Elasticity of Demand-

It is defined as the responsiveness of the quantity demanded of good to the change in price, income, and price of related good. We can say it is percentage change in quantity demanded divided by percentage changes in price, income and price of related goods.

$$E_D = \frac{\% \text{ change in demand}}{\% \text{ Change in determinants of demand}}$$

With the concept in mind, we will now discuss the different type of elasticity of demand-

1. Price Elasticity of Demand
2. Income Elasticity of Demand
3. Cross Elasticity of Demand
4. Advertising or Promotional elasticity of Demand

1. Price Elasticity of Demand-

Price elasticity of demand expresses relationship between change in quality demanded of a commodity and a proportionate change in its price. While calculating price elasticity of demand the determinants of demand should be kept constant.

If say 'elasticity of demand' only we mean to say price 'elasticity of demand'. It is expressed as

$$E_P = \frac{\% \text{ change in demand}}{\% \text{ change in demand}}$$

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

Where:

ΔQ= Change in quantity

ΔP= Change in price

Q=Original quantity

P=Original price

Degree or Types of Price Elasticity-

Price elasticity demand is negative for all goods except for goods (inferior goods) that are exception to the law of demand. Price elasticity between varies 0 & ∞, which will be the respective condition when the goods is completely inelastic or perfectly elastic.

i]Perfectly Elastic Demand-

$$E=\infty$$

When demand of a commodity increased or decreases to any extent without any change or only upon a small change in its price, is called perfectly elastic demand. In other words when demand of a commodity keeps on changing even if there is no change in its price. (It is an imaginary condition

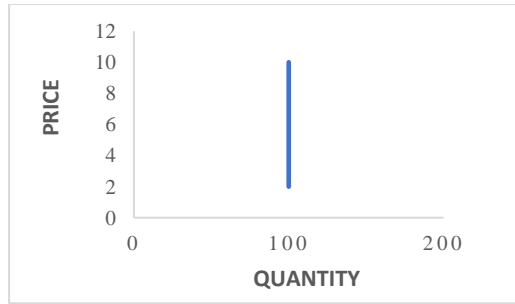| Price (₹)	Quantity (Unit)
10	100
10	110
10	120
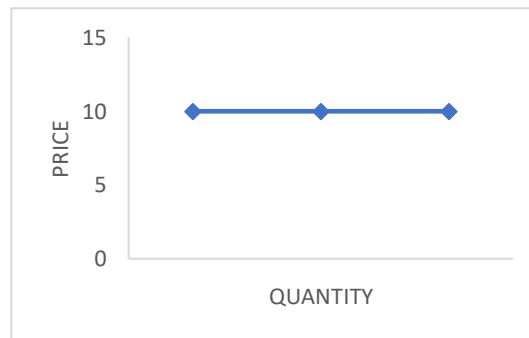
ii]Perfectly Inelastic Demand-

$$E=0$$

When demand of a commodity does not change at all irrespective of any change in price, it is called perfectly inelastic demand.

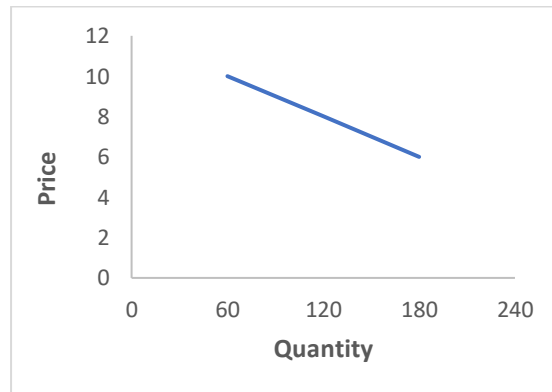| Price (₹)	Quantity (Unit)
10	100
8	100
6	100
2	100

iii].Unitary Elastic Demand-

$$E=1$$

Price elasticity of Demand is unity when the change in demand is exactly proportionate to the change in price. For eg.- If on 10% increase in the price of a commodity, demand decrease 10%, it will be called unity elastic. Eg. Commodities lie cars, fashion items.

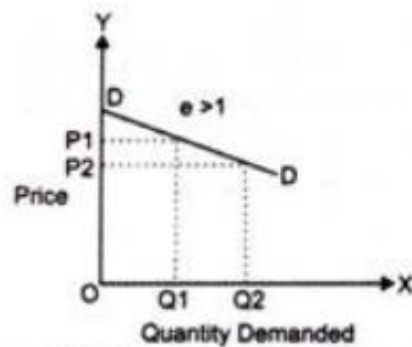| Price (₹)	Quantity (Unit)
10	60
8	120
6	180

iv]Highly Elastic or relative Elastic Demand-

$$E>1$$

When the proportionate change in demand of a quantity is more than the proportionate change in its price. Eg- Luxurious goods

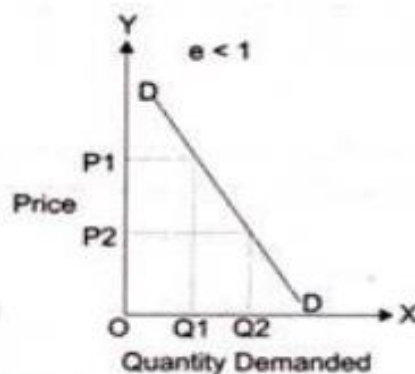| Price (₹)	Quantity (Unit)
10	100
8	140
6	200

Figure-4: Relatively Elastic Demand

v] Inelastic Demand or Less or Relative Inelastic Demand-

$$\boxed{E<1}$$

Whem propotionate change in the demand of a commodity is less than poportionate change in price. Eg.- Wheat and Milk

Price (₹)	Quantity (Unit)
10	1
8	2
6	3

Figure-5: Relatively Inelastic Demand

Determinants of price Elasticity of Demand-

The elasrticity of demand varies from commodity to commodity while the demand for some commodity is highly elastic, the demand for others is highly inelstic. Following are the maing determinants of thr elasticity of demand.

   1. **Availibility and Closeness of sustitute-**

Fewer close susbtitute of the product, less elastic the demand for the product and vice versa.

   2. **Propotion of income spent on the product-**

When the good proportion of income spent is more, more elastic the demand for the product and vice versa

3. Time period-

Demand is more elastic in long run than in short run. Urgency is less elastic demand.

4. Uses of Product-

The price elasticity of demand would be higher for those products which habe large number of use.

5. Habit Formation-

The demand for the product which the consumer consume due to habit is relatively inelastic demand.

Aplication of Price Elasticity Demand-

1. Pricing decision of business organization
2. Pricing regulation by the government
3. Paradox of plenty
4. Use in the international trade
5. Fiscal Policy

Measurment of Price Elasticity of Demand-

Thereare five methods of measuring elasticity of demad

1. **Percentage Method-**

In this method price elasticity of demand is measured by the ratio of percentage change in quantity demanded divided by the percentage change in price of a commodity.

$$E_P = \frac{\% \text{ change in demand}}{\% \text{ change in demand}}$$

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

Where:

ΔQ= Change in quantity

ΔP= Change in price

Q=Original quantity

P=Original price

2. **Point Method-**

Under this medhod the price elasitcoty od demand is measured geometrically. Price elasticity of demand at any poit can br measured by appkying he following formula-

$$E_p = \frac{\text{Lowe segment of the demand curve}}{Upper \text{ segment of the demand curve}}$$

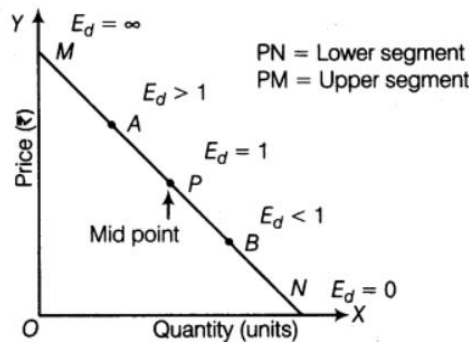Point elasticity is the elasticity of demand at a finite point on a demand
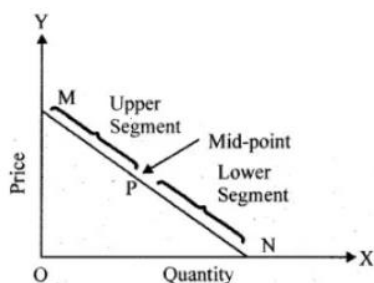
$$E_p = \frac{PN}{PM}$$

Note-

1. At mid point of linear demand curve, $e_p=1$
2. At any point above the mid point, $e_p>1$
3. At any point belowthe mid point, $e_p<1$

4. At extreme point, N $e_p = 1$
5. At extreme point e_p is undefined because division by zero is undefined.

3. **Revenue Method**-

Revenue refers to the sale proceeds of a firm. Elasticity of a demand can be estimated if average revenue and marginal revenue are known. Average revenue is the price per unit of comodity. Margin revenue is the additional to total revenue by sale of an addutional unit of the commodity.

$$E_p = \frac{A}{A - M}$$

Where,

A= Average revenue

M= Marginal revenue

4. **Total outlay or Expenditure Method-**

According to this method the elasticity of demand is measured by considering the change in total outlay as a result of change in price of the commodty. In this method we compare the total expenditure before and after the price change and there we find the elasticity of demand.

Total Outlay= Quantity purchased* Price of commodity

Price per Unit	Demand(Unit)	Total Expenditure	Comments
7	6	42	Position before change in price
6	10	60	$E_p > 1$
6	5	30	$E_p < 1$
6	7	42	$E_p = 1$

5. **Arc Method-**

Segment of curve between two points is called an arc. The measure of elasticity of demand detween any two finite point on the demand curve is known as arc elasticity.
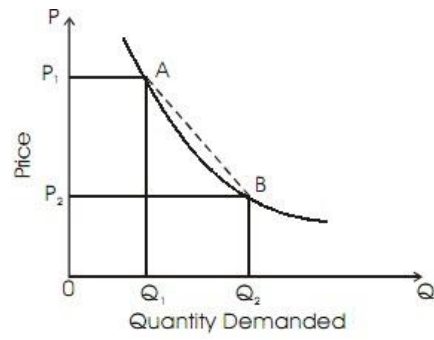
Here we have to take average price of OP_1 and OP_2 and average of orignal and new demand.

$$E_p = \frac{\Delta Q}{\Delta P} \times \frac{(P_1 + P_2)}{(Q_2 + Q_2)}$$

2.Income Elasticity of Demand

A responsiveness or degree of change in demand for a product as a result of change in income is known as income elasticity. The formula for calculating income elasticity of demand is the percent change in quantity demanded divided by the percent change in income. With income elasticity of demand, you can tell if a particular good represents a necessity or a luxury.

$$E_Y = \frac{\% \ Change \ in \ demand \ for \ a \ product}{\% \ Change \ in \ income \ of \ consumer}$$

i Income elasticity more than 1

The positive income elasticity of demand will be more than unitary if the proportionate change in the amount of a product demanded is higher than the change in consumer income in due proportion.

E>1   eg.- Five star hotels[Luxury]

ii   Income elasticity less than 1

If the change in the amount of a product demanded in due proportion is less than the change in consumer income in due proportion, positive income elasticity of demand will be less than unitary.

E<1   eg.- Essential goods

iii Income elasticity is 0

It corresponds to the situation when there is no impact of rising household income on commodity production. Such goods are termed essential goods. For example, a high-income consumer and a low-income consumer will need salt in the same quantity.

E=0   eg.- Salt

iv   Income elasticity is negative

It refers to a condition in which demand for a commodity decreases with a rise in consumer income and increases with a fall in consumer income. Inferior goods are such commodities. For example, the demand for millet will decrease if the income of consumers increases since they will prefer to purchase wheat instead of millet. Thus, millet is an inferior good to wheat for customers.

E<0   eg.- Coarse grain

v Income elasticity is more than 0

E>0   eg.- Normal goods

vi Income elasticity is equal to 1

The positive income elasticity of demand will be unitary if the proportionate change in the amount of a product demanded equals the change in consumer income in due proportion.

E=1   eg.- Semi Luxury

3.Cross Elasticity of Demand

The quantity demanded of a particular commodity varies according to the price of other commodities. Cross elasticity measures the responsiveness of the quantity demanded of a commodity due to changes in the price of another commodity. For example, the demand for tea increases when the price of coffee goes up. Here the cross elasticity of demand for tea is high. If two goods are substitutes then they will have a positive cross elasticity of demand. In other words, if two goods are complementary to each other than negative income elasticity may arise.

$$E_c = \frac{Proportionate\ change\ in\ purchase\ of\ commodity\ X}{Proportionate\ change\ in\ price\ of\ commodity\ Y}$$

1. When cross elasticity is more than 0 (Substitute goods)

    Ec>0

    eg. Gur and Sugar

2. When cross elasticity is less than 0 (Complimentary goods)

    Ec<0

    eg. car and petrol

3. When cross elasticity is equal to 0 (Unrelated goods)

    Ec = 0

    eg. cycle & cake

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Samuelson, Paul A;Nordhaus, William D.(2014).Economics. Boston, Mass: Irwin McGraw-Hill.