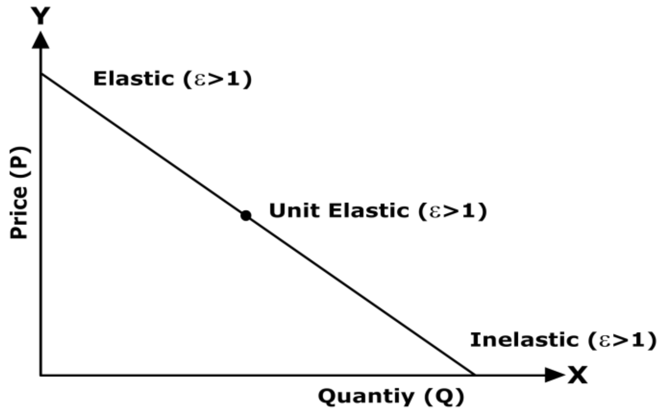

Figure 1: Linear demand Curve has different elasticities at different points

We know that for most goods, a fall in price will cause an expansion in demand, but if that expansion in demand were proportionately greater than the fall in price, then we would say that quantity demanded is very responsive to a price change; thus demand is said to be ***relatively elastic.*** The opposite situation, ***relatively inelastic*** demand, indicates that there has been a less than proportionate change in quantity demanded – a weak response to price change. When the total amount spent remains unchanged, the proportionate change in quantity demanded is the same as the proportionate change in price, and demand is said to be ***unitary elastic.***

Another case is when we have a perfectly vertical demand curve, which indicates that the quantity demanded will be exactly the same, regardless of price. This type of demand curve is called a perfectly inelastic demand curve (see figure 3). A perfectly horizontal demand curve indicates that consumers will have almost any quantity demanded, but only at that price. This type of demand curve is called perfectly elastic demand curve (See figure 2). There is another type of demand curve which is non-linear rectangular hyperbola. It has constant elasticity all along the curve (Figure4). It is also called constant elasticity demand curve.

Illustration : if price of X goes up from Rs20 to Rs 25 and demand for X falls from 3000 to 2700 units, then

$$\text{Elasticity} = \frac{(\Delta Q)}{(\Delta P)} * \frac{P}{Q} = \frac{-300}{5} * \frac{20}{3000} = -0.4$$ (hence demand is relatively inelastic)

This is also known as **point elasticity of demand**. It is computation of elasticity at a point on the demand curve.
There is another method to calculate elasticity between 2 different points on an interval on a demand curve (Linear or Non-linear), which is known as ***interval elasticity*** or ***arc elasticity.***
To measure elasticity over an interval, the above formula gets modified slightly. Instead of taking P/Q, we take Average P/Average Q (i.e. average of prices and average of quantities at two points).

The formula becomes: $$\textbf{Elasticity} = \frac{(\Delta Q)}{(\Delta P)} * \frac{\text{Average } P}{\text{Average } Q}$$

Elasticity varies along a demand curve (Generally)

a) Linear Demand Curve: To see why, we look at the mathematical formula for elasticity, we know, in a linear demand curve, slope $(\Delta Q)/(\Delta P)$ is constant. Moving along a linear demand curve doesn't change slope but the second component of the elasticity formula (P/Q) varies as we move from one point to another, thereby, leading to change in the total value of elasticity. If we move down the curve, the ratio P/Q falls, which reduces the absolute value of ε falls. Similarly if we move up the curve, P/Q increases leading to increase in the absolute value of ε. There is a direct relation between P and ε
b) Curved Demand Curve: in a non-linear demand curve, both slop as well as the ratio changes as we move from one point to another. However, there is no relation between P and ε as such.
c) Rectangular Hyperbola with the functional form $Q = aP^b$: the elasticity is constant and is equal to b. the value of b can be greater than, less than or equal to 1. Hence this form of demand can be more elastic, less elastic or unitary elastic.

Why is elasticity important for us?

Total revenue and Price elasticity of demand

One way to see why price elasticity of demand might be useful is to consider the question: How will revenue from sale of goods change as we change price?
Total revenue, which is defined as total amount producers earn from a good (TR = P*Q) gets affected by change in P and change in Q, which move in the opposite direction.