

**SAMPLE QUESTION PAPER - 2**  
**Economics (030)**  
**Class XI (2024-25)**

**Time Allowed: 3 hours**

**Maximum Marks: 80**

**General Instructions:**

1. This question paper contains two sections:  
Section A – Micro Economics  
Section B – Statistics
2. This paper contains 20 Multiple Choice Questions type questions of 1 mark each.
3. This paper contains 4 Short Answer Questions type questions of 3 marks each to be answered in 60 to 80 words.
4. This paper contains 6 Short Answer Questions type questions of 4 marks each to be answered in 80 to 100 words.
5. This paper contains 4 Long Answer Questions type questions of 6 marks each to be answered in 100 to 150 words.

**Section A**

1. **Assertion (A):** Interpretation of data implies the drawing of a conclusion on the basis of the data analyzed in the earlier stage. [1]  
**Reason (R):** Calculation of value by different methods and tools for various purposes is made to arrive at the last stage of study viz., interpretation of data.  

a) Both A and R are true and R is the correct explanation of A.	b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.	d) A is false but R is true.
  
2. A composite price index based on the prices of a group of items is known as the [1]  

a) Laspeyres Index	b) CPI
c) Paasche Index	d) Aggregate price index
  
3. When X increases, Y decreases but their ratio is not constant. What kind of correlation exist between X and Y? [1]  

a) Positive Linear	b) Negative Linear
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c) Positive

d) Negative Non Linear

4. Calculate price index number for 2004 taking 1994 as the base year from the following data by simple aggregative method: [1]

Commodities	A	B	C	D	E
Price (1994) (Rs)	100	40	10	60	90
Price (2004) (Rs)	140	60	20	70	100

a) 140

b) 150

c) 120

d) 130

5. An index that is designed to measure changes in quantities over time is known as the [1]

a) Time index

b) None of these

c) Quantity index

d) Paasche index

6. Simple aggregate of quantities is a type of [1]

a) Quantity indices

b) Quantity control

c) Both Quality control and  
Quantity Indices

d) Price control

7. 1 lac people attended the rally addressed by the Prime Minister in Delhi and 2 Lakh in Mumbai. These statistics are based on [1]

a) Collection

b) Accuracy

c) Estimation

d) Reasonability

8. If you are interested in how the government expenditure have fluctuated over time, it would be best to use: [1]

a) Pie graph

b) Time series graph

c) Histogram

d) Frequency Curves

9. Laspayer's index is based on [1]

a) Base year quantities

b) Base year Prices

c) Current year quantities.

d) Average of current and base year

10. Calculate the correlation coefficient between x and y and comment on their relationship [1]

X	3	2	1	1	2	3
Y	9	4	1	1	4	9

a) 0.47

b) 0.25

c) 0.0

d) 0.99

11. In how many groups, different commodities have been divided while constructing the Wholesale Price Index in India? [3]

12. Mean marks obtained by 100 students are estimated to be 40. Later on it is found that one value was read as 83 instead of 53. Find out the 'corrected' mean. [3]

OR

The arithmetic mean of 1, 3, 5, 6, X and 10 is 6, then find the value of X.

13. From the following frequency distribution, prepare 'less than' and 'more than' cumulative frequency distribution. [4]

Wages (in Rs.)	100-110	110-120	120-130	130-140	140-150
Number of Workers	4	12	20	7	5

14. Distinguish between classification and tabulation of data. [4]

OR

What is shown on X-axis and Y-axis of a graph?

15. "A good sample is generally based on correctness and continuity". In the context of above statement explain the characteristics of good sample. [4]

16. Calculate coefficient of rank correlation from the following data. [6]

X	48	33	40	9	16	16	65	24	16	27
Y	13	13	24	6	15	4	20	9	6	19

17. Compare mean, median and mode as measures of central tendency. Discuss the situations when one is more suitable than other. [6]

OR

Wage rate of 19 workers is given below

Wages (in Rs.)	10	20	30	40	50
Number of Workers	4	5	3	2	5

Calculate arithmetic mean using step deviation method.

**Section B**

18. In the case of contraction of supply, we move: [1]
- a) from upper point to lower point      b) to left on the another supply curve
- c) to right on the another supply curve      d) from lower point to upper point
19. The problem of ' How to produce' is making a choice between [1]
- a) None of these      b) Capital Intensive methods
- c) Labour intensive methods      d) Both of these
20. The steeper is the negatively sloped demand curve, the further below is the marginal revenue curve. [1]
- a) True      b) May be
- c) Can't say      d) False
21. The relationships between TR and MR when price fall is [1]
- a) TR falls but MR rises      b) TR rises but MR falls
- c) Both rise in sales      d) TR rises and then fall but MR falls with sales
22. The relationship between AC & MC is [1]
- a) AC continues to fall till MC is greater than AC      b) AC continues to fall till MC is less than AC

c) AC continues to rise till MC is less than AC

d) AC continues to fall till MC is equal to AC

23. **Assertion (A):** There is a negative relationship between income and the demand of an individual. [1]

**Reason (R):** Inferior goods are the goods the demand for which increases as the income of the buyer rises.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

24. Under perfect competition, the firm earns normal profit in the long run because of: [1]

a) free entry and exit

b) large number of buyers and sellers

c) absence of selling cost

d) homogeneous commodity

25. The relationship between AR and MR when price is constant is [1]

a)  $AR > MR$

b) The values increase

c) The values decrease

d) The values are same

26. Implicit costs are [1]

a) Same as explicit costs

b) Total cost

c) Opportunity costs

d) Imputed costs

27. In perfect competition, when the marginal revenue and marginal cost are equal, profit is: [1]

a) Negative

b) Average

c) Zero

d) Maximum

28. What does a simple economy mean? [3]

OR

What is PP Frontier? Write its assumptions.

29. What is the minimum price ceiling? Explain its implications. [3]
30. Explain the difference between 'change in demand' and 'change in quantity demanded'. [4]
31. Differentiate between Short Period and Long period. [4]

OR

Giving reasons, Identify the equilibrium level of output and find profit at this output using Marginal Cost and Marginal Revenue approach from the following table:

Output (units)	1	2	3	4	5
Total Revenue (Rs.)	10	20	30	40	50
Total Cost (Rs.)	12	22	30	40	52

32. Explain the concepts of [4]
- Marginal Rate of Substitution (MRS),
  - Budget line, with the help of numerical examples.
33. Explain the Law of Variable Proportion with the help of total and marginal physical schedule. [6]
34. **Answer the following questions** [6]
- When price of a commodity falls by Rs 1 per unit, its quantity demanded rises by 3 units. Its Price Elasticity of Demand is (-) 2. Calculate its quantity demanded if the price before change was Rs 10 per unit. [3]
  - A consumer buys 30 units of a good at a price of Rs. 10 per unit. Price elasticity of demand for the good is (-)1. How many units the consumer will buy at a price of Rs. 9 per unit Rs. Calculate. [3]

**Solution**  
**SAMPLE QUESTION PAPER - 2**  
**Economics (030)**  
**Class XI (2024-25)**  
**Section A**

1.

(b) Both A and R are true but R is not the correct explanation of A.

**Explanation:**

Interpretation of data implies the drawing of a conclusion on the basis of the data analyzed in the earlier stage. Calculation of value by different methods and tools for various purposes is made to arrive at the last stage of study viz., interpretation of data.

2.

(d) Aggregate price index

**Explanation:**

A composite index number is a number that measures an average relative changes in a group of relative variables with respect to base whereas a simple index number is a number that measures a realive change in a single variable with respect to base. So, composite index number is based on an aggregate of items.

3.

(d) Negative Non Linear

**Explanation:**

Since one variable increases and the other decreases, but the ratio of change is not constant, so it is a negative non linear correlation. In non linear correlation, the amount of change in one variable does not bear a constant ratio to the amount of change in the other related variable.

4.

(d) 130

**Explanation:**

Commodities	A	B	C	D	E
Price (1994) (Rs)	100	40	10	60	90
Price (2004) (Rs)	140	60	20	70	100

$$= 140 + 60 + 20 + 70 + \frac{100}{100} + 40 + 10 + 60 + 90 \times 100 = 130$$

5.

(c) Quantity index

**Explanation:**

Index numbers measure changes in variables with respect to time. Quantity of anything is a variable. So, when current year quantity is compared with base year quantity, we have

quantity index number.

6. (a) Quantity indices

**Explanation:**

Quantity indices is a type of Simple aggregate of quantities.

This index number measures the changes in the level of quantities of items consumed, or produced, or distributed during a year under study with reference to another year known as the base year. Like the price index number, the simplest formula of this index number is as follows:

$$Q_{01} = (q_1/q_0) \times 100$$

Where,  $Q_{01}$  = quantity index number of the current year on the basis of the base year's quantity.

7.

(c) Estimation

**Explanation:**

Such huge data cannot be collected as doing so is costlier in terms of time, money, and manpower. So, estimation is the only way in such cases.

8.

(b) Time series graph

**Explanation:**

Expenditure over time implies time series data.

9. (a) Base year quantities

**Explanation:**

A weighted aggregative price index using base period quantities as weights, is also known as Laspeyre's price index.

10.

(d) 0.99

**Explanation:**

X	Y	$dX$	$dY$	$dX^2$	$dY^2$	$dXdY$
3	9	1	5	1	25	5
2 (A)	4 (A)	0	0	0	0	0
1	1	-1	-3	1	9	3
1	1	-1	-3	1	9	3
2	4	0	0	0	0	0
3	9	1	5	1	25	5
	$\Sigma$	0	4	4	68	16



$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}$$

$$= \frac{6(16) - (0)(4)}{\sqrt{6(4) - (0)^2} \sqrt{6(68) - (4)^2}} = 0.99$$

11. To measure WPI, commodities are classified into the following categories:

- 1) Primary goods: It covers both food and nonfood items. These goods are directly obtained from natural resources.
- 2) Fuels: it includes fuel and related products like coal, petroleum, electricity.
- 3) Manufactured or Industrial good: it includes machinery, equipment, chemicals, fertilizers, etc.

12. Given,  $\bar{X} = 40$ ,  $n=100$

$$\text{Now, } \bar{X} = \frac{\sum X}{n} \Rightarrow 40 = \frac{\sum X}{100}$$

$$\Rightarrow \sum X(\text{wrong}) = 40 \times 100 = 4000,$$

Also given, correct value=53, incorrect value =83.

We have to add the correct value and deduct the incorrect value from 4000 and divide it by no. of observations.

$\therefore$  Correct  $\bar{X}$

$$= \frac{\sum X(\text{Wrong}) + (\text{Correct value}) - (\text{Incorrect value})}{n}$$

$$= \frac{4000 + 53 - 83}{100} = \frac{3970}{100} = 39.70$$

Thus, corrected mean =39.70

OR

In this question, mean is given as 6.

The observations are 1,3,5,6,X and 10. So the total no. of observations is 6. One observation is missing which we take as X.

Mean = Total of all observations / No. of observations

$$\bar{X} = \frac{\sum X}{n}$$

$$\bar{X} = \frac{1+3+5+6+X+10}{6}$$

$$\Rightarrow 6 = \frac{25+X}{6} \Rightarrow 36 = 25 + X$$

$$\therefore X = 36 - 25 = 11$$

13. 'Less Than' Cumulative Frequency Distribution.

It is obtained by adding successively the frequencies of all the previous classes including the class against which it is written. The cumulate is started from the lowest to the highest size.

Wages (in Rs.)	Cumulative Frequency (cf)
Less than 110	4
Less than 120	16

Less than 130	36
Less than 140	43
Less than 150	48

‘More Than’ Cumulative Frequency Distribution.

It is obtained by finding the cumulate total of frequencies starting from the highest to the lowest class.

Wages (in Rs.)	Cumulative Frequency (cf)
More than 100	48
More than 110	44
More than 120	32
More than 130	12
More than 140	5

14. The primary difference between classification and tabulation is that the process of classifying data into groups is known as classification of data, whereas tabulation is the act of presenting data in tabular form, for better interpretation.

Differences between classification and tabulation of data are:

Basis	Classification	Tabulation
Meaning	Classification of data means that the data is arranged in different classes according to the presence or absence of certain attributes.	Tabulation of data means that the classified data is arranged in rows and columns, under suitable heads and sub-heads,
Sequence	Classification precedes the process of tabulation.	Data can be tabulated only after it has been classified.
Method or Process	Classification is a method which facilitates statistical analysis.	Tabulation is a process which facilitates the presentation of data by preparing table.
Tool	It is a tool which helps to organise data.	It is a tool which helps in the presentation of data.
Bifurcates data into	Categories and sub-categories.	Headings and sub-headings.
Purpose	To analyse data.	To present data.

OR

Variable is shown on X axis and frequencies are shown on Y axis.

15. The characteristics of a good sample are as follows:

- i. A Sample must represent characteristics of the entire universe population i.e., it should be representative.
- ii. It must be adequate enough to offer reliable conclusions.
- iii. The units of the sample should be independent of each other.
- iv. In case more than one sample is selected from a given population, then these samples should be homogeneous.
- v. To have a correct picture of the problem under investigation, it is important to draw a sample keeping in view the objective of the investigation.

16. In the given sum Equal Ranks or Tie in Ranks are assigned to Y. In such case the same ranks are assigned to two or more entities, then the ranks are assigned on an average basis.

The ranks shall be calculated as:  $(5+6)/2 = 5.5$  and so on.

The formula to calculate the rank correlation coefficient when there is a tie in the ranks is:

$$r_k = 1 - \frac{6 \left[ \sum D^2 + \frac{1}{12} (m_1^3 - m_1) + \frac{1}{12} (m_2^3 - m_2) \right]}{n^3 - n}$$

#### Calculation of Rank Correlation

X	R <sub>1</sub>	Y	R <sub>2</sub>	D = R <sub>1</sub> - R <sub>2</sub>	D <sup>2</sup>
48	2	13	5.5	-3.5	12.25
33	4	13	5.5	-1.5	2.25
40	3	24	1	2.0	4.0
9	10	6	8.5	1.5	2.25
16	8	15	4	4.0	16.0
16	8	4	10	-2.0	4.0
65	1	20	2	-1.0	1.0
24	6	9	7	-1.0	1.0
16	8	6	8.5	-0.5	0.25
27	5	19	3	2.0	4.0
					$\sum D^2 = 47$

$$\therefore r_k = 1 - \frac{6 \left[ \sum D^2 + \frac{1}{12} (m^3 - m) + \frac{1}{12} (m^3 - m) + \frac{1}{12} (m^3 - m) \right]}{n^3 - n}$$

$$= 1 - \frac{6(47+2+0.5+0.5)}{990} = 1 - \frac{6 \times 50}{990} = 1 - \frac{300}{990} = 1 - 0.303 = 0.697$$

It indicates that there is a moderate degree of positive correlation.

17. Mean, median and mode are all different measures of central tendency or the average but they are all different from each other. A comparison of the three is therefore necessary. Let

us suppose there are a set of five observations - 1, 1, 2, 5, and 6. The mean is what most people call the average and it is found by adding all these numbers and dividing it with the number of observations:  $1 + 1 + 2 + 5 + 6 = 15/5 = 3$ . The median on the other hand is one where half the values are below and half the values are above. In our above observation set, the median is 2 because there are 2 observations (5 and 6) greater than 2 and two (1 and 1) which are less than 2, making it the median. The mode is the observation that is repeated the maximum number of times. therefore in our observation set it is 1 because 1 is the only number that occurs twice, making it the mode. The choice of which method to use depends on the following considerations.

1. Rigidly defined - Mean and median are rigidly defined whereas mode is not. So as far as rigidity is concerned, mean and median are better than mode.
2. Based on all observations - An average should be based on all the observations of a series. This is met only mby mean and not by median and mode.
3. sampling stability - When the requirement is of least sampling variations, then mean is the best.
4. Further algebraic treatment - Mean only satisfies this characteristic, and because of this most of the stastical theories use mean as a measure of central tendency.
5. Easy to understand and calculate - An average should be easy to understand and easy to interpret. This characteristic is satisfied by all the three averages.
6. The measure of central tendency should not be undly affected by the extreme observations. The mode is the most suitable average from this point of view. Median is slightly affected whereas mean is very much affected by the presence of extreme observations.

OR

### Calculation of Arithmetic Mean

Wages (in Rs. (X))	Number of Workers (f)	dx (X-A) (A=30)	d'x $(\frac{dx}{c})$ c=10	Product of Step Deviation and Frequency (i.e., fd' x)	
10	4	-20	-2	-8	-13
20	5	-10	-1	-5	
30	3	0	0	0	0
40	2	10	+1	+2	+12
50	5	20	+2	+10	
	$\Sigma f = 19$				$\Sigma fd' X = -1$

Now,

$$\bar{X} = A + \frac{\Sigma fd'x}{\Sigma f} \times c$$

Here,

A = Assumed value of mean = 30

C = Common factor chosen = 10

$\Sigma fd'X$  = Sum of Product of Step Deviation and Frequency = -1

$\Sigma f$  = Sum of frequencies = 19

Putting the values in the given formula:

$$\bar{X} = 30 + \frac{(-1)}{19} \times 10$$

$$= 30 - 0.053 \times 10$$

$$= 30 - 0.53 = 29.47$$

Hence, required arithmetic mean ( $\bar{X}$ ) = 29.47

### Section B

18. (a) from upper point to lower point

**Explanation:**

Movement from a higher point to a lower point on the same supply curve is known as a contraction of supply.

19.

(d) Both of these

**Explanation:**

Technology means the correct proportion in which the different factors of production are to be employed. There are two types of techniques. A labour-intensive technique would employ relatively more labour and less capital. On the other hand, capital-intensive technique means more capital and less labour. The context of how to produce is 'which techniques are to be adopted'?

20. (a) True

**Explanation:**

True

21.

(d) TR rises and then fall but MR falls with sales

**Explanation:**

When more output is sold by lowering the price, then MR will fall. Till the point MR is positive, TR will rise and when MR becomes negative, TR starts falling. TR is at its maximum when MR is zero.

22.

(b) AC continues to fall till MC is less than AC

**Explanation:**

When  $MC < AC$ ,  $AC$  falls

When  $MC = AC$ ,  $AC$  is constant and at its minimum point

When  $MC > AC$ ,  $AC$  rises

23.

(c) A is true but R is false.

**Explanation:**

There is a negative relationship between income and the demand of an individual because inferior goods are the goods the demand for which decreases as the income of the buyer rises.

24. (a) free entry and exit

**Explanation:**

Entry into the market as well as exit from the market is free for firms under perfect competition. It ensures their normal profit in the long run.

25.

(d) The values are same

**Explanation:**

When price is constant then  $AR$  will also be equal to price as  $AR = TR/Qty$ . Marginal revenue is addition in revenue with sale of every additional unit. If price is constant, then each additional unit will yield revenue equal to the price. So, in perfect competition  $AR = MR$ .

26.

(d) Imputed costs

**Explanation:**

It is the cost of self-supplied factors.

27.

(d) Maximum

**Explanation:**

In perfect competition, when the marginal revenue and marginal cost are equal, profit is maximum.

28. An individual himself is not capable of producing all goods and services which he needs for the satisfaction of wants. He depends upon others. If you are a teacher, students depend upon you for their education. You, on the other hand, depend upon a baker for the bread, a tailor for stitching your clothes, a maidservant for domestic help, and so on. Thus, mutual interdependence is the essence of economic activity. Mutual interdependence leads to exchange. Accordingly, we can say that mutual interdependence and exchange are the core elements of an economy.

A simple economy is the one in which the degree of 'interdependence and exchange' is of a moderate degree. Every individual in the community is occupied in the manufacturing of some goods or services and they require an amalgam of many goods and services not all of which are produced by them.

OR

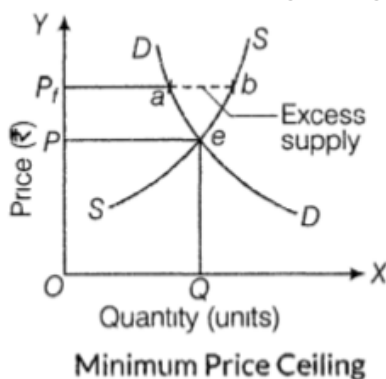
The production possibility frontier (PPF) is a curve depicting all maximum output possibilities for two goods, given a set of inputs consisting of resources and other factors. The PPF assumes that all inputs are used efficiently.

The four key assumptions underlying production possibilities analysis are:

1. resources are used to produce one or both of only two goods,
2. the quantities of the resources do not change,
3. technology and production techniques do not change, and
4. resources are used in a technically efficient way.

29. A price ceiling occurs when the government limits how much producers can charge for a good. It is called a ceiling because you cannot charge more than the amount specified by the government. This is set by the government to protect the interest of the seller.

Price floor is set above the equilibrium price which creates 'excess supply' in the market as shown in the diagram given below.



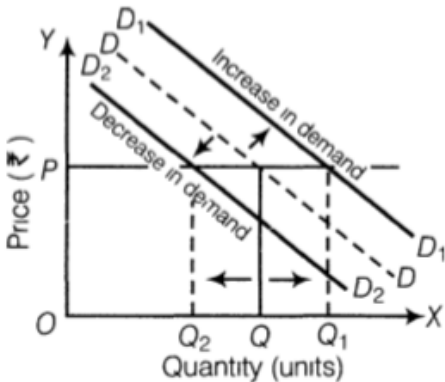
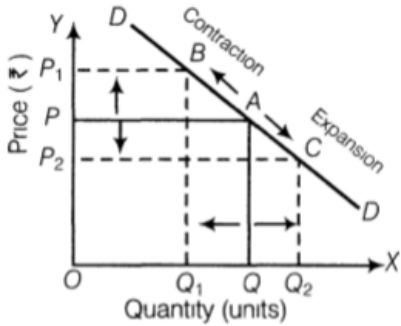
In the above diagram, OP is equilibrium price because at this price demand is equal to supply. Further OP<sub>f</sub> is the price floor which creates excess supply equal to ab.

Implications of minimum price ceiling:

- i. It assures the farmers that whatever they produce will get sold in the market.
- ii. It secures higher income for producers and labours (i.e. labour laws are an example of price floor).
- iii. The end result is high prices for consumers.

30. Differences between change in demand and change in quantity demanded are

Basis	Change in Demand	Change in quantity Demanded
Reason	It is caused by a change in prices of substitutes, change in prices of complementary goods, change in	It is caused by an increase or decrease in the price of the given

	income, etc. other than the own price of the commodity.	commodity, keeping other factors constant.
Impact on demand curve	It leads to a shift in the demand curve either rightwards (known as increase in demand) or leftwards (known as decrease in demand).	It leads to a movement along the same demand curve either upwards (known as contraction in demand) or downwards (known as expansion in demand).
Diagrammatic Presentation	Diagrammatically, this is shown as a forward or backward shift in demand curve.  <p style="text-align: center;">Shift in Demand Curve</p>	Diagrammatically, this is shown as a downward or an upward movement on the same demand curve.  <p style="text-align: center;">Movement along a Demand Curve</p>

31.	Short period	Basis	Long Period
	A short period refers to the period of time in which a firm cannot change some of its factors like plant, machinery, building, etc. due to insufficiency of time but can change any variable factor like labour, raw material, etc.	Meaning	A long period, on the other hand, is a time period during which a firm can change all factors of production including machines, building, organization etc.
	Output can only be increased by changing the quantity of variable factors.		Output
	Factors of production here can be grouped in two categories: <ul style="list-style-type: none"> <li>o Fixed Factors</li> <li>o Variable Factors</li> </ul>	Classification	In the long period, the distinction between the fixed and the variable factors disappear.



Demand here plays a dominant role in the determination of price of a commodity	Effects	In the long period, supply can be adjusted to any change in demand. So, demand and supply play equal role in price determination.
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OR

Output	TR (Rs.)	TC (Rs.)	Profit (TR -TC)	MR (Rs.)	MC (Rs.)
1	10	12	-2	-	-
2	20	22	-2	10	10
3	30	30	0	10	8
4	40	40	0	10	10
5	50	52	-2	10	12

Equilibrium refers to a state of rest when no change is required. A firm (producer) is said to be in equilibrium when it has no inclination to expand or to contract its output. This state either reflects maximum profits or minimum losses.

There are two methods for determination of Producer's Equilibrium:

1. Total Revenue and Total Cost Approach (TR-TC Approach)
2. Marginal Revenue and Marginal Cost Approach (MR-MC Approach)

According to MR - MC approach, the producer's equilibrium refers to the stage of that output level at which:

- i.  $MC = MR$ : As long as MC is less than MR, it is profitable for the producer to go on producing more because it adds to its profits. He stops producing more only when MC becomes equal to MR.
- ii. MC is greater than MR after  $MC =$  output level. When MC is greater than MR after equilibrium, it means producing more will lead to a decline in profits.

As per the given schedule, the producer will be at equilibrium when he is producing 4 units of output because both the conditions of producers equilibrium are being fulfilled at this point i.e.

- i.  $MC = MR$  [ $MC = MR = 10$ ].
  - ii. MC becomes greater than MR after the  $MC = MR$  output level [ $MC = 9$ , whereas  $MR = 7$  at the 5th unit of output].
  - iii. Producer won't be at equilibrium at the 2nd unit of output though  $MC = MR$  because MC is not greater than MR after that level of output.
32. i. Marginal Rate of Substitution refers to the rate at which the consumer is willing to sacrifice one goods to obtain one more unit of the other goods.

ii. A budget line is the line that shows the maximum amount of goods-X or of goods-Y (or the possible combinations of X and Y) that the consumer can buy, given his money income and the prices of the goods X and Y.

Let the two goods be X and Y. We are given  $P_X = ₹ 4$ ,  $P_Y = ₹ 5$ , Consumer's income (M) = ₹ 20. Budget line equation is :  $P_X X + P_Y Y = M$  or  $\Rightarrow 4x + 5y = 20$ .

33. Law of Variable Proportions states that as we increase the quantity of input, keeping other inputs fixed, the total product initially increases at an increasing rate, then at a decreasing rate and finally at a negative rate.

Variable factor (Labour)	TP	MP	Phase
1	10	10	1st
2	30	20	
3	45	15	2nd
4	52	7	
5	52	0	
6	48	-4	3rd

Law of variable proportion can be discussed in three phases:

- i. **Increasing Returns to a Factor:** In the first phase, every additional variable factor adds more and more to the total output. It means TP increases at an increasing rate and MP of each variable factor rises.
- ii. **Diminishing Returns to a Factor:** In the second phase, every additional variable factor adds a lesser amount of output. It means TP increases at a diminishing rate and MP falls with increase in variable factor.
- iii. **Negative Returns to a Factor:** In the third phase the employment of additional variable factor causes TP to decline. MP now becomes negative.

34. Answer the following questions

(i) Given,  $\Delta P = ₹ 1$  per unit,  $\Delta Q = 3$  units

$$E_{dd} = (-)2, P = ₹ 10$$

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

$$\text{or } (-)2 = \frac{3}{-1} \times \frac{10}{Q}$$

$$Q = \frac{3 \times 10}{2}$$

$$Q = 15 \text{ units}$$

$\therefore$  Quantity demanded before change in price = 15 units.

(ii) Given,

$$Q_1 = 30$$

$$Q_2 = ?$$

$$P_1 = Rs.10$$

$$P_2 = Rs. 9$$

$$E_d = -1$$

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

$$\Delta Q = Q_2 - Q_1 = Q_2 - 30$$

$$\Delta P = P_2 - P_1 = 9 - 10 = -1$$

$$-1 = \frac{Q_2 - 30}{30} \times \frac{10}{-1}$$

$$3 = Q_2 - 30$$

$$33 = Q_2$$