Ethio Exams Telegram University

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Chapter Three: Theory of Consumer Behaviour

- **Consumer theory** is based on what people like, so it begins with something that we can't directly measure, but must infer.
- That is, **consumer theory** is based on the premise that we can infer what people like from the choices they make.
- **Consumer behaviour** can be best understood in **three steps.**
  1) **First**, by examining **consumer's preference**, we need a practical way to describe how people prefer one good to another.
  2) **Second**, we must take into account that consumers face **budget constraints** – they have limited incomes that restrict the quantities of goods they can buy.
  3) **Third**, we will put **consumer preference** and **budget constraint** together to determine consumer choice.

3.1 Consumer preferences

- A consumer makes **choices** by **comparing bundle of goods.**
- Given any two consumption bundles, the consumer either decides that one of the consumption **bundles is strictly better than the other**, or decides that she is **indifferent** between the two bundles.
- In order to tell whether one bundle is preferred to another, we see how the consumer behaves in choice situations involving two bundles.
- **If she always chooses X when Y is available**, then it is natural to say that this consumer prefers X to Y. We use the symbol > to mean that one bundle is strictly preferred to another, so that **X >Y** should be interpreted as saying that the consumer **strictly prefers X to Y**, in the sense that she definitely wants the X–bundle rather than the Y–bundle.
- If the consumer is **indifferent between two bundles** of goods, we use the symbol ~ and write **X~Y.**

- **Indifference** means that the consumer would be just as satisfied, according to her own preferences, consuming the bundle X as she would be consuming bundle Y.
- If the consumer **prefers or is indifferent between the two bundles** we say that **she weakly prefers X to Y** and write **X ≥ Y**.
- The relations of **strict preference**, **weak preference**, and **indifference** are **not independent concepts**; the relations are themselves related.
- **For example:**

✓ if X ≥ Y and Y ≥ X, we can conclude that **X ~Y.** That is, if the consumer thinks that **X is at least as good as Y** and that **Y is at least as good as X**, then she must be **indifferent between the two** bundles of goods.

✓**Similarly,** if **X ≥ Y** but we know that it is not the case that X~ Y, we can conclude that X>Y. This just says that if the consumer thinks that X is at least as good as Y, and she is not indifferent between the two bundles, then she thinks that **X is strictly better than Y**.

3.2 The concept of utility

- **Economists** use the term **utility** to describe the **satisfaction** or **pleasure** derived from the consumption of a good or service.
- In other words, utility is the power of the product to satisfy human wants.
- Given any two consumption bundles X and Y, the consumer definitely wants the X–bundle than the Y–bundle **if and only if the utility of X is better than the utility of Y.**

Do you think that utility and usefulness are synonymous?

✓ **In defining utility**, it is important to bear in mind **the following points**.

1) **Utility** and **Usefulness** are **not synonymous**.

For example: Paintings by Picasso may be useless functionally but offer great utility to art lovers.

- Hence, **usefulness is product centric** whereas **utility is consumer centric.**

2) **Utility is subjective**. **Vary from person to person**. That means, the utility that two individuals derive from consuming the same level of a product may not be the same. **For example:** non–smokers do not derive any utility from cigarettes.
3) **Utility** can be **different at different places** and **time**.

For example: the utility that we get from drinking coffee early in the morning may be different from the utility we get during lunch time.

3.3 Approaches of measuring utility

✓**Two major approaches** to measure utility: **cardinal** and **ordinal approaches**.

❖The cardinalist school postulated that **utility can be measured objectively**.

❖According to the **ordinalist** school, **utility is not measurable in cardinal numbers** rather the consumer can rank or order the utility he derives

3.3.1 The cardinal utility theory

❖ According to the **cardinal utility** theory, utility is measurable by arbitrary unit of measurement called **utils** in the form of 1, 2, 3 etc.

For example: we may say that consumption of an orange gives Bilen 10 utils and a banana gives her 8 utils, and so on.

❖ From this, we can assert that **Bilen** gets more satisfaction from **orange** than from **banana.**

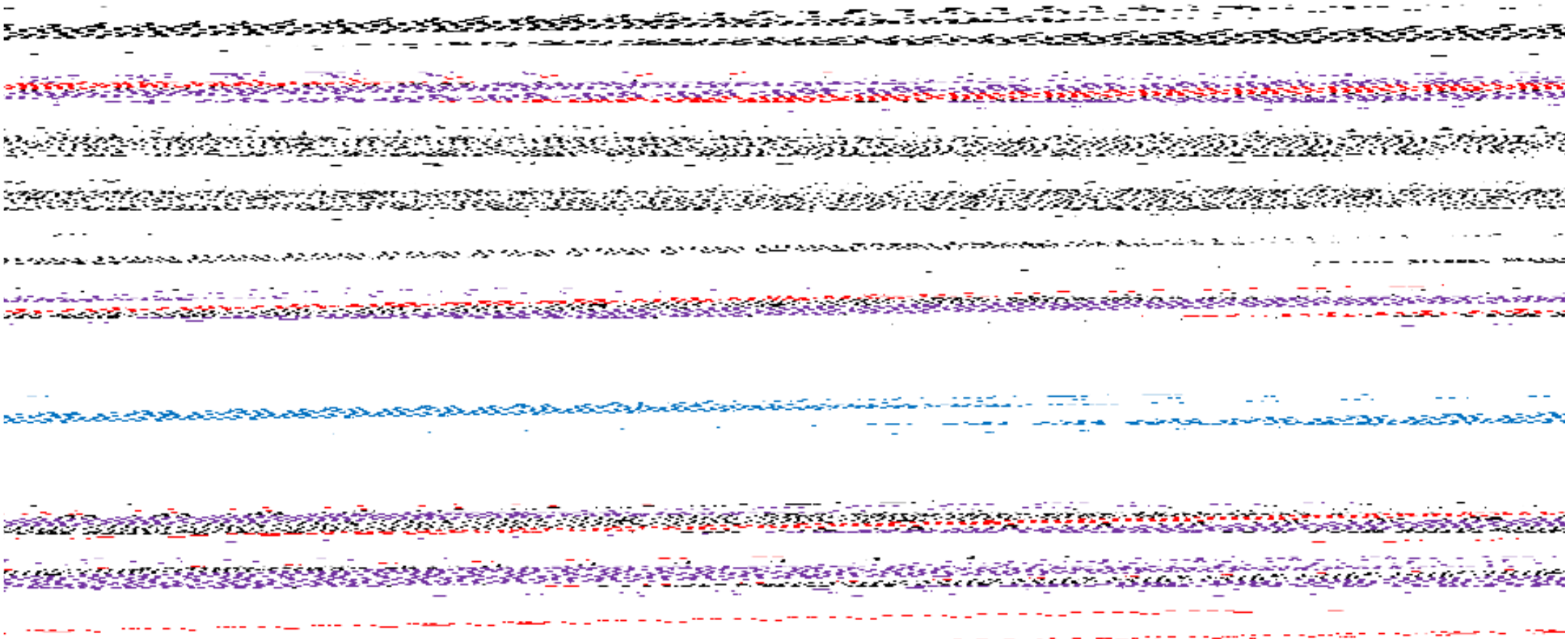
3.3.1.1 Assumptions of cardinal utility theory

❖The cardinal approach is based on the following **major assumptions**.

1) Rationality of consumers. The **main objective** of the consumer is to maximize his/her satisfaction given his/her limited budget or income. Thus, in order to maximize his/her satisfaction, the consumer has to be rational.

2) Utility is cardinally measurable.

3) Constant marginal utility of money. A given unit of money deserves the same value **at any time** or **place** it is to be spent.



utility increases.

- **However,** there is **a saturation point** for that commodity beyond which the consumer will not be capable of enjoying any greater satisfaction from it.

B) Marginal Utility (MU)

- is the **extra satisfaction** a consumer realizes from an additional unit of the product.
- In other words, marginal utility is the **change in total utility** that results from the consumption of one more unit of a product.
- Graphically, it is **the slope of total utility**.
- Mathematically, marginal utility is:

$$MU = \frac{\Delta TU}{\Delta Q}$$

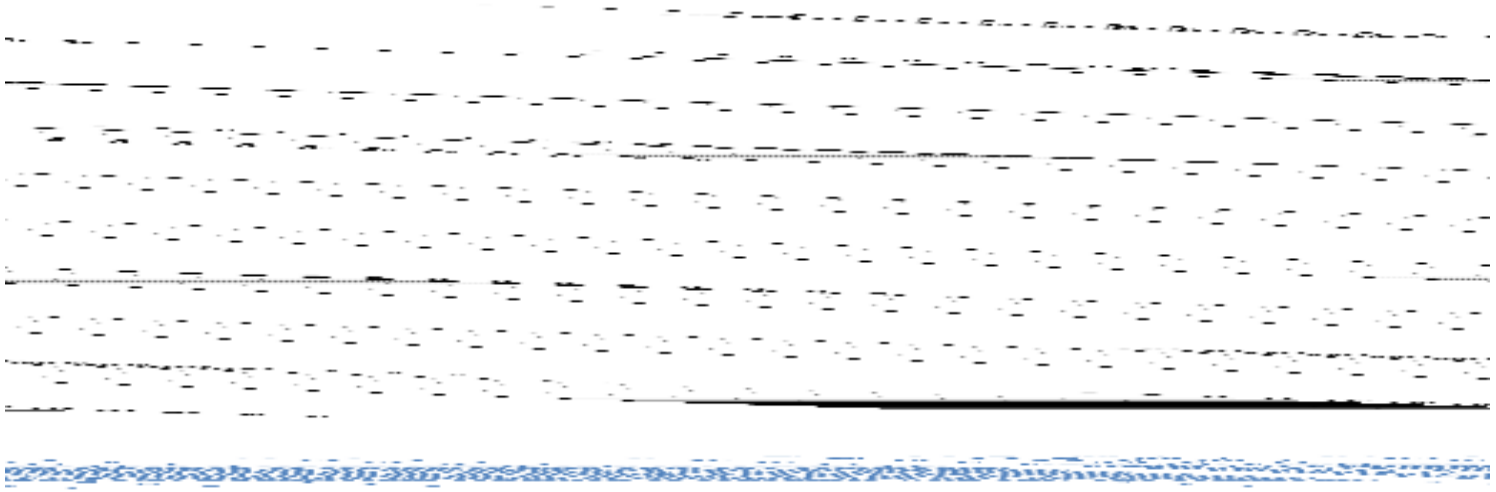
- where, ΔTU is the change in total utility, and ΔQ is the change in the amount of product consumed.

Example: Lets consider a hypothetical example given in **Table 3.1** below.

Table 3.1: Total and marginal utility

Quantity	Total Utility(TU)	Marginal Utility(MU)
0	0	–
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	–2

❖ **Graphically**, the above data can be depicted as follows.



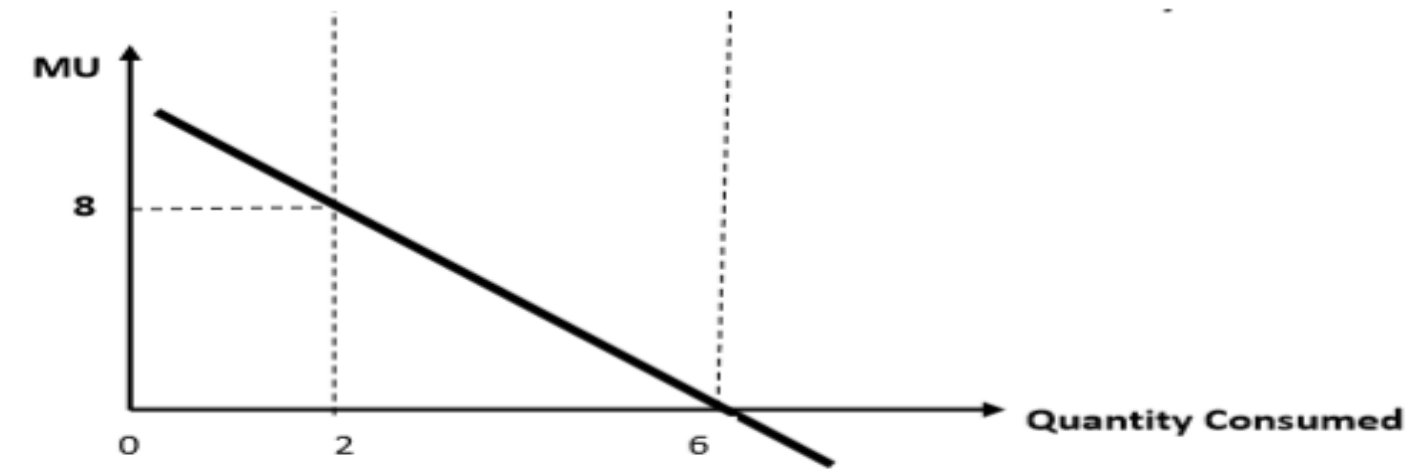


Figure 3.1: Total and marginal utility curves

- The **total utility first increases**, **reaches the maximum** (**when the consumer consumes 6 units**) and **then declines** as the quantity consumed increases.
- On the other hand, the **marginal utility continuously declines** (even becomes zero or negative) as quantity consumed increases.
- **From** the graph of **TU** and **MU**:
  - ✓ When **TU** is **increasing**, **MU** is **positive**.
  - ✓ When **TU** is **maximized**, **MU** is **zero**.
  - ✓ When **TU** is **decreasing**, **MU** is **negative**.

3.3.1.3 Law of diminishing marginal utility (LDMU)

Is the utility you get from consumption of the first orange the same as the second or the third orange?

- The **law of diminishing marginal utility** states that as the quantity consumed of a commodity increases **per unit of time**, **the utility derived from each successive unit decreases**, consumption of all other commodities remaining constant.
- In other words, the **extra satisfaction** that a consumer derives **declines** as he/she consumes more and more of the product **in a given period of time.**
- The **LDMU** is based on the following assumptions.
  - ✓ The **consumer** is **rational**
  - ✓ The consumer consumes **identical** or **homogenous product**. The commodity to be consumed should have **similar quality**, **color**, **design**, etc.
  - ✓ There is **no time gap/constant** in consumption of the good
  - ✓ The consumer **taste/preferences remain unchanged**

3.3.1.4 Equilibrium of a consumer

- **The objective of a rational consumer** is to **maximize total utility**.
- As long as the additional unit consumed brings a positive marginal utility, the consumer wants to consumer more of the product because total utility increases.
- **However**, the consumer has **income/budget constraint**.

A) The case of one commodity

- The **equilibrium condition** of a consumer that consumes a **single good X** occurs when the **marginal utility of X is equal to its market price**.

$$MU_x = P_x$$

expenditure.

$$max(U(Q_x) - P_xQ_x)$$

- The **necessary condition** for **maximization** is equating the derivative of a function to zero.
- **Thus,** $\frac{dU(Q_x)}{dQ_x} - \frac{dP_xQ_x}{dQ_x}$
- **Because ,** $\frac{dU(Q_x)}{dQ_x} = MU_x$

$$MU_x = P_x$$

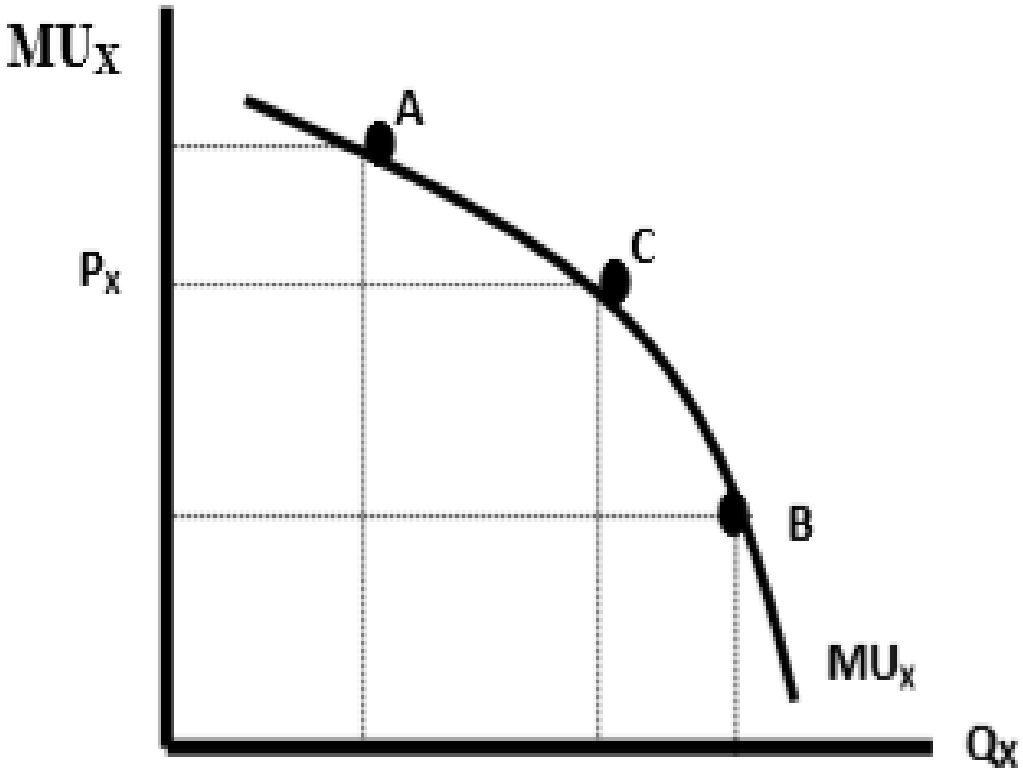


Figure 3.2: Equilibrium condition of consumer with only one commodity

B) The case of two or more commodities

- For the case of two or more goods, the consumer's equilibrium is achieved when the **marginal utility per money spent is equal** for each good purchased and **his money income available for the purchase of the goods is exhausted.**
- That is,

$$1)\ \frac{MU_x}{P_x} = \frac{MU_y}{P_y} = \cdots = \frac{MU_n}{P_n}$$

$$2)\ P_xQ_x + P_yQ_y + \cdots + P_nQ_n = M$$

- Where, **M** is the **income** of the consumer.

Example: Suppose **Saron** has M=7 **two goods**: **banana** and **bread.** The unit **price of banana = 1** Birr and the unit **price of a loaf of bread = 4 Bi**

Table 3.2: Utility schedule for two commodities

Income = 7 Birr, Price of banana = 1 Birr, Price of bread = 4 Birr							
Banana				*Bread*			
Quantity	*TU*	*MU*	*MU/P*	*Quantity*	*TU*	*MU*	*MU/P*
0	0	-	-	0	0	-	-
1	6	6	6	1	12	12	3
2	11	5	5	2	20	8	2
3	14	3	3	3	26	6	1.5
4	16	2	2	4	29	3	0.75
5	16	0	0	5	31	2	0.5
6	14	-2	-2	6	32	1	0.25

Bread = 1 loaf of bread.

- At this combination $P_xQ_x + P_yQ_y = M$

  That is **(1*3) + (4*1) = 7**

- Given this, the total utility that Saron derives from this combination can be given by:

  TU = TU1 + TU2

  TU = 14 + 12 TU = 26

- Given her **fixed income** and the **price level of the two goods**, **no combination of the two goods will give her higher TU than this level of utility.**

Limitation of the cardinal approach

1) The assumption of cardinal utility is doubtful because **utility may not be quantified.** Utility cannot be measured absolutely (objectively).
2) The assumption of **constant MU of money** is **unrealistic** because as income increases, the **marginal utility of money changes.**

3.3.2 The ordinal utility theory

- In the ordinal utility approach, **it is not possible for consumers to express the utility of various commodities they consume in absolute terms, like 1 util, 2 utils, or 3 utils.**
- **However**, it is possible to express the **utility in relative terms**.
- The consumers **can rank commodities in the order of their preferences** as 1st, 2nd, 3rd and so on.
- **Therefore,** the consumer need not know in specific units the utility of various commodities to make his choice.

- It suffices for him to be able to **rank the various baskets of goods** according to the satisfaction that each bundle gives him.

3.3.2.1 Assumptions of ordinal utility theory

- The ordinal approach is based on the following assumptions.
  1) **Consumers are rational:** they maximize their satisfaction or utility given their income and market prices.
  2) **Utility is ordinal:** utility is not absolutely (cardinally) measurable. Consumers are required only to order or rank their preference for various bundles of commodities.
  3) **Diminishing marginal rate of substitution:** The marginal rate of substitution **is the rate at which a consumer is willing to substitute one commodity for another commodity** so that his total satisfaction remains the same.

4) The **total utility** of a consumer is measured by the amount (quantities) of all items he/she consumes from his/her consumption basket.

5) **Consumer's preferences are consistent.**

For example: if there are three goods in a given consumer's basket, say, X, Y, Z and if he prefers X to Y and Y to Z, then the consumer is expected to prefer X to Z. This property is known as **axioms of transitivity.**

- The **ordinal utility approach** is explained with the help of **indifference curves.**
- **Therefore**, the ordinal utility theory is also known as the **indifference curve approach.**

3.3.2.2 Indifference set, curve and map

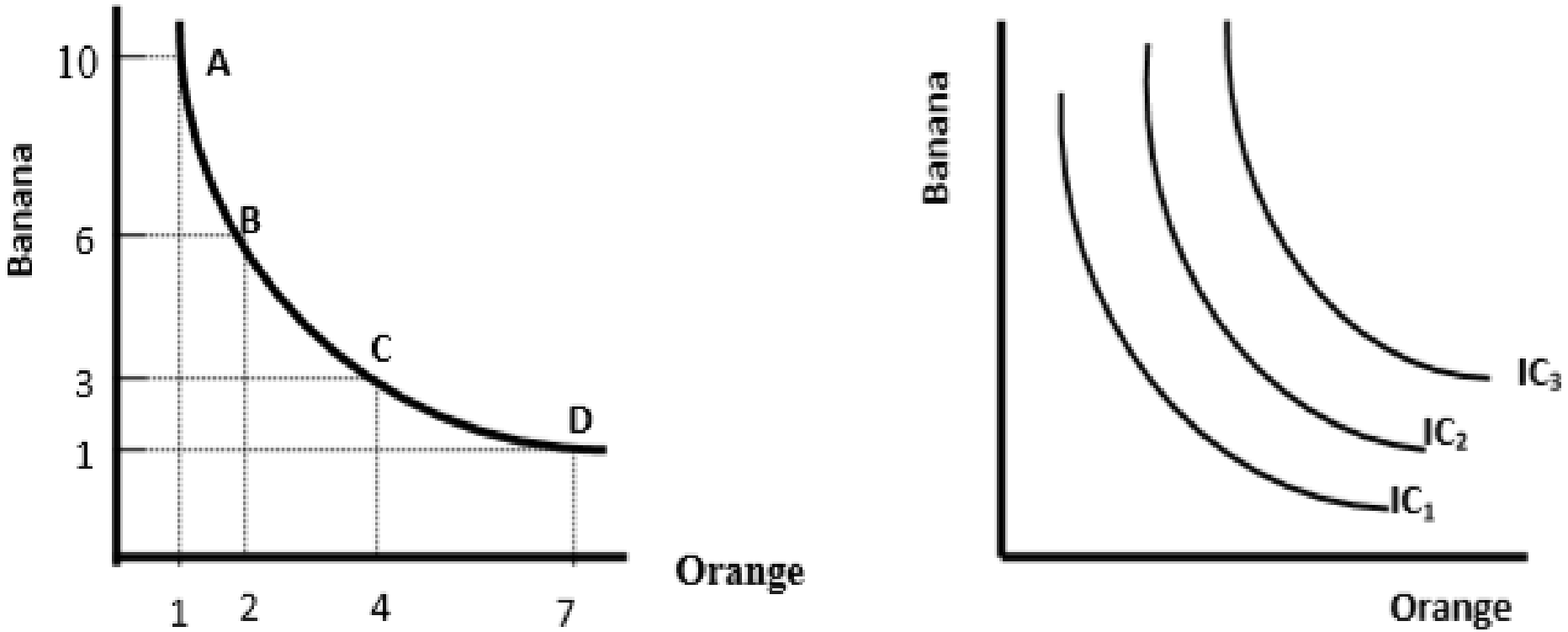
- **Indifference set/ schedule:** is a combination of goods for which the consumer **is indifferent**. It shows the **various combinations of goods** from which the consumer derives the **same level of satisfaction**.

Example: Consider a consumer who consumes two goods **X** and **Y**.

Table 3.3: Indifference schedule

Bundle(Combination	A	B	C	D
Orange	1	2	4	7
Banana	10	6	3	1

- In table 3.3 above, each combination of good **X** and **Y** gives the consumer equal level of total utility.
- Thus, the individual is indifferent whether he consumes combination A, B, C or D.
- **Indifference curve: graphical expression of indifference set/ schedule. It** shows **different combinations of two goods which yield the same utility** (level of satisfaction) to the consumer.
- **Indifference map:** A set of indifference curves.



i) Indifference curve

ii) Indifference map

Figure 3.3: Indifference curve and indifference map

3.3.2.3 Properties of indifference curves

1) **Indifference curves** have **negative slope** (downward sloping to the right). because the consumption level of one commodity can be increased only by reducing the consumption level of the other commodity.
2) **Indifference curves** are **convex to the origin**.

✓ The convexity of indifference curves is the reflection of **the diminishing marginal rate of substitution.** implies that the **commodities can substitute** one another but **are not perfect substitutes.**

3) **A higher indifference curve** is always preferred to **a lower one**.
4) **Indifference curves never cross each other** (cannot intersect).

✓ The assumptions of consistency and transitivity will rule out the intersection of indifference curves.

Figure 3.4 shows the **violations of the assumptions of preferences** due to the intersection of indifference curves.

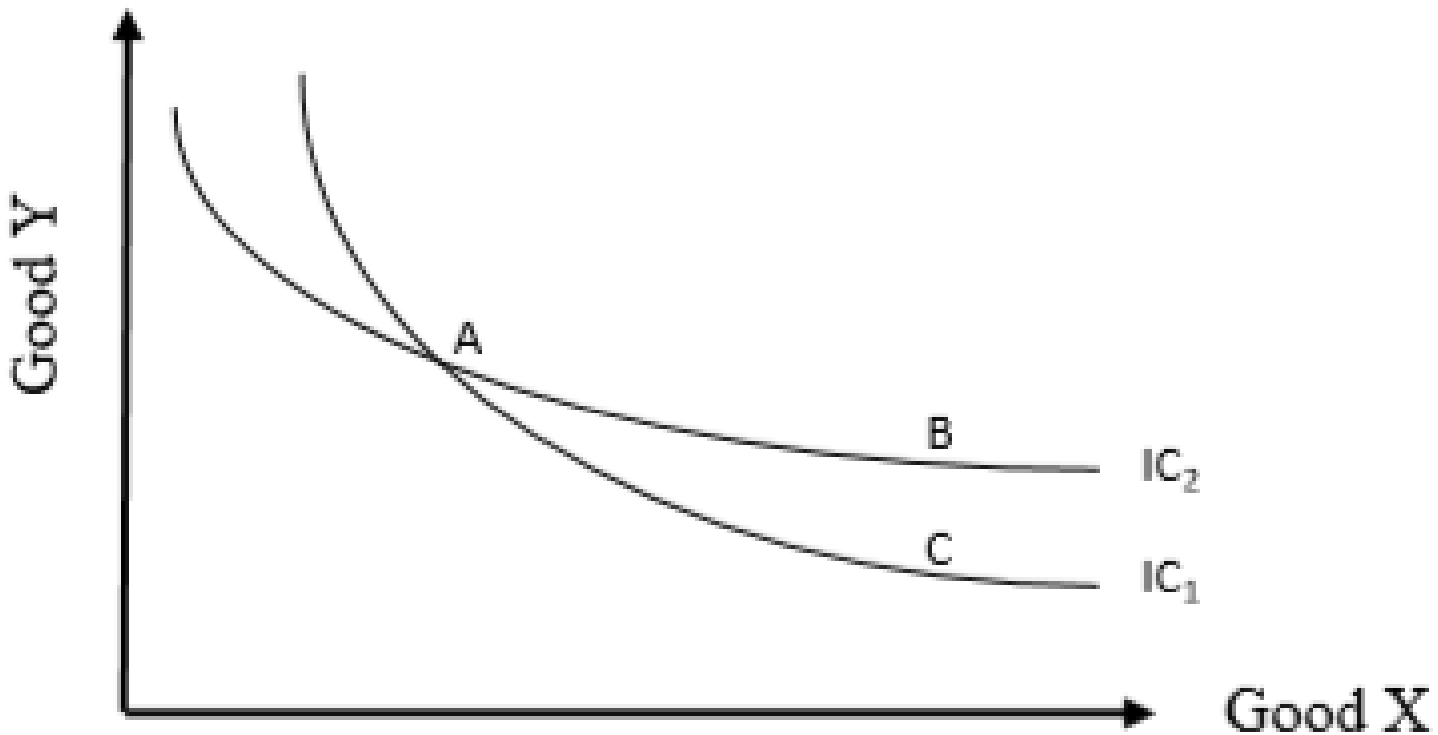


Figure 3.4: Intersection of indifference curves

Note : The **intersection of indifference curves** the **same bundles of commodities give different utility**.

3.3.2.4 Marginal rate of substitution (MRS)

- **Marginal rate of substitution** is a rate at which consumers are **willing to substitute one commodity for another** in such a way that the consumer remains on the same indifference curve.
- It shows **a consumer's willingness to substitute one good for another** while he/she is indifferent between the bundles.
- **MRS of X for Y ($MRS_{X,Y}$)** is defined as the number of units of commodity **Y that must be given up** in exchange **for an extra unit of commodity X** so that the consumer maintains the same level of satisfaction.
- Since one of the goods is scarified to obtain more of the other good, the **MRS is negative**.
- Hence, usually we take the absolute value of the slope.

$$MRS_{XY} = \frac{Number\ of\ units\ of\ Y\ given\ up}{Number\ of\ units\ of\ X\ gained} = \frac{\Delta Y}{\Delta X}$$

Let's consider the following indifference curve

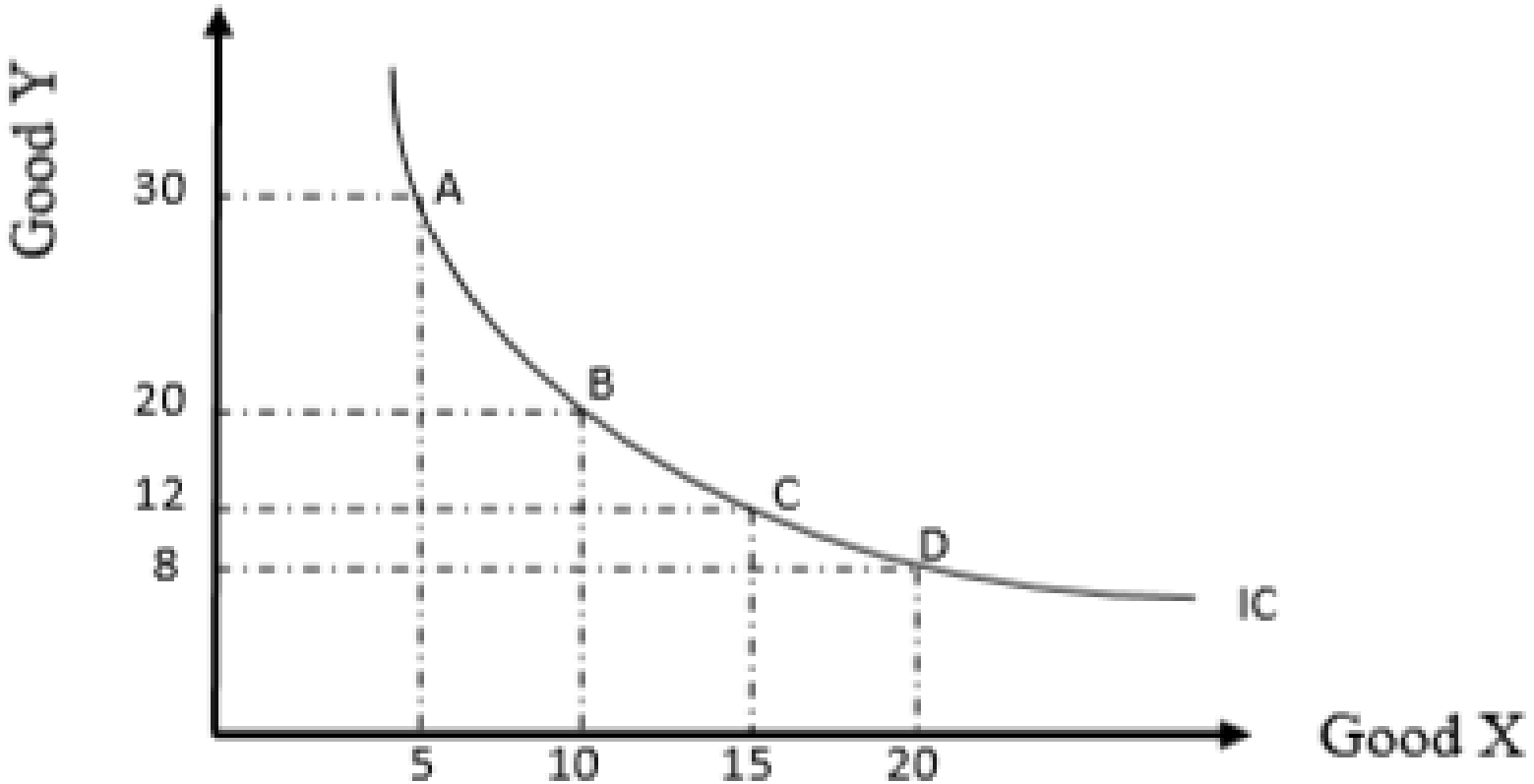
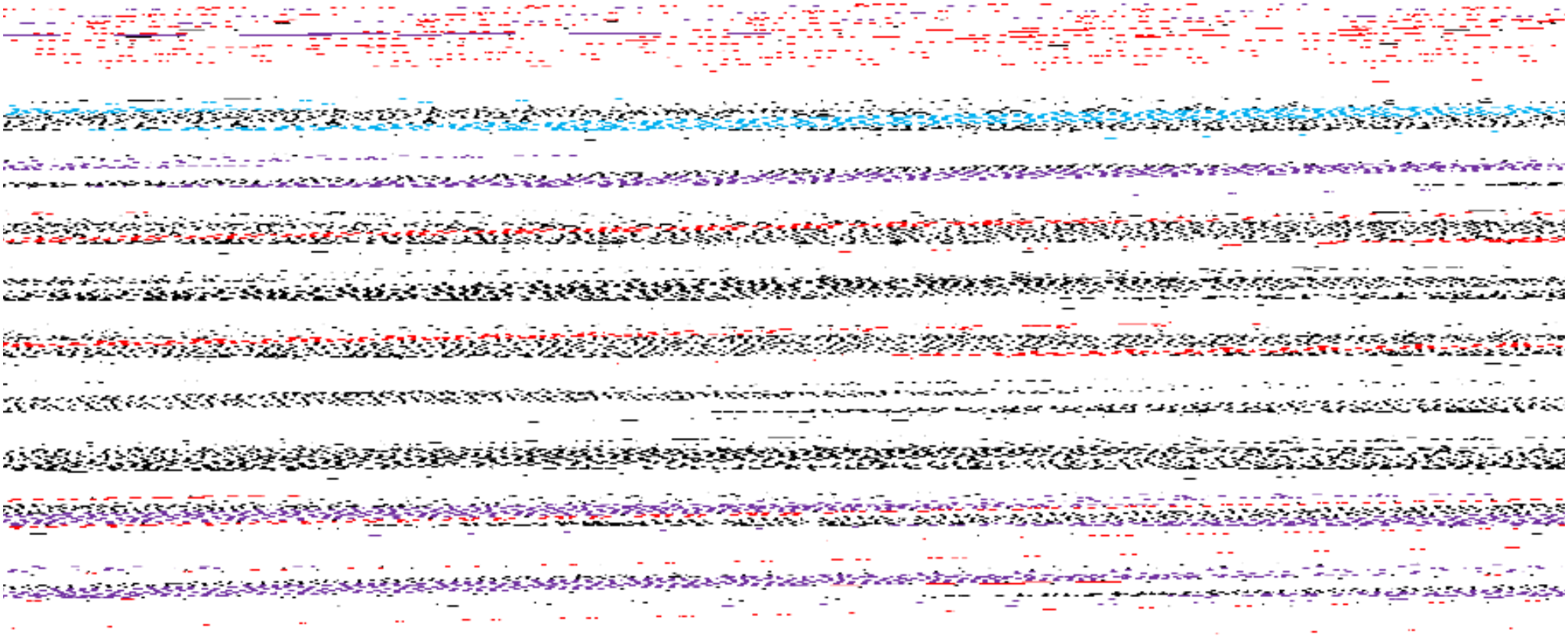
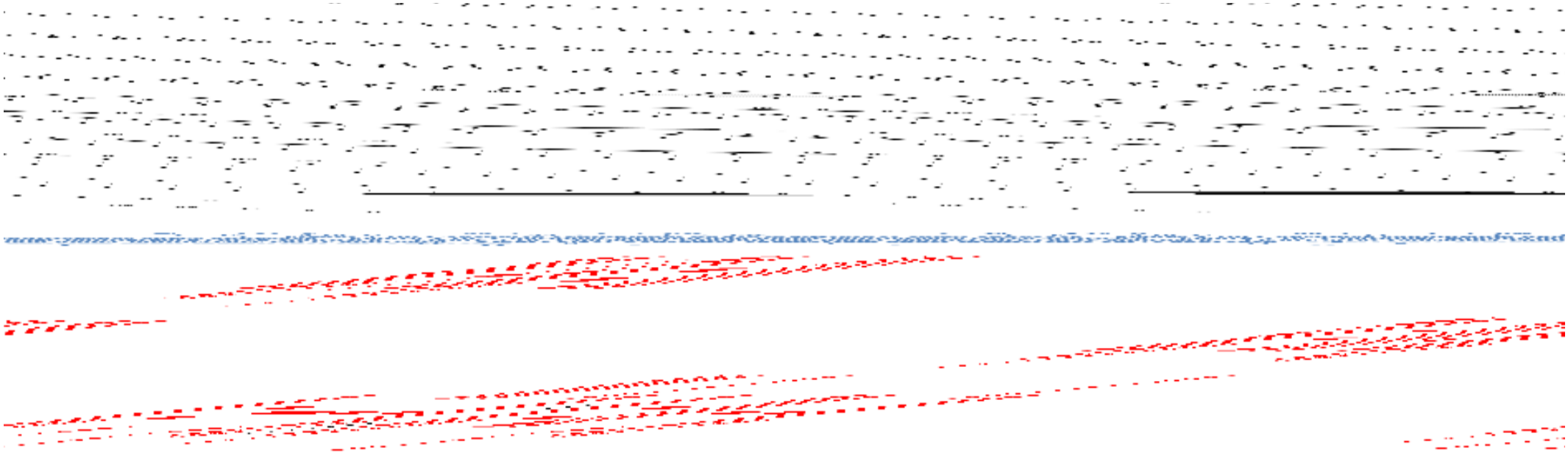


Figure 3.5: Indifference curve for two products X and Y



- It is also possible to derive MRS using the **concept of marginal utility**.
- $MRS_{X,Y}$, is related to MU_X and MU_Y as follows:

$$MRS_{X,Y} = \frac{MU_x}{MU_y}$$



Example: Suppose a consumer's utility function is given by $U(X, Y) = X^4Y^2$

Find $MRS_{X,Y}$.

Solution: $$MRS_{X,Y} = \frac{MU_X}{MU_Y}\ ;\ MU_X = \frac{\partial U}{\partial X} = 4X^3Y^2 \text{ and } \frac{\partial U}{\partial Y} = 2X^4Y$$

$$MRS_{X,Y} = \frac{4X^3Y^2}{2X^4Y} = 2\frac{Y}{X}$$

3.3.2.5 The budget line or the price line

- **Indifference curves** only tell us **about consumer preferences** for any two goods but they **cannot show** which combinations of the two goods will be bought.
- In reality, the consumer is constrained by his/her income and prices of the two commodities.
- This constraint is often presented with the help of the **budget line**.
- **The budget line** is a set of the commodity bundles that can be purchased if the entire income is spent.
- It is a graph which shows the various **combinations of two goods that a consumer can purchase given his/her limited income** and the prices of the two goods.

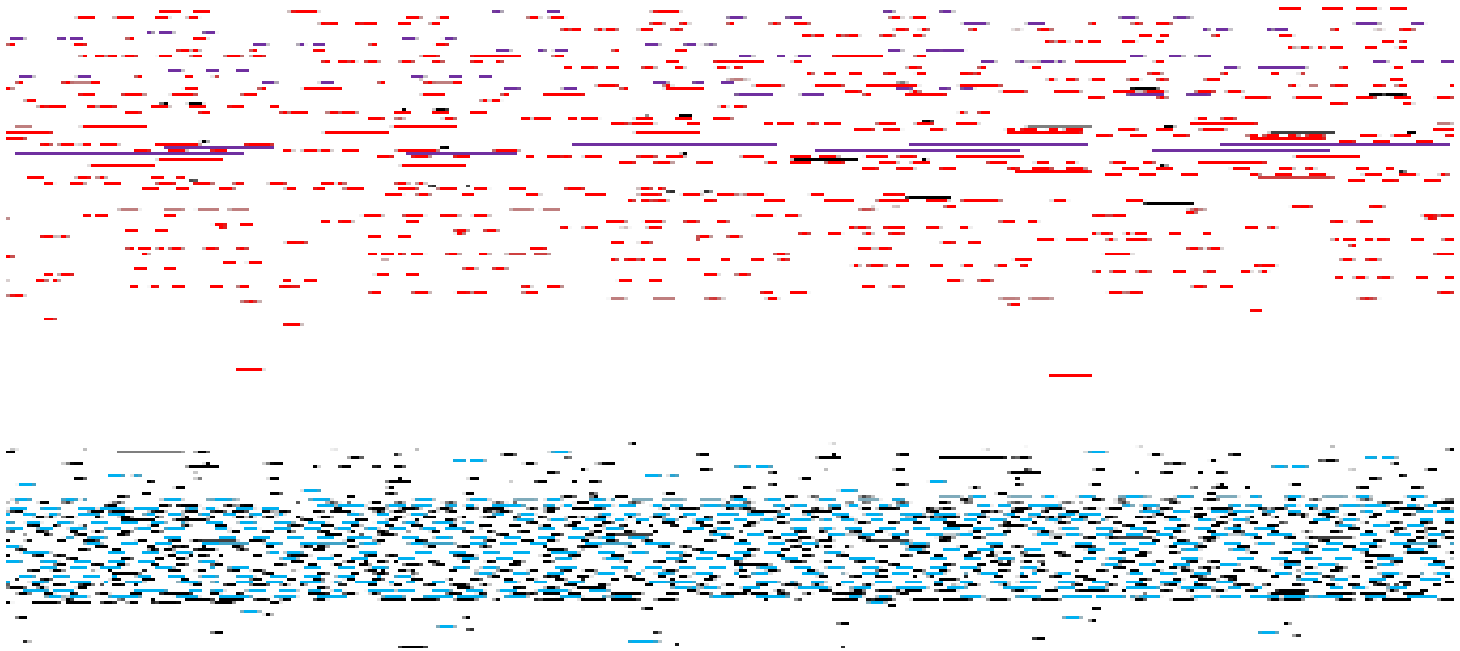
- Assuming that the consumer spends all his/her income on the two goods (X and Y), we can express the budget constraint as:

$$P_x Q_x + P_y Q_y = M$$

- By rearranging the above equation, we can derive the following general equation of a budget line:

$$Q_y = \frac{M}{P_y} - \frac{P_X}{P_y} Q_x$$

Graphically,



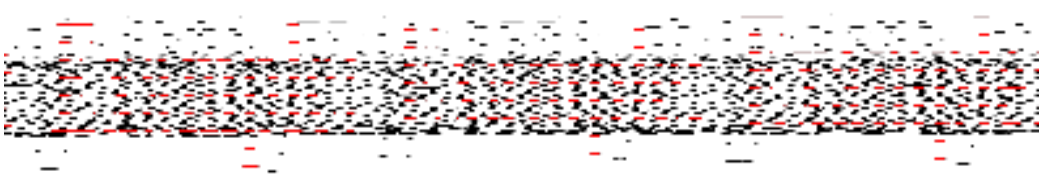
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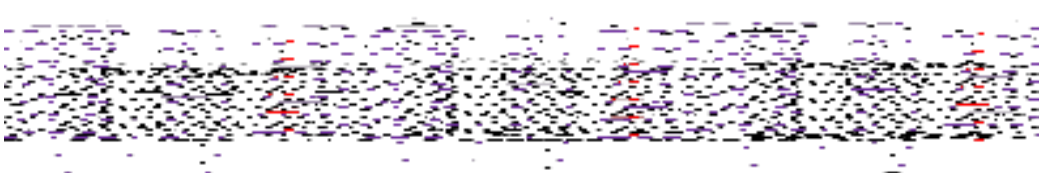
- ✓ The slope of the budget line is given is by $-\frac{P_X}{P_y}$
- ✓ Any combination of the two goods within the budget line (such as point A) or **along the budget** line is **attainable**.
- ✓ Any combination of the two goods outside the budget line (such as point B) is unattainable **(unaffordable)**.

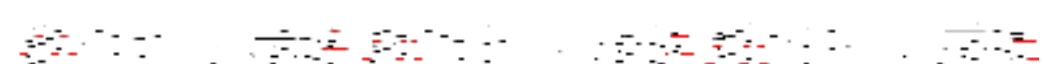
$$3Q_x + 5Q_y = 100$$

$$5Q_y = 100 - 3Q_x$$

$$Q_y = \frac{100}{5} - \frac{3}{5}Q_x \; ; Q_y = 20 - \frac{3}{5}Q_x$$







Note: A budget is drawn for **given prices** and **fixed consumer's income**. Hence, the changes in prices or income will affect the budget line.

- **Change in income:** If the income of the consumer changes (keeping the prices of the commodities unchanged), the budget line also shifts (changes).
- **Increase in income causes** an **upward/outward shift** in the budget line that allows the consumer to buy more goods and services and,
- **decreases in income** causes in the budget line that leads the consumer to buy less quantity of t**a downward/inward shift** he two goods.
- It is important to note that the **slope of the budget line** (the ratio of the two prices) does not change when income rises or falls.

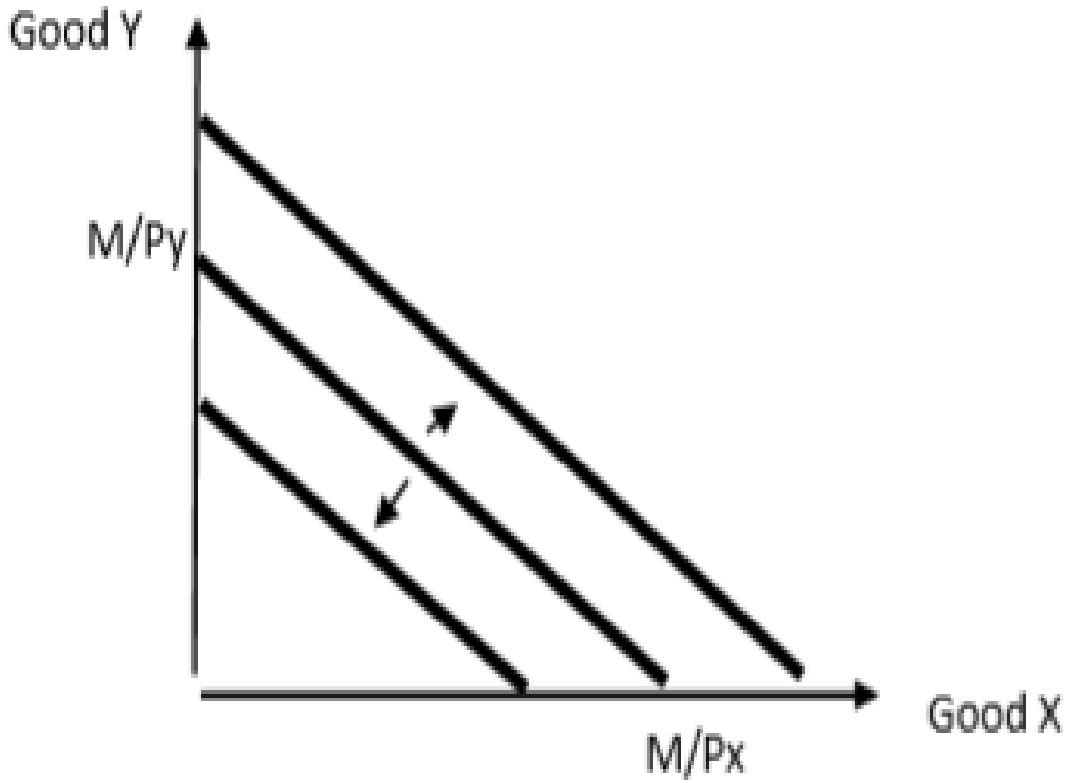


Figure 3.7: ***Effects of increase (right) and decrease (left) in income on the budget line***

Change in prices:

- An **equal increase(proportion)** in the prices of the two goods **shifts the budget line inward.** Since the **two goods become expensive,** the consumer can purchase the lesser amount of the two goods.
- An **equal decrease(proportion)** in the prices of the two goods, one the other hand, shifts the **budget line out ward**. Since the two goods beco 'e amounts of

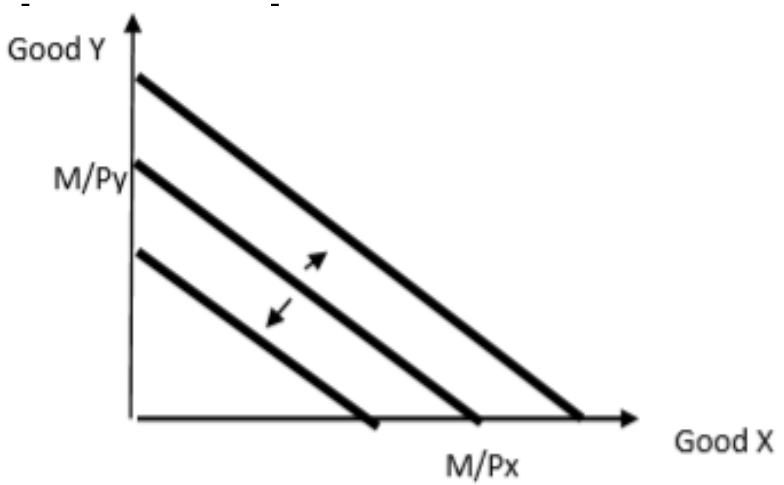


Figure 3.8: *Effect of proportionate increase (inward) and decrease (out ward) in the prices of both goods*

- **An increase or decrease** in the price of one of the two goods, keeping the price of the other good and income constant, **changes the slope of the budget line** by affecting only the intercept of the commodity that records the change in the price.
- **For instance**, if the price of good X decreases while both the price of good Y and consumer's income remain unchanged, the horizontal intercept moves outward and makes the budget line flatter. The reverse is true if the price of good X increases.
- On the other hand, if the **price of good Y decreases** while both the price of good X and consumer's income remain unchanged, the vertical intercept moves upward and makes the **budget line steeper**. The reverse is true for an increase in the price of good Y.

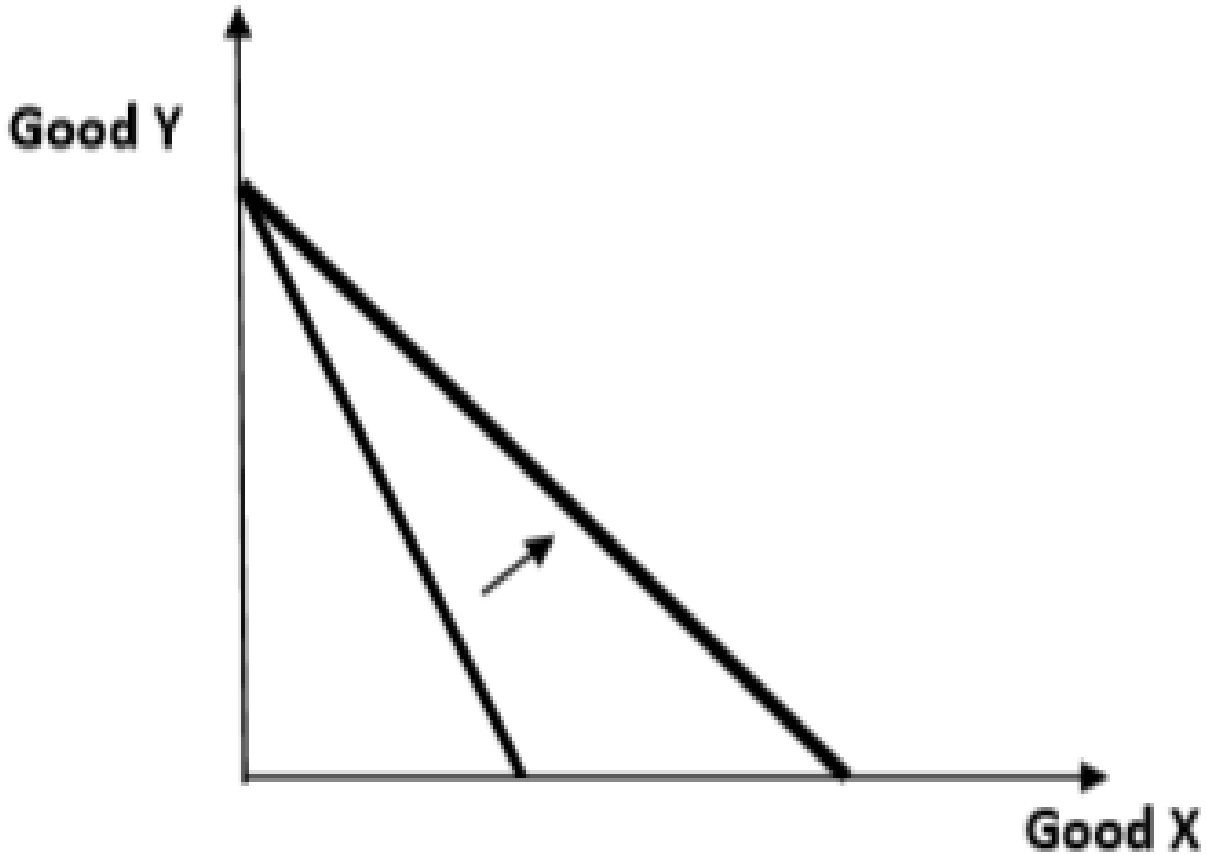


Figure 3.9: Effect of decrease in the price of only good X on the budget line

- The **preferences of a consumer** (what he/she wishes to purchase) are indicated **by the indifference curve**.
- The **budget line** specifies different combinations of two goods (say X and Y) the **consumer can purchase** with the limited income.
- **Therefore,** a rational consumer tries to attain the highest possible indifference curve, given the budget line.
- This occurs at the point where **the indifference curve is tangent** to the budget line so that the **slope of the indifference curve** ($MRS_{X,Y}$) is equal to **the slope of the budget line**($-\frac{P_X}{P_y}$).

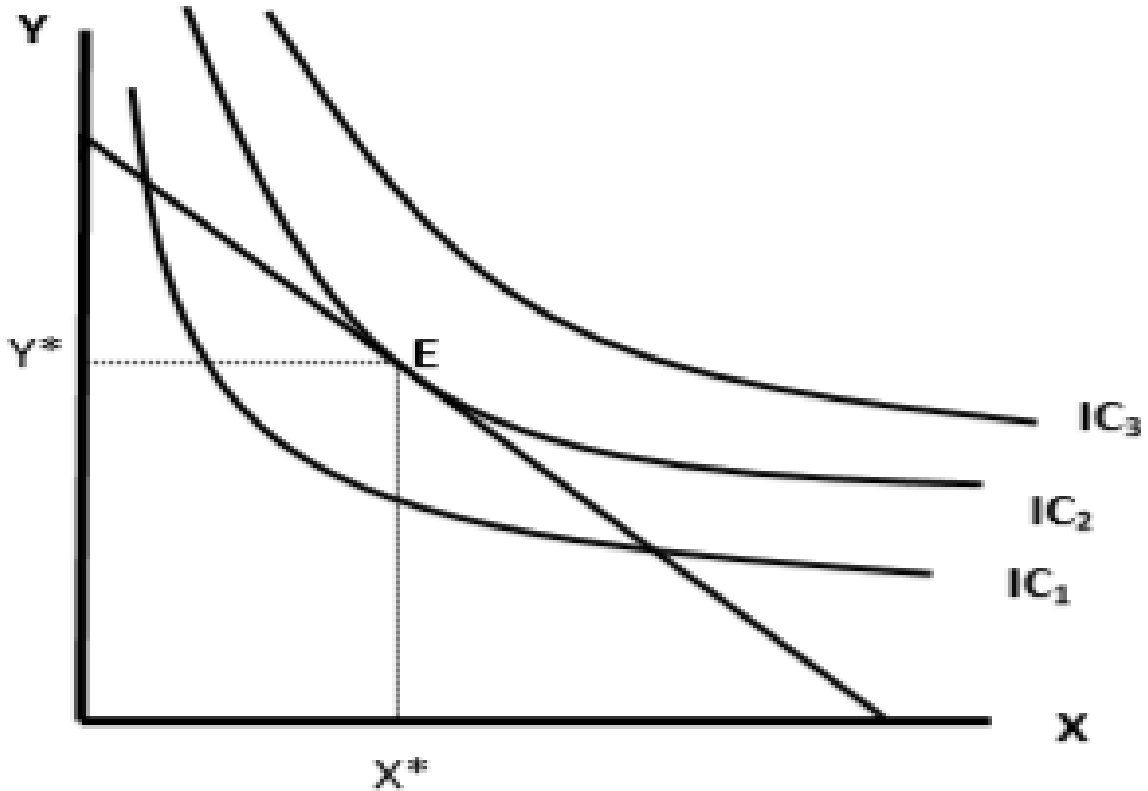


Figure 3.10: Consumer equilibrium under indifference curve approach

- In figure 3.10, the equilibrium of the consumer is at point E, where the budget line is tangent to the highest attainable indifference curve (IC2).

❖ **Mathematically**, consumer optimum (equilibrium) is attained at the point where:

Slope of indifference curve = Slope of the budget line

$$MRS_{X,Y} = -\frac{P_X}{P_y}$$

$$\Rightarrow \quad \frac{MU_X}{MU_Y} = -\frac{P_X}{P_y}$$

Example: A consumer consuming two commodities X and Y has the utility function $U(X,Y) = XY + 2X$. The prices of the two commodities are **4** birr and **2** birr respectively. The consumer has a total income of **60** birr to be spent on the two goods.

a) Find the utility maximizing quantities of good X and Y.

b) b) Find $MRS_{X,Y}$ at equilibrium.

Solution:

a) The budget constraint of the consumer is given by:

$$4Q_x + 2Q_y = 60$$

$$Q_y = \frac{60}{2} - \frac{4}{2}Q_x \; ; \; Q_y = 30 - 2Q_x$$ .....Budget Line

- ✓ Thus, the slope of the budget line = **2**
- ✓ **Slope of the IC** = $MRS_{X,Y} = \frac{MU_X}{MU_Y} = \frac{Y+2}{X}$
- ✓ **At Equilibrium: Slope of the IC** = slope of the budget line

$$\frac{Y+2}{X} = 2; \; Y+2 = 2X \; ; \qquad Y = 2X$$

- ✓ Substituting this in the budget equation results

Y= 14 and X = 8

b) $MRS_{X,Y} = \frac{MU_X}{MU_Y} = \frac{Y+2}{X} = \frac{14+2}{8} = \frac{16}{8} = 2$