $\Delta P = 12 - 8 = 4$

$Qs_1 = 28$, $Qs_2 = 42$

$$e_s = \frac{\Delta S}{\Delta P} \times \frac{P}{S}$$

$$= \frac{42\text{-}28}{12\text{-}8} \times \frac{8}{28} = 1$$

Activity 2.5

1   From the following supply schedule, calculate price elasticity of supply if the price falls from Birr 5 per unit to Birr 3 per unit.

Price per unit (Birr)	Quantity per unit of time (kg)
6	6000
5	5500
4	4500
3	3000
2	0

2   The coefficient of elasticity of supply of a commodity A is 3. What quantity of the commodity will a seller supply at the price of Birr 4 per unit if he supplies 30 units at Birr 3 per unit?

3   If price of a commodity falls from Birr 60 per unit to Birr 58 per unit, its supply expands from 300 to 400 units. Find out its elasticity of supply.

4   The coefficient of elasticity of supply of a commodity is 2. A seller supplies 20 units of this commodity at a price of Birr 10 per unit. What quantity of this commodity will the seller supply when price rises by Birr 12 per unit?

U N I T   R E V I E W

UNIT SUMMARY

- *Demand for* a commodity refers to the amount that will be purchased at a particular price during a particular period of time.

- *Individual demand* for a commodity is the amount purchased by a single consumer at a given price during a particular period of time.

- *Market demand* refers to the total quantity of a commodity that all households are prepared to buy at a given price during a specified period of time.

- *Determinants of demand* are the factors affecting the demand for a commodity. Important determinants of demand are:
  - *price of the commodity,*
  - *income of the consumer,*
  - *prices of related goods,*
  - *consumers tastes and preferences,*
  - *consumers expectations,*
  - *consumer-credit facility,*
  - *size and composition of population,*
  - *distribution of income,*
  - *government policy.*

- *A normal good* is a good for which the demand increases with increases in income.

- *An inferior good* is a good for which the demand tends to fall with an increase in the income of the consumer.

- *Substitute goods* are those goods which satisfy the same type of demand and can be used in place of one another.

- *Complementary goods* are those goods which are used jointly or together.

- *Giffen goods* are those inferior goods on which the consumer spends a large part of his income and whose demand falls with a fall in their prices.

- When the price of a good rises, the demand for it generally falls.

- When income rises, demand for a normal good rises but demand for an inferior good falls; demand for necessities is independent of the level of income, beyond a particular level of income.

- There is a direct relationship between the demand for a good and the price of its substitute.

- There is an inverse relationship between the demand for a good and the price of its complement.

❑ *The law of demand* states that, other things remaining equal, the quantity demanded of a commodity increases when its price falls and decreases when the price rises. The law can be illustrated with the help of a demand schedule a demand curve, and a demand function.

❑ *A demand schedule* is a table that shows different quantities of a commodity that would be demanded at different prices.

❑ *A market demand* schedule of a good is the sum of demand schedules of individual consumers.

❑ *A demand curve* is the graphical representation of a demand schedule.

❑ The *negatively slope of demand curves* or the law of demand showing the inverse relationship between price and the amount purchased is due to:

  ○ *diminishing marginal utility,*

  ○ *income effect,*

  ○ *substitution effect,*

  ○ *increase in number of consumers,*

  ○ *several uses of a commodity.*

❑ *Income effect* refers to change in demand on account of change in real income resulting from a change in the price of a commodity. A fall in price results in an increase in real income and vice-versa.

❑ *Substitution effect* is the effect that a change in relative prices of substitute goods has on the quantity demanded.

❑ *Exceptions* to the law of demand are:

  ○ *Giffen goods,*

  ○ *Prestige goods,*

  ○ *Expectations about future prices,*

  ○ *necessities, and*

  ○ *emergencies.*

❑ Changes in demand due to the changes in the price of the commodity itself are known as change in *quantity demanded*, whereas changes due to change in factors other than price are called *change in demand*.

❑ *Supply* of a commodity refers to the quantity of a commodity which producers are willing to produce and offer for sale at a particular price during a particular period of time.

❑ *Individual supply* refers to a quantity of a commodity which one firm is willing to produce and offer for sale at a particular price during a specified period.

❑ *Market or Industry's supply* is the quantity that all the producers are willing to produce and offer for sale at a particular price during a specified period.

- *Determinants of supply* are:
  - *Price of a commodity,*
  - *Goals of the firm,*
  - *Input prices,*
  - *Prices of related products,*
  - *Techniques of production,*
  - *Nature of the commodity,*
  - *The policy of taxation and subsidy,*
  - *Expectations of future prices,*
  - *Natural factors.*
- *Law of supply* states that other things remaining the same, the quantity of any commodity that firms will produce and offer for sale rises with a rise in price and falls with a fall in price.
- *Supply schedule* is a tabular statement showing various quantities which producers are willing to produce and sell at various prices during a given period, it is of two types:
- Individual supply curve,
- Market supply curve. A supply curve is normally positively sloping.
- Changes in supply due to the change in the price of the commodity itself are known as *change in quantity supplied*, whereas changes due to change in factors other than price are called *change in supply*.
- *Market equilibrium* refers to a situation in which quantity demanded of a commodity equals the quantity supplied of a commodity.
- *Equilibrium price* is the price at which quantity demanded equals quantity supplied. At any other price, demand and supply are not equal.
- *Equilibrium quantity* refers to the amount that is bought and sold at equilibrium price.
- *Diagrammatically, equilibrium price* is determined at the point of intersection of demand curve with supply curve.
- *An increase in demand* for a commodity causes an increase in both the equilibrium price and equilibrium quantity.
- *A decrease in demand* for a commodity causes a decrease in both, the equilibrium price and equilibrium quantity.
- *An increase in supply* of a commodity causes a decrease in the equilibrium price and increase in equilibrium quantity.
- *A decrease in supply* of a commodity causes an increase in equilibrium price and a decrease in the equilibrium quantity.
- *A simultaneous increase* in demand and supply of a commodity will result in no change in price, increase in price or decrease in price depending upon whether increase in demand is equal to, greater than or smaller than the increase in supply.

☐ *Elasticity of demand* refers to the degree of responsiveness of quantity demanded of a commodity to change in any of its determinants.

☐ *Price elasticity of demand* measures the ratio of percentage change in the quantity demanded of a commodity to a given percentage change in its price. The numerical value of price elasticity of demand ranges from zero to infinity.

☐ *Degree of price elasticity of demand* is expressed in terms of five types:
   O *zero elasticity,*
   O *infinite elasticity,*
   O *unitary elasticity,*
   O *greater than unity elasticity,*
   O *less than unity elasticity.*

☐ *Point elasticity of demand* measures elasticity at a point on the demand curve.

☐ *Arc elasticity of demand* measures elasticity over a finite range or arc of the demand curve.

☐ Three methods of measuring price elasticity of demand are:
   O *Percentage method,*
   O *Total expenditure method,*
   O *Geometric method or Point method.*

☐ *Percentage method or Proportionate method* measures the elasticity by dividing the percentage change in demand by percentage change in price. Symbolically,

$$e_P = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

☐ *Total expenditure method* measures the price elasticity of demand by considering change in the total expenditure as a result of change in the price of the commodity. If total expenditure remains unchanged with change in price, elasticity is equal to unity; if total expenditure change inversely with change in price, elasticity is greater than unity; if total expenditure changes directly with change in price, elasticity is less than unity.

☐ *Geometric method* measures elasticity by taking the ratio of line segment below the point on the demand curve to the line segment above the point.

☐ *Determinants* of price elasticity of demand are:
   O *availability of substitutes,*
   O *nature of the commodity,*
   O *proportion of income spent,*
   O *the number of uses of a commodity,*
   O *time factor,*
   O *postponement of consumption,*

- *price range,*
- *habits of the consumer.*

☐ *Income elasticity* measures the responsiveness of demand for a commodity to a change in the income of the consumer. Income elasticity of demand is positive in case of normal goods and negative in case of inferior goods.

☐ *Cross elasticity* measures the responsiveness of demand for a commodity to a change in the price of the related commodity. Cross elasticity is positive in case of substitute goods and negative in case of complementary goods.

☐ *Price elasticity of supply* measures the degree of responsiveness of the quantity supplied of a commodity to a change in its price.

☐ *Measurement of elasticity of supply*:

$$e_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

☐ *Determinants of elasticity of supply* are:
- *Cost of production,*
- *Time factor,*
- *Nature of the commodity,*
- *Availability of facilities for expanding output,*
- *Nature of inputs,*
- *Risk taking,*
- *Expectations of future prices.*

REVIEW EXERCISE FOR UNIT 2

I *Distinguish between the following:*

1 Income demand and price demand
2 Normal goods and inferior goods
3 Direct demand and derived demand
4 Complementary goods and substitute goods
5 Market demand and individual demand
6 Change in demand and change in quantity demanded
7 Individual supply and market supply
8 Change in supply and change in quantity supplied
9 Excess demand and excess supply
10 Price ceiling and price floor.

II *Match the items in column A with those in column B:*

Column A		Column B
11	More demand at lower price	A Increase in demand
12	Less demand at higher price	B Decrease in demand
13	More demand at the same price	C Extension of demand
14	Same demand at lower price	D Downward movement along the same demand curve
15	Extension of demand	
16	Increase in demand	E Contraction of demand
17	Contraction of demand	F Upward movement along the same demand curve
18	Decrease in demand	
19	More supply at same price	G Leftward shift in the demand curve
20	Same supply at higher price	H Rightward shift in the demand curve
		I Decrease in supply
		J Increase in supply

III *Write 'True' or 'False' for each of the following:*

21 A change in price of coffee may affect the demand for tea.

22 A change in price of wheat may affect the supply of petrol.

23 The demand for sugar may increase due to an increase in population.

24 A decrease in supply refers to a rightward shift in supply curve.

25 The only factor that can cause a change in quantity demanded is the price of the commodity.

26 Giffen goods are a special category of inferior goods.

27 A rise in the price of normal goods leads to a fall in quantity demanded.

28 A change in income causes a change in quantity demanded.

29 An increase in demand leads to a fall in equilibrium price.

30 Price ceiling causes surplus.

IV *In case of each of the following, four choices are given but only one out of them is correct. Choose the correct one.*

31 Demand reflects the quantity that consumers:

    A   want at alternative prices.

    B   need at alternative prices.

    C   are willing and able to buy at alternative prices.

    D   can buy at alternative prices.

32 A price change:

    A   affects the consumer's ability to buy the good.

    B   affects the consumer's willingness to buy the good.

    C   changes the tastes of consumers.

    D   all of the above.

33 Which one of the following is not held constant in defining the demand schedule?

    A   income

    B   prices of related goods

    C   prices of the good in question

    D   number of consumers

34 A movement along a demand curve can be caused by a change in:

    A   income

    B   the price of a substitute or complement

    C   expectation about future prices

    D   the price of the good in question

35 If a supply curve is a vertical straight line, the value of elasticity of supply(e_s) is:

    A ∞ B   >1   C   <1   D   0

V *Write very short answers to the following*

36 Give an example of a substitute good.

37 What happens to the demand for substitute goods of a commodity when the price of the commodity falls?

38 What will be the effect on the demand for tea if the price of coffee rises?

39 Give two examples of complementary goods.

40 What will be the effect on the demand for ink if the price for pens falls?

41   What do you understand by unrelated goods.

42   If the demand for good Y increases as the price of another good X rises, how are the two goods related?

43   If the quantity demanded of commodity X decreases as the household's income increases, what type of good is X?

44   If the demand for good Y decreases as the price of another good, X, falls, how are the two goods related?

45   If the demand for good Y increases as the price of another good X falls, how are the two goods related?

46   If the demand for good Y decreases as the price of another good, X, rises, how are the two goods related?

47   How does a favourable change in tastes affect the demand and demand curve for a commodity?

48   How would you obtain a market demand curve from given individual demand curves?

49   If demand becomes zero with a slight rise in the price, what would you call such a demand?

50   When the proportionate (or percentage) change in quantity demanded is more than the proportionate (or percentage) change in price, what is the elasticity of demand?

51   What will be the elasticity of supply if the change in quantity supplied is exactly in proportion to the change in price?

52   Draw a unitary elastic supply curve.

53   When is the market said to be in a state of equilibrium?

54   If nothing is supplied, even at a marginally reduced price, what will be the elasticity of supply?

55   When supply remains unchanged, what is the effect of change in demand on price?

56   Suppose the market demand function for good X is given by $Q_x = 30 - 2P$, and the supply function for good X is given by $Q_x = -6 + P$. Then, calculate the:

    a   market clearing price and quantity respectively.

    b   price and supply elasticity of demand.