

Ordinal Utility Analysis

- Cardinal utility analysis is simple to understand, but suffers from a major drawback in the form of quantification of utility in numbers.
- In real life, we never express utility in the form of numbers.
- At the most, we can rank various alternative combinations in terms of having more or less utility.
- In other words, the consumer does not measure utility in numbers, though she often ranks various consumption bundles.
- This forms the starting point of Ordinal Utility Analysis.

- A consumer's preferences over the set of available bundles can often be represented diagrammatically.
- The points representing bundles which give the consumer equal utility can generally be joined to obtain a curve like the one in the diagram.

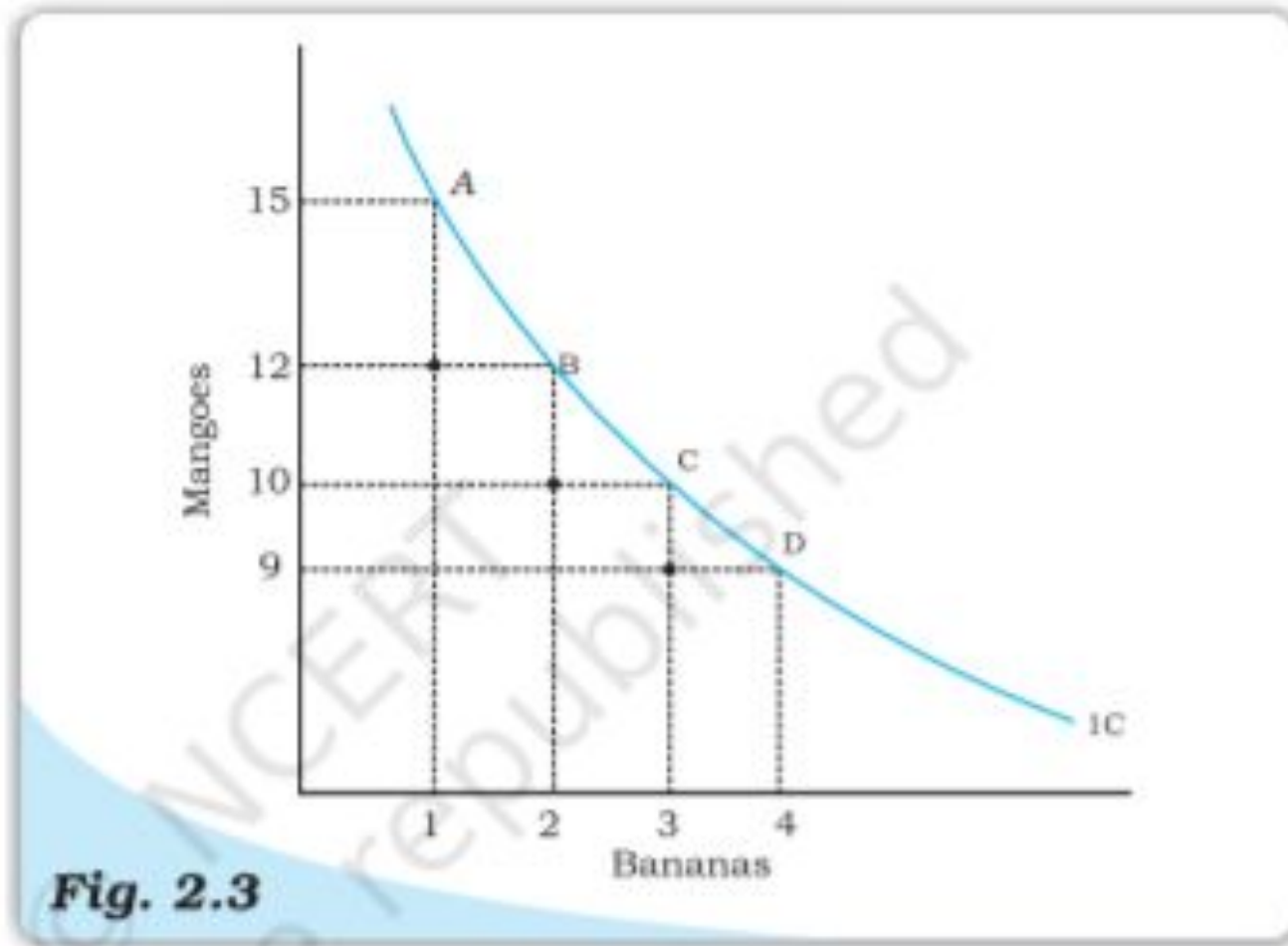


Fig. 2.3

- The consumer is said to be indifferent on the different bundles because each point of the bundles give the consumer equal utility.
- Such a curve joining all points representing bundles among which the consumer is indifferent is called an **indifference curve**.
- All the points such as A, B, C and D lying on an indifference curve provide the consumer with the same level of satisfaction.
- It is clear that when a consumer gets one more banana, he has to forego some mangoes, so that her total utility level remains the same and she remains on the same indifference curve.
- Therefore, indifference curve slopes downward.
- The amount of mangoes that the consumer has to forego, in order to get an additional banana, her total utility level being the same, is called marginal rate of substitution (MRS).
- In other words, MRS is simply the rate at which the consumer will substitute bananas for mangoes, so that her total utility remains constant. So,

$$MRS = \Delta Y / \Delta X$$

Table 2.2: Representation of Law of Diminishing Marginal Rate of Substitution

Combination	Quantity of bananas (Q_x)	Quantity of Mangoes (Q_y)	MRS
A	1	15	-
B	2	12	3:1
C	3	10	2:1
D	4	9	1:1

- As the number of bananas with the consumer increases, the MU derived from each additional banana falls. Similarly, with the fall in quantity of mangoes, the marginal utility derived from mangoes increases. So, with increase in the number of bananas, the consumer will feel the inclination to sacrifice small and smaller amounts of mangoes.
- This tendency for the MRS to fall with increase in quantity of bananas is known as **Law of Diminishing Marginal Rate of Substitution**.
- This can be seen from the diagram. Going from point A to point B, the consumer sacrifices 3 mangoes for 1 banana, going from point B to point C, the consumer sacrifices 2 mangoes for 1 banana, and going from point C to point D, the consumer sacrifices just 1 mango for 1 banana.
- Thus, it is clear that the consumer sacrifices smaller and smaller quantities of mangoes for each additional banana.

Community Indifference Curve

- Just as an indifference curve pertaining to an individual consumer depicts different combinations of the two commodities which provide equal satisfaction and are, therefore, equally preferred, similarly a community indifference curve or social indifference curve represents such combinations of two commodities which give equal satisfaction to the community and it is indifferent about those combinations.

- The community indifference curves are derived by the aggregation of the indifference curves of all the individuals in the society.
- Since all combinations on a social indifference curve yield the same level of satisfaction, the increase in the quantity of one commodity must correspond with some decrease in the quantity of other commodity.

- Consequently the community or social indifference curve slopes downwards from left to right as shown below.

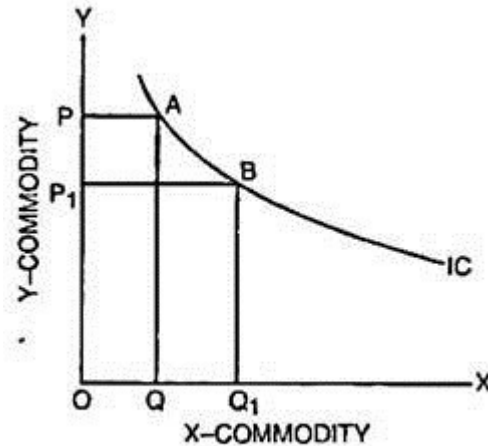


Fig. 4.2

- In the diagram, IC is the community indifference curve. The two combinations A and B of commodities X and Y are supposed to give equal satisfaction to the community. Combination A includes OQ of X + OP of Y and combination B includes OQ₁ of X + OP₁ of Y. In combination B, as society increases the consumption of X by ¹QQ₁, it reduces at the same time, the consumption of Y by PP₁ so that compensating variation in satisfaction takes place and both the combinations A and B are equally preferred.

- If a series of community indifference curves is shown such that higher the indifference curve, higher is the level of satisfaction from combinations lying upon it and vice-versa, that series of social indifference curves represents the community indifference map, which is shown below.

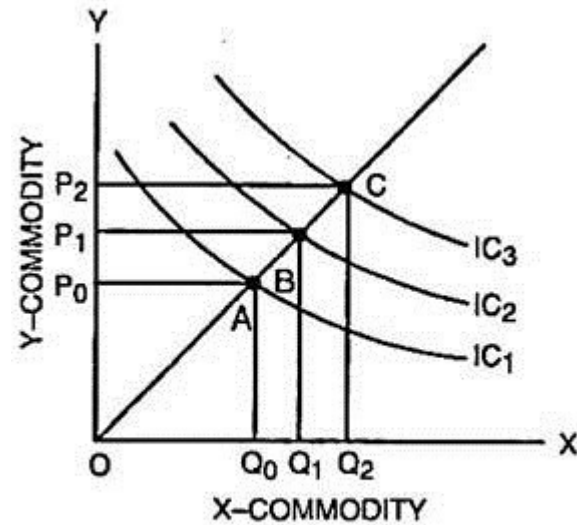


Fig. 4.3

- The slope of the indifference curve is measured by the marginal rate of substitution of X for Y (MRS_{xy}), MRS_{xy} is the quantity of Y which the society gives up in order to have some quantity of X commodity. It is measured by the ratio of a change in quantity of Y commodity to a change in the quantity of X commodity.
- $MRS_{xy} = - (\delta y / \delta x)$
- As the community increases the consumption of an additional unit of X, it may be willing to give up less and less quantities of Y. Consequently, the MRS_{xy} goes on diminishing and the community indifference curve follows the path of a negatively sloping convex curve to the origin.
- Alike the indifference curve of an individual, the community indifference curve has the same set of properties

Consumer's Budget

- The consumption bundles that are available to the consumer depend on the prices of the two goods and the income of the consumer. Given her fixed income and the prices of the two goods, the consumer can afford to buy only those bundles which cost her less than or equal to her income.

- Suppose the income of the consumer is M and the prices of bananas (X) and mangoes (Y) are P_x and P_y respectively.
- If the consumer wants to buy Q_x quantities of bananas, she will have to spend $P_x * Q_x$ amount of money.
- Similarly, if the consumer wants to buy Q_y quantities of mangoes, she will have to spend $P_y * Q_y$ amount of money.
- Therefore, if the consumer wants to buy the bundle consisting of Q_x quantities of bananas and Q_y quantities of mangoes, she will have to spend $P_x * Q_x + P_y * Q_y$ amount of money.
- She can buy this bundle only if she has at least $P_x * Q_x + P_y * Q_y$ amount of money.
- Given the prices of the goods and the income of a consumer, she can choose any bundle as long as it costs less than or equal to the income she has. In other words, the consumer can buy any bundle (Q_x, Q_y) such that

$$M \geq (P_x * Q_x) + (P_y * Q_y)$$

- This is called the consumer's **budget constraint**.
- The set of bundles available to the consumer is called the **budget set**.
- The budget set is thus the collection of all bundles that the consumer can buy with her income at the prevailing market prices.

- The budget set can be represented with a budget line.
- All bundles in the positive quadrant which are on or below the line are included in the budget set.
- The equation of the line is -

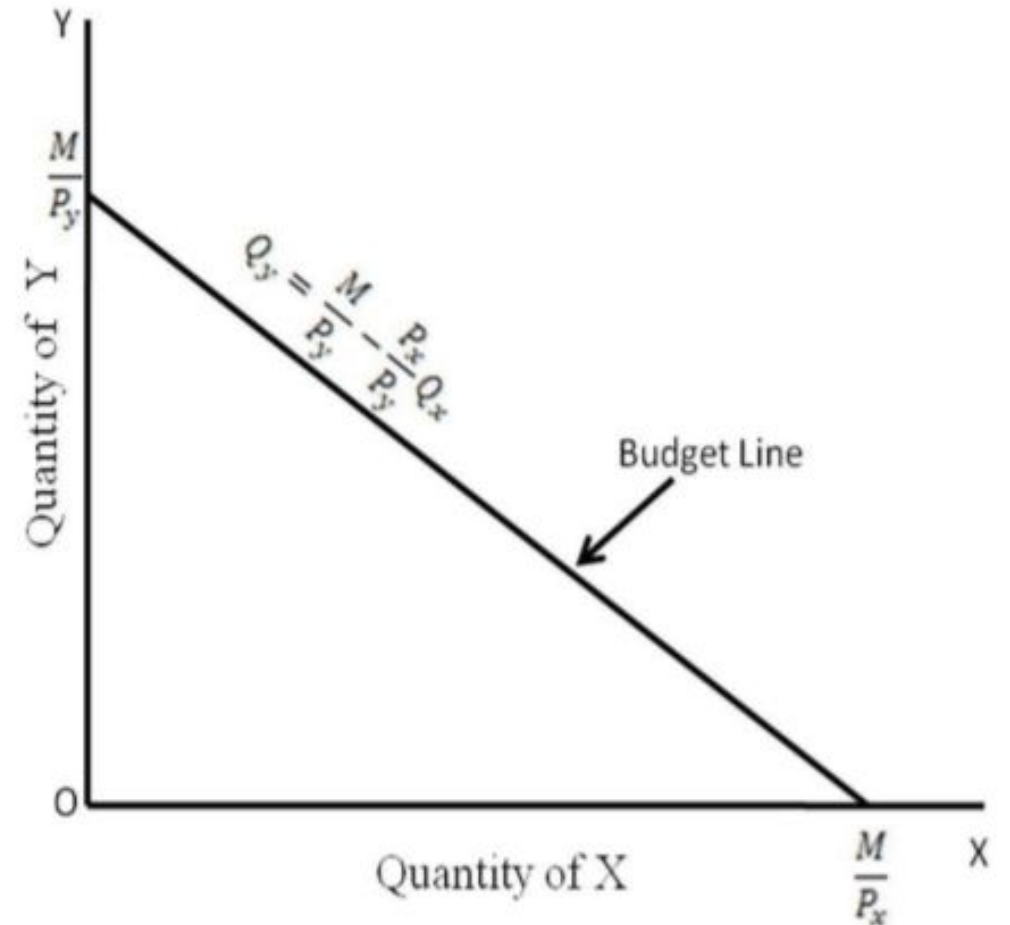
$$(P_x * Q_x) + (P_y * Q_y) = M$$

We can rewrite the budget line as:

$$P_y * Q_y = M - (P_x * Q_x)$$

Dividing both sides by P_y yields:

$$Q_y = M/P_y - (P_x/P_y)Q_x$$



- The line consists of all bundles which cost exactly equal to M. This line is called the budget line. Points below the budget line represent bundles which cost strictly less than M.

- **Slope of budget line:**

- As we know that the slope of a curve is calculated as a change in variable on the Y-axis divided by change in variable on the X-axis, slope of the budget line in given example will be number of units of x₂, that the consumer is willing to sacrifice for an additional unit of x₁.

- Slope of Budget Line =

$$\begin{aligned} & \text{Units of Y willing to Sacrifice/ Units of X willing to Gain} \\ & = \Delta Y / \Delta X \end{aligned}$$

- This slope of budget line is equal to 'Price Ratio' of two goods.

- Price Ratio =

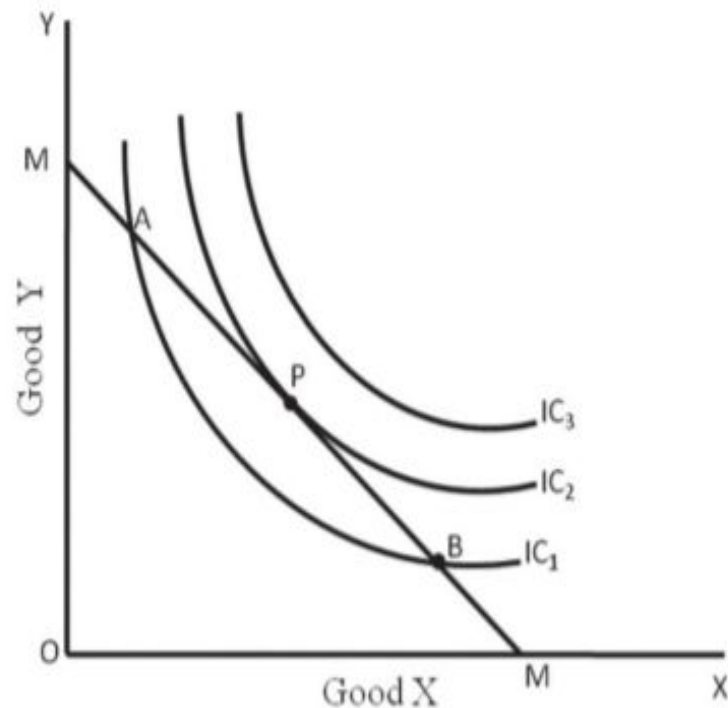
$$\begin{aligned} & \text{Price of X (P}_x\text{)/Price of Y (P}_y\text{)} \\ & = -P_x / P_y \end{aligned}$$

- Consumer equilibrium is a point of maximum satisfaction for the consumer.
- Study of Consumer equilibrium requires some **assumptions** to be made about the consumer behaviour. These are:
- i) Rationality: The consumer is rational. He wants to obtain maximum satisfaction given his income and prices.
- ii) Consumer has an indifference map, showing his scale of preference for various combinations of good x and y.
- iii) Utility is ordinal: It is assumed that the consumer can rank his preference according to the satisfaction of each combination of goods.
- iv) Consistency of choice: It is also assumed that the consumer is consistent in the choice of combination of goods.
- v) Consumer has a given and fixed amount of money income to spend on the goods. Thus, consumer has to choose to spend his income on either of the two goods or a combination thereof.
- vi) All the units of the goods are homogeneous.
- vii) The goods are divisible i.e. they can be divided into small units
- viii) Total utility: The total utility of the consumer depends on the quantities of the good consumed.

• **Conditions of Consumer's Equilibrium**

There are two fundamental conditions of consumer's equilibrium through Indifference curve approach:

- 1) The price line should be tangent to the Indifference curve. It means that at the point of equilibrium the slope of the indifference curve and of the price line should be same.
 - The slope of Indifference curve indicates MRS_{xy} i.e. $-\Delta Y/\Delta X$. The slope of the price line indicates the ratio between price of two goods X and Y i.e. P_x/P_y .
- 2) Indifference curve should be convex to the point of origin: Marginal rate of substitution of X for Y (MRS_{xy} i.e. $\Delta y/\Delta x$) is equal to the slope of the price line that indicates the ratio between prices of two goods.



- In the diagram, IC₁, IC₂ and IC₃ are the three indifference curves and MM is the budget line. With the constraint of budget line, the highest indifference curve, which a consumer can reach, is IC₂.
- The budget line is tangent to indifference curve IC₂ at point 'P'. This is the point of consumer equilibrium.

- All other points on the budget line to the left or right of point 'P' will lie on lower indifference curves and thus indicate a lower level of satisfaction.
- As budget line can be tangent to one and only one indifference curve, consumer maximises his satisfaction at point P, when both the conditions of consumer's equilibrium are satisfied:
 - i) $MRS = \text{Ratio of prices or } PX/PY$: At tangency point P, the absolute value of the slope of the indifference curve (MRS between X and Y) and that of the budget line (price ratio) are same. Equilibrium cannot be established at any other point such as $MRS_{xy} > PX/PY$ at all points to the left of point P or $MRS_{xy} < PX/PY$ at all points to the right of point P. So, equilibrium is established at point P, when $MRS_{xy} = -PX/PY$.
 - ii) MRS continuously falls: The second condition is also satisfied at point P as MRS is diminishing at point P, i.e. IC2 is convex to the origin at point P.

Revealed Preference Theory

- **Revealed preference theory**, introduced by the American economist Paul Samuelson in 1938, holds that consumers' preferences can be revealed by what they purchase under different circumstances, particularly under different income and price circumstances.
- The theory entails that if a consumer purchases a specific bundle of goods, then that bundle is 'revealed preferred' to any other bundle that the consumer could afford, given constant income and prices.

- If a consumer buys some collection of goods, A, rather than any of the alternative collections B, C and D and if it turns out that none of the latter collections is more expensive than A, then we say that A has been revealed preferred to the combinations B, C and D or that B, C and D have been revealed inferior to A.

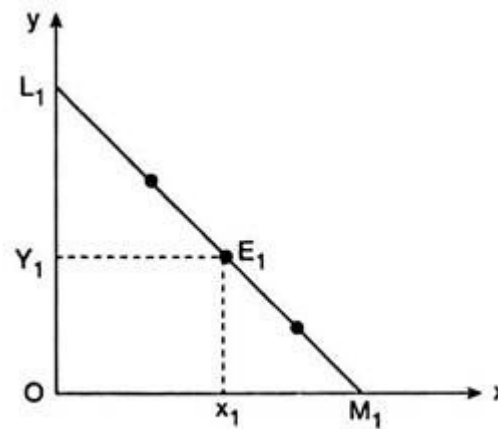


Fig. 6.104 Revealed preference

- Therefore, if the consumer buys the combination $E_1(x_1, y_1)$ of the goods X and Y and does not buy the combination $E_2(x_2, y_2)$ at the prices (p_x^1, p_y^1) of the goods, then we would be able to say that he prefers combination E_1 to combination E_2 , if we obtain

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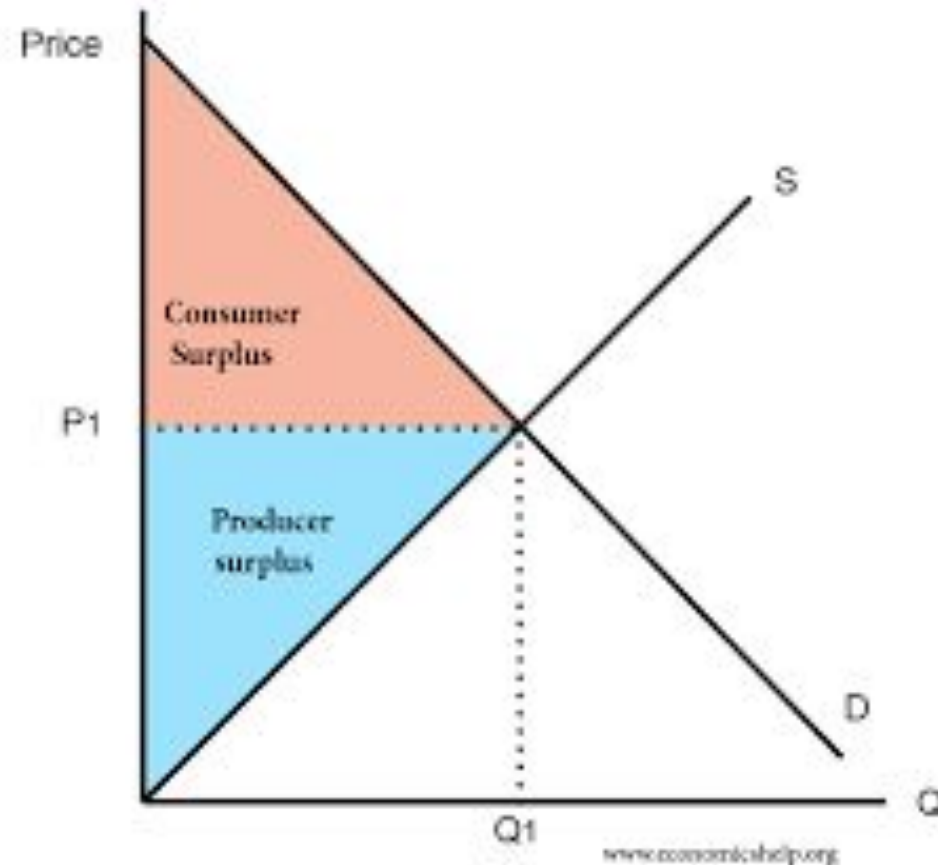
$$p_x^1 x_1 + p_y^1 y_1 \geq p_x^1 x_2 + p_y^1 y_2$$

- We have to note here the difference between “preference” and “revealed preference”. Combination A is “**preferred**” to B implies that the consumer ranks A ahead of B.
- But A is “revealed preferred to B” means A is chosen when B is affordable (no-more-expensive).

More formally, suppose the consumer is buying the combination (x_1, y_1) at the price set (p'_x, p'_y) . Let us also suppose that another combination is (x_2, y_2) , such that $p'_x x_1 + p'_y y_1 \geq p'_x x_2 + p'_y y_2$. Now, if the consumer buys the most preferred combination subject to his budget constraint, then we will say the combination (x_1, y_1) is strictly preferred to combination (x_2, y_2) .

Consumer Surplus

- *It is the difference between the actual price that the customers pay for a product & the maximum price that they are ready to pay (for a single unit).*
- **Consumer Surplus Formula = Maximum Price Willing To**



- Let us assume that a customer decides to buy a smartphone and is willing to pay up to Rs. 10000 for that. Now, while browsing through various electronics stores, the customer discovers a store that offers the phone at Rs. 9000.
- Given,
- Maximum price willing to pay = Rs. 10,000
- Actual price = Rs. 9000
- Consequently, using the first formula we get,
$$\begin{aligned}\text{Consumer Surplus} &= \text{Rs. } 10,000 - \text{Rs. } 9000 \\ &= \text{Rs. } 1000\end{aligned}$$