



STUDY MATERIAL
CLASS – XI (2023-24)
SUBJECT: ECONOMICS
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केन्द्रीय विद्यालय संगठन
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ECONOMICS (Code .030)
CLASS XI- CURRICULUM (2023-2024)

Units		Marks
Part A	Statistics for Economics	
	Introduction	15
	Collection, Organization and Presentation of Data	
	Statistical Tools and Interpretation	25
	Sub Total	40
Part B	Introductory Microeconomics	
	Introduction	4
	Consumer's Equilibrium and Demand	14
	Producer Behaviour and Supply	14
	Forms of Market and Price Determination under perfect competition with simple applications	08
	Sub Total	40
Part C	Project Work	20
	Total	100 marks

Part A: Statistics for Economics

Unit 1: Introduction: What is Economics? Meaning, scope, functions and importance of statistics in Economics .

Unit 2: Collection, Organisation and Presentation of data ,Collection of data - sources of data - primary and secondary; how basic data is collected with concepts of Sampling; methods of collecting data; some important sources of secondary data: Census of India and National Sample Survey Organisation.

Organisation of Data: Meaning and types of variables; Frequency Distribution.

Presentation of Data: Tabular Presentation and Diagrammatic Presentation of Data:

(i) Geometric forms (bar diagrams and pie diagrams), (ii) Frequency diagrams (Histogram, polygon and Ogive) and (iii) Arithmetic line graphs (time series graph).

Unit 3: Statistical Tools and Interpretation

Measures of Central Tendency- Arithmetic mean, median and mode

Correlation – meaning and properties, scatter diagram; Measures of correlation - Karl Pearson's method (two variables ungrouped data) Spearman's rank correlation (Non-Repeated Ranks and Repeated Ranks).

Introduction to Index Numbers - meaning, types - wholesale price index, consumer price index and index of industrial production, uses of index numbers; Inflation and index numbers.

Part B: Introductory Microeconomics

Unit 4: Introduction: Meaning of microeconomics and macroeconomics; positive and normative economics, What is an economy? Central problems of an economy: what, how and for whom to produce; concepts of production possibility frontier and opportunity cost.

Unit 5: Consumer's Equilibrium and Demand

Consumer's equilibrium - meaning of utility, marginal utility, law of diminishing marginal utility, conditions of consumer's equilibrium using marginal utility analysis.

Indifference curve analysis of consumer's equilibrium-the consumer's budget (budget set and budget line), preferences of the consumer (indifference curve, indifference map) and conditions of consumer's equilibrium. Demand, market demand, determinants of demand, demand schedule, demand curve and its slope, movement along and shifts in the demand curve; price elasticity of demand - factors affecting price elasticity of demand; measurement of price elasticity of demand – percentage-change method and total expenditure method.

Unit 6: Producer Behavior and Supply

Meaning of Production Function – Short-Run and Long-Run

Total Product, Average Product and Marginal Product.

Returns to a Factor

Cost: Short run costs - total cost, total fixed cost, total variable cost; Average cost;

Average fixed cost, average variable cost and marginal cost-meaning and their relationships.

Revenue - total, average and marginal revenue - meaning and their relationship.

Producer's equilibrium-meaning and its conditions in terms of marginal revenue marginal cost. Supply, market supply, determinants of supply, supply schedule, supply curve and its slope, movements along and shifts in supply curve, price elasticity of supply; measurement of price elasticity of supply - percentage-change method.

Unit 7: Forms of Market and Price Determination under Perfect Competition with simple applications.

Perfect competition - Features; Determination of market equilibrium and effects of shifts in demand and supply. Simple Applications of Demand and Supply: Price ceiling, price floor.

Part C: Project in Economics

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PART- A : STATISTICS FOR ECONOMICS

UNIT-1 INTRODUCTION

BASIC CONCEPTS

Economics – ‘Economics is a science that deals with the use of scarce resources that have alternative uses to satisfy human wants’.

Economic activities –Those activities which are done for monetary gains are called economic activities.

Economics as a science of wealth

) Adam Smith, the father of economics considers economics as a study of nature and causes of wealth of nation. It is a study of material goods related to an economic man.

‘Alfred Marshall’ defines economics as ‘**The study of mankind in the ordinary business of life**’

Components of economic activity:

(1)**Consumption**:- consumption is the process of using up utility value of goods and services for the direct satisfaction of our wants. Utility of goods means inherent capacity of goods and services to satisfy human wants.

(2) **Production**:- ‘Production is the process of converting raw material into useful things’. Things become useful as they acquire utility value in the process of production.

(3) **Distribution**:- ‘Factor income distributed among factors those who worked as agents of production.’ The factors of production - land, labour, capital and entrepreneurship. (Land form of rent, labourers form of wage, capital form of interest and entrepreneurs form of profits)
Distribution of income refers to the distribution of GDP.

Economic Problem : It is the problem of choice arising an account of the fact that resources are scarce and these have alternative uses.

Robbins defines economics as: A science that studies human behavior as a relationship between ends and scarce means which have alternative uses.

WHAT IS STATISTICS:- Statistics is used in singular and plural sense.

A Plural Sense : ‘Statistics are numerical statement of facts in any department of economy placed in relation to each other’. Such as Population statistics, Employment statistics, Public expenditure ect.

Features of statistics in the Plural Sense:

- (1) Aggregate facts
- (2) Numerically expressed
- (3) Pre- determined objective
- (4) Collected in a systematic manner
- (5) Mutually related and comparable
- (6) Multiplicity of causes.

Statistics, in singular sense:- ‘Statistics may be defined as the collection, presentation, analysis and interpretation of numerical data’.

Stages of Statistical Study:- These stages are:

- (1) Collection of Data
- (2) Organisation of data
- (3) Presentation of data
- (4) Analysis of data
- (5) Interpretation of data

Stages of Statistical Study and the related Statistical Tools

Stage	Statistical Study	Statistical Tools
Stage – I	Collection of Data	Census or Sample Techniques
Stage –II	Organisation of data	Array of Data and Tally Bars
Stage –III	Presentation of data	Tables, Graphs ,and Diagrams
Stage – IV	Analysis of data	Percentages, Averages, Correlation and Regression Coefficients
Stage – V	Interpretation of data	Magnitude of Percentages, Averages and the Degree of Relationship between different economic variables

SCOPE OF STATISTICS:- Study of the scope of statistic includes:

- (1) Nature of Statistics
- (2) Limitations of Statistics
- (3) Subject Matter of Statistics

Limitation of Statistics

- (1) Study of numerical facts only
- (2) Study of Aggregates only
- (3) Result are true only on average
- (4) Without reference, results may prove to be wrong.
- (5) Can be used only by the experts, Homogeneity of data, an essential requirement.
- (6) Prone to misuse.

IMPORTANCE OF STATISTICS

1. Quantitative expression of economic problems
2. Economic forecasting
3. Construction of economic theories of economic models
4. Working out cause and effect relationship
5. Formulation of policies
6. Economic equilibrium.

ASSERTION REASON Based Questions

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

- (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true..
- (e) If both Assertion and Reasons are incorrect.

Q1.ASSERTION (A): Production is the process of converting raw material into useful things.

REASONING (R): Things become useful as they acquire utility value in the process of production.

Ans (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

Q2.ASSERTION (A): consumption is the process of using up utility value of goods and services for the direct satisfaction of our wants.

REASONING (R): Factor income distributed among factors those who worked as agents of production.

Ans (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

Q3.ASSERTION (A): Statistics are numerical statement of facts in any department of economy placed in relation to each other.

REASONING (R): Statistics is used in only singular sense

Ans.(c) Assertion (A) is true but Reason (R) is false.

Q4.ASSERTION (A): Census or Sample Techniques is a stage of Statistical Study

REASONING (R): Statistics may be defined as the collection, presentation, analysis and interpretation of numerical data.

Ans. (d) Assertion (A) is false but Reason (R) is true.

Statement Based Question

Alternatives:

- a) Both the statement are true
- (b) Both the statement are false
- (c) Statement 1 is true and Statement 2 is false
- (d) Statement 2 is true and Statement 1 is false

Q1. (i) Statement 1: Economics is study of man in the ordinary business of life.

(ii) Statement 2: Economics is a science of wealth.

Ans. a) Both the statement are true

Q2. (i) Statement 1: Non-economic activities are concerned with creation of money.

(ii) Statement 2: Teacher teaching his own son are related to Non-economic activities.

Ans. d) Statement 2 is true and Statement 1 is false.

Q3. (i) Statement 1: In plural sense statistics may be defined as the collection, presentation, analysis and interpretation of numerical data.

(ii) **Statement 2:** In a singular sense, statistics are numerical statements of facts. .
Ans. b) Both the statement are false.

MULTIPLE CHOICE QUESTIONS (MCO)

1. The statistics is concerned with

- a) **Aggregate of numerical fact**
- b) Aggregate of disorganised fact
- c) Aggregate of qualitative fact
- d) Aggregate of heterogeneous fact

2. Statistics is used by

- a) Government
- b) Businessman
- c) Economist
- d) All of the above**

3 . Statistics in singular sense is

- a) Collection of data
- b) Organisation of data
- c) Presentation of data
- d) All of the above**

4. Statistics is the study of ____ facts

- a) Quantitative**
- b) Qualitative
- c) Both quantitative and qualitative
- d) Aggregate

5. In singular sense, statistics means:

- (a) Statistical science
- (b) Statistical law
- (c) Both 'a' and 'b'**
- (d) None of these

6. which of the following is correct regarding statistics:

- (a) Aggregate facts
- (b) Numerically expressed
- (c) Pre- determined objective
- (d) All of these**

7. Which Of The Following Indicates A Stage Of Statistical Study?

- (A) Collection of Data
- (B) Presentation of Data
- (C) Analysis of Data
- (D). **All of these**

8. In Plural sense, which of the following is not a characteristic of

- (A). Aggregate of Data
- (B) Only expressed in words**
- (C). Affected by multiplicity of causes
- (D). Collected in a systematic manner

9. Which is an economic activity?

- (A) Production
- (B) Consumption
- (C). Distribution
- (D) All of these**

10. Which of the following statement is incorrect? (A). Resources have alternative uses

- (B). All numbers are Statistics**
- (C). Macroeconomics studies large aggregates
- (D). Statistics studies only the aggregates of quantitative facts

11. The process of converting raw material into goods is called

- (A) **Production**
- (B) Saving

(C). Investment (D). Exchange

12. Which is not considered as an economic activity?

- (A). Banking (B). **Sujata helping her mother in the kitchen**
(C). Agriculture (D). Business

13. Which of the following is not a function of Statistics?

- (A) Economic forecasting (B) Economic equilibrium
(C). **Political equilibrium** (D). Construction of economic models

14. The first stage of statistical study is

- (A) Analysis of data (B) Presentation of data
(C) Organisation of data (D). **Collection of data**

CASE STUDY

Statistics does not recognize individual items. Consider the statement, “the weight of Mr X in the college is 50 KG”. This statement does not constitute statistical data. Statistical methods are not going to investigate anything about this statement. Whereas, if the weights of all the students of the college are given, statistical methods may be applied to analyse that data.

Statistics is both a science and an art. It is systematic and finds applications in studying problems in economics, business, astronomy, physics, medicine etc. Statistical methods are sophisticated in nature. Everyone is not expected to possess the intelligence required to understand and to apply these methods to practical problems. This is the job of an expert, who is well-versed with statistical methods.

1. Statistical laws are universal. True/ False
2. The average marks scored by Mohan in mathematics is not a statistics. True/False

Choose correct
answer:

3. Statistics are:
(A) Aggregate of facts
(B) Numerically expressed
(C) Collected for a pre-deter mind purpose
(D) All of these
4. Statistics is:
(A) Science
(B) Arts
(C) A and B both
(D) None of these

SHORT & LONG ANSWER TYPE QUESTION

Q1. State the components of economic activity.

Components of economic activity:

(1) Consumption:- consumption is the process of using up utility value of goods and services for the direct satisfaction of our wants. Utility of goods means inherent capacity of goods and services to satisfy human wants.

(2) Production:- ‘Production is the process of converting raw material into useful things’. Things become useful as they acquire utility value in the process of production.

(3) **Distribution:-** 'Factor income distributed among factors those who worked as agents of production.' The factors of production - land, labour, capital and entrepreneurship. (Land form of rent, labourers form of wage, capital form of interest and entrepreneurs form of profits) Distribution of income refers to the distribution of GDP.

Q2. Define statistics as a singular noun. Discuss various statistical methods involved in it.

Statistics, in singular sense:- 'Statistics may be defined as the collection, presentation, analysis and interpretation of numerical data'.

Stages of Statistical Study:- These stages are:

- (i) Collection of Data: This is the first step in statistical enquiry. Data collected by investigator himself or obtained from published or unpublished sources.
- (ii) Organisation of data: Collected data is organized in a proper form which involves editing and classification.
- (iii) Presentation of data: Organised data are presented in sum systematic manners as a Tables, Diagrams and graphs ect.
- (iv) Analysis of data: After presentation of data, various methods are used to analyse the data as dispersion , correlation ect.
- (v) Interpretation of data : It involves statistical thinking, skill and experience. On the basis of this conclusion, certain decisions can be taken.

Q3. Explain the stages of statistical study and the related statistical tools.

Stages of Statistical Study and the related Statistical Tools

Stage	Statistical Study	Statistical Tools
Stage – I	Collection of Data	Census or Sample Techniques
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Stage –III	Presentation of data	Tables, Graphs ,and Diagrams
Stage – IV	Analysis of data	Percentages, Averages, Correlation and Regression Coefficients
Stage – V	Interpretation of data	Magnitude of Percentages, Averages and the Degree of Relationship between different economic variables

Q4. Discuss the importance of statistics in government planning.

Ans. Statistics in Economic Government: The government gathers the facts related to :

- (i) National income, Per capita income
- (ii) Poverty, unemployment
- (iii) Population
- (iv) Helps of optimum utilization of scarce resources

Q5. Discuss the importance of statistics in Economies.

Ans. Statistics in Economics : Statistics helps in formulation of economic policies:

- (i) Formulation of law of demand and law of supply policies
- (ii) Useful to study of behavior of consumers and producers
- (iii) Helps in establishing mathematical relation
- (iv) Statistics in production
- (v) Statistics in consumption

- (vi) Statistics in distribution

Q5. Discuss the importance of statistics in Economic Business

Ans. Statistics in Economic Business: Statistics play a very important role in major business activities.

- (i) For estimating market demand
- (ii) For production planning according to market demand
- (iii) Market research is based on statistics
- (iv) For Trade policy
- (v) Important for the detailed analysis of the money transactions in the business.

Q6. Explain the limitations of statistics.

Ans. Limitation of Statistics ;

- (i) Study of numerical facts only: Statistics are numerically expressed. It can be used for measuring quantitative data only.
- (ii) Statistical results are true only on average : Statistical laws are not exact like laws natural sciences are exact as their result are universally true.
- (iii) Statistics does not deal with individuals: Statistics deals only with aggregates of facts and no importance is attached to individual.
- (iv) Without reference, results may prove to be wrong.
- (v) Can be used only by the experts: Statistical methods are most dangerous tools in the hand of inexpert. The techniques of the statistics are not so simple to be used by anyone.
- (vi) Homogeneity of data is essential : Data must have the quality of the uniformity homogeneity to make data comparable.
- (vii) Statistics can be misused: Statistics can be misused, if statistical tools not used rightly. Result can be manipulated according to suitability.

2. COLLECTION OF DATA

Collection of data is the first important aspect of statistical survey.

Data – Information which can be expressed in numbers.

Two sources of data –

(1) Primary Sources of data:- ‘Data originally collected in the process of investigation are known as primary data’

(2) Secondary Sources of data:- ‘Secondary data are those which are already in existence, and which have been collected, for some other purpose than the answering of the question in hand.’

Basic of Difference	Primary Data	Secondary Data
Originality	These are original data.	These are not original but already collected by some other person for institution.
Expenditure	More time, money and labour is required.	Less time, money and labour is required.
Precaution	More precautions are required while collecting these data.	Less precaution is required while collecting these data.
Editing	No need of editing for these data.	Editing is required.

Principal Differences between Primary and Secondary Data

1. Deference in Originality.
2. Difference in Objective
3. Difference in cost of Collection

METHODS OF DATA COLLECTION

Methods / Sources of Collection of Primary Data :

(1) PERSONAL INTERVIEWS

- (i) Direct Personal Investigation
- (ii) Indirect Oral Investigation
- (iii) Information from correspondents

(2) INFORMATION THROUGH QUESTIONNAIRES AND SCHEDULES

- (i) Mailed questionnaire
- (ii) Questionnaire filled by enumerators
- (ii) Telephonic interviews

(1) PERSONAL INTERVIEWS

- (i) **Direct Personal Investigation:-** The direct personal investigation is the method by which data are personally collected by the investigator from the respondents.

Merits:- (i) Originality

(ii) Accuracy

(iii) Reliability

(iv) Uniformity

(v) Elastic

Demerits:- (i) Difficult to cover wide areas

- (ii) Costly
- (iii) Limited coverage
- (iv) Personal bias

(ii) **Indirect Oral Investigation**:- ‘ Indirect oral investigation is the method by which information is obtained not from the persons regarding whom the information is needed’

It is collected orally from other persons who are expected to possess the necessary information.

Merits: (a) wide coverage

- (b) Simple
- (c) Expert opinion
- (d) Free from bias
- (e) Less expensive

Demerits:- (a) Less accurate

- (b) Doubtful conclusions
- (c) Biased

Difference between Direct Personal Investigation and Indirect Oral Investigation

Direct Personal Investigation	Indirect Oral Investigation
(1) Investigator establishes direct contact with the respondents	(1) Contacting other than those about whom information is sought
(2) Possible only when the field of investigation is small.	(2) Field of investigation is relatively large.
(3) Investigator must be well versed in the language and cultural habits of respondents.	(3) No such requirement.
(4) Relatively costlier.	(4) Less costlier.

(iii) Information from local sources or correspondents :- The investigator appoints local correspondents at different places. They collect information in their own way and furnish the same to the investigator.

- Merits**:- (a) Economical
- (b) Continuity
 - (c) Wide coverage
 - (d) Suitable for special purpose

- Demerits**:- (a) Loss of originality
- (b) Lack of uniformity
 - (c) Less accuracy
 - (d) Personal bias
 - (e) Delay in collation.

(2) INFORMATION THROUGH QUESTIONNAIRES AND SCHEDULES

(i) **Mailing (Questionnaire) surveys**:- Questionnaires are mailed to the respondents. A letter is attached with the questionnaire giving the purpose of enquiry. The respondent notes the answers against the questions and returns the completed questionnaire to the investigator.

Advantages	Disadvantages
1) Least expensive 2) Only method to reach remote areas 3) Informants can be influenced	Long response time Cannot be used by illiterates. Doubts cannot be cleared regarding questions

(ii) Enumerator's Method:- Questionnaire is prepared according to the purpose of enquiry. The enumerator himself approaches the respondent with the questionnaire. The questionnaires which are filled by the enumerators themselves by putting questions are called schedules.

Merits:- (a) Wide coverage (b) Personal contact
(c) Accuracy (d) Completeness

Demerits:- (a) Expensive (b) Time consuming
(c) Availability of enumerator (d) Partial

Telephonic interviews:- This mode data collection, the investigator seeks the desired information from the respondents over the telephone.

Advantages	Disadvantages
1) Relatively low cost 2) Relatively high response rate 3) Less influence on informants	Limited use Reactions cannot be watched Respondents can be influenced

Qualities of good questionnaire

- (a) Limited question
- (b) Simplicity
- (c) No undesirable questions
- (d) Proper order of the questions
- (e) Calculation
- (f) Instructions
- (g) Cross verification
- (h) Request for return.

Types of question:- (a) Simple alternative question

- (b) Multiple choice questions
- (c) Open question
- (d) Specific information question

Two main sources of secondary data:

- (1) Published sources
- (2) Unpublished sources

(1) Published sources:- (i) Government publication

(ii) Semi -government publication

(iii) Publication of research institutions

(v) Report of committees and commissions

(vi) Publication of research scholars

(vii) Journals and papers

(viii) International publication

(2)Unpublished sources:-There are some unpublished secondary data as well. These data are collected by the government organisations and others, generally for their self use or office record. These are not published .These unpublished numerical information may, however, be used as secondary data.

Precaution in use of secondary data :- (i) Ability of the collection organization

(ii) Objective and scope

(iii) Time and conditions of collection

(iv)Accuracy

(v)Method of collection

Two important sources of secondary data

(i) Census of India

(ii) Report and publication of national sample survey office (NSSO)

CENSUS AND SAMPLE METHOD OF COLLECTION OF DATA

CENSUS METHOD

‘Census method that method in which data are collected covering every item of the universe or population relating to the problem under investigation’.

Merits:- (1) Reliable and Accurate

(2)Extensive information

(3) Study of complex investigation

(4)Indirect investigation

(5) Study of diverse characteristics

Demerits:- (1) Large manpower (2) Costly

(3) Not suitable for large investigation

SAMPLE METHOD

‘Sample method is that method in which data is collected about the sample on a group of items taken from the population for examination and conclusion are drawn on their bases’.

Merits:- (1) Economical

(2) Time saving

(3) Large investigation

(4) More scientific

(5) Identifications

Demerits: (1) Partial

(b) Possibility of bias at the time of classification of the population into different parts.

(iii) Systematic Sampling :- ‘ Units of the population are numerically, geographically and alphabetically arranged. Every items of the numbered items is selected as a sample item’.

(iv)Quota Sampling:- In this method, the population is divided into different groups or classes according to different characteristics of the population’

(v)Convenience Sampling:- In this method, sampling is done by the investigator in such a manner that suit his convenience’

Reliability of sampling data

- (1) Size of the sample
- (2) Method of sampling
- (3) Training of enumerators
- (4) Bias of correspondents and enumerators

Difference between census method and sampling method.

Census Method	Sampling Method
1) Every unit of population studied	1) Few units of population are studied
2) Reliable and accurate results	2) Less Reliable and accurate results
3) Expensive method	3) Less expensive method
4) More time consuming	4) Less time consuming
5) Suitable when population is of homogenous nature	5) Suitable when population is of heterogeneous nature

Statistical Errors:

Sampling errors:- These are related to the size or nature of the sample selected for the study.

Due to a very small size of the sample selected for study or due to non-representative nature of the sample, the estimated value may differ from the actual value of a parameter. For example: if the estimated value of a parameter is found to be 10 while the actual/true value is 20 then, the sampling error is $10-20 = -10$.

Non-sampling errors: Errors that occur at the stage of collecting data.

Types of non-sampling errors:

- a] Errors of measurement due to incorrect response.
- b] Errors of non-response of some units of the sample selected.
- c] Sampling bias occurs when sample does not include some members of the target population.

MCQ

Q 1. A questionnaire is _____

- (a) A list of answers

(b) A list of objectives of the investigation

(c) A list of questions pertaining to the investigation

(d) A list of data

Q 2. Primary data is more useful when

(a) High degree of accuracy is required

(b) Less time is available

(c) Source of origin is not important

(d) All of these

Q 3. Data collected from government publication is

(a) Secondary data

(b) Primary data

(c) Both (a) and (b)

(d) Neither (a) nor (b)

Q 4. Which method involves study of each and every item of the universe

(a) Sample

(b) Census

(c) Random sampling

(d) None of these

Q 5. An investigator has selected a sample to suit his convenience. This method is

(a) Quota sampling

(b) Convenience sampling

(c) Random sampling

(d) None of these

Q 6. Methods of statistical enquiry:

(a) Census method

(b) Sample method

(c) Both (a) and (b)

(d) None of these

Q 7. Statistical errors are due to:

(a) Selection of wrong samples

(b) Selection of inadequate samples

(c) Wrong information given by informants

(d) All of these

Q 8. In this method sample selection depends on the choice of the investigator:

(a) Quota-sampling

(b) Cluster sampling

(c) Purposive sampling

(d) None of these

Q 9. Sampling error is the difference between actual average and average of:

(a) Non-response error

(b) Sample estimate

(c) Data acquisition

(d) None of these

Statement Based Question

Alternatives:

- a) Both the statement are true
- (b) Both the statement are false
- (c) Statement 1 is true and Statement 2 is false
- (d) Statement 2 is true and Statement 1 is false

Q1. (i) Statement 1: Primary data originally collected in the process of investigation

(ii) Statement 2: Primary data are costlier in terms of time, money and efforts.

Ans. a) Both the statement are true

Q2. (i) Statement 1: under direct personal investigation method , data are personally collected by the investigator.

(ii) Statement 2: This method allows wide coverage of the area of study..

Ans. (c) Statement 1 is true and Statement 2 is false

Q3. (i) Statement 1: Sample method are more reliable and Accurate .

(ii) Statement 2: By using sample method data are collected covering every item of the universe.

Ans. (b) Both the statement are false

SHORT & LONG ANSWER TYPE QUESTION

Q1. What is meant by direct personal investigation? Explain it.

Ans. **Direct Personal Investigation:-** The direct personal investigation is the method by which data are personally collected by the investigator from the respondents.

Suitability: area of investigation is limited, Original data to be required, Maximum degree of accuracy is required.

Merits:- (i) Originality: Information is collected from the source of origin.

(ii) Accuracy: It provides first hand information.

(v) Reliability : Data collected by investigator personally and inquiry is intensive, data collected are reliable

(vi) Uniformity: There is uniformity in data collected by investigator personally.

Demerits:- (i) Difficult to study wide areas : Direct personal investigation method cannot be used if the area of investigation is large.

(ii) Costly: It is expansive method in term of time and money.

(iii) Complex: This method is complex as it requires investigator to be trained.

Q2. What is indirect oral investigation? Give its suitability.

Ans. **Indirect Oral Investigation:-** ‘ Indirect oral investigation is the method by which information is obtained not from the persons regarding whom the information is needed’

It is collected orally from other persons who are expected to possess the necessary information.

Suitability: The field of investigation is large, Investigation is so complex in nature, Direct contact with concerned informants cannot be possible.

Merits: (i) wide coverage areas: This method can be used when field of enquiry is large.

(ii) Simple: This is simple approach of data collection.

(iii) Expert opinion: An investigator can seek expert opinion.

(iv) Less expensive: It is less expansive method in term of time, labour and money.

Demerits:- (i) Lack of accuracy: In this method information is obtained from person than the concerned respondents, there is a possibility of not received true information.

(ii) Doubtful conclusions : The collected information may be doubtful due to carelessness of the witnesses.

(iii) Personal bias: There is a possibility of information being personal bias.

Q3. Distinguish between direct personal investigation and indirect oral investigation.

Ans. Difference between Direct Personal Investigation and Indirect Oral Investigation

Direct Personal Investigation	Indirect Oral Investigation
(1) Investigator establishes direct contact with the respondents	(1) Contacting other than those about whom information is sought
(2) Possible only when the field of investigation is small.	(2) Field of investigation is relatively large.
(3) Investigator must be well versed in the language and cultural habits of respondents.	(3) No such requirement.
(4) Relatively costlier.	(4) Less costlier.

Q4. Describe the information from local sources method of collecting primary data.

Information from local sources or correspondents :- The investigator appoints local correspondents at different places. They collect information in their own way and furnish the same to the investigator.

Suitability: Area of investigation is wide, Regular and continuous data are required, High accuracy.

Merits:(i) Economical :This method is inexpensive in term of time and money.

(ii) Field of enquiry is large: It can cover a wide area under enquiry.

(iii) Suitable for special purpose: This method is suitable for special investigation.

Demerits:- (i) Lack of originality: This method is Lack of originality because personal contact with respondents

(ii) Less accurate: The data collected by this method are less accurate.

(iii) More time consuming: There is a delay in the collation of information needed.

Q5. What are the qualities of good questionnaire? .

Ans. **Qualities of good questionnaire**

- (i) Limited number of questions: The number of question should be limited. More questions discourage people to completed questionnaire.
- (ii) Simple and clear: The questions asked should be short, clear and short.
- (iii) No personal questions: The questions which are too personal in nature, should be avoided.
- (iv) Arrangement of questions Proper order: The question should be arranged in a proper order.
- (v) No calculation: Questions involving mathematical calculation must be avoided.
- (vi) Instructions: A questionnaire must show clear instruction for filling the given information.
- (vii) Cross examination: Question may be papered in such a way which helps cross examination.

Q6. What are secondary data? Discuss the publish sources of secondary data.

Ans. Secondary data are those which are already in existence, and which have been collected, for some other purpose than the answering of the question in hand.

Published sources

(i) **Government publication:** Government department , origination and ministries publish current information with statistical facts as their regular activity. It is reliable source of information.

(ii) **Semi -government publication:** Municipalities and metropolises commission publish information relating to health, education, births and other economic infrastructure. It is reliable source of information.

(iii) **Publication of research institutions:** Large number of universities and research institution publish various research activities.

- (v) **Report of committees and commissions:** Various committees and commissions are appoint by the government for suggestions and policy making works. Thais repot also furnish a lot of statistical information.
- (vi) **Publication of Trade institutions:** Trade association have their research and statistical divisions which collect and publish data. It is reliable source of information.
- (vii) **Journals and papers :** Journals and news papers regularly publish and collect data on various subjects and topics

Q7. Difference between census method and sampling method.

Census Method	Sampling Method
6) Every unit of population studied	1) Few units of population are studied
7) Reliable and accurate results	2) Less Reliable and accurate results
8) Expensive method	3) Less expensive method
9) More time consuming	4) Less time consuming
10) Suitable when population is of homogenous nature	5) Suitable when population is of heterogeneous nature

Q8. What is meant by random sampling? Explain the random sampling methods.

Ans. **Random sampling:** 'Random sampling is that method of sampling in which each and every item of the universe has equal chance of being a selected the sample'. There is an equal probability for every item of this universe being selected in the sample.

These method are further subdivided as simple random sampling and restricted random sampling.

(1) Simple Random Sampling: Simple random sampling, which each and every item of the universe has equal chance of being a selected the sample. Simple Random Sampling may be done any of the following ways:

(i) Lottery method: Under lottery method paper slip are made for each items in the universe. These slip are shuffled in the container and required number of slip are drawn as a sample.

(ii) Tables of random numbers: Random number tables have been generated . A sample is framed with reference to this table and equal probability of selection of every individual unit in the population.

(2) Restricted Random sampling: In this method, the cases where different items of the population are heterogeneous, sample are selected under some restrictions. Restricted Random sampling may be done any following ways:

- (i) **Systematic Sampling** :- Units of the population are numerically, geographically and alphabetically arranged. Every items of the numbered items is selected as a sample item .
- (ii) **Stratified / Mixed Sampling:** 'According to this method of sampling, population is divided into different strata having different characteristics and some of the items are selected from each strata, so that the entire population gets represented'.

UNIT -2 ORGANISATIONS OF DATA

'Organisation of the data refers to the arrangement of figures in such a form that comparison of the mass of similar data may be facilitated and further analysis may be possible'.

Classification: 'The process of grouping data according to their characteristics is known as classification of data'.

Objectives of Classification:

- a] To simplify complex data
- b] Utility
- c] Comparability
- d] To make analysis and interpretation easy.
- e] To arrange and put the data according to their common characteristics.
- F] Scientific arrangement

Basis of classification :- (1) Geographical classification

- (2) Chronological classification
- (3) Qualitative classification – (i) Simple (ii) Manifold
- (4) Quantitative or Numerical classification

(1) Geographical classification:- This classification of data is based on the geographical or locational differences of the data.

(2) Chronological classification :- When data are classified on the basis of time.

Sales of the firm (2018-2020)

Year	Sales(Rs)
2020	80 Lakh
2021	90 Lakh
2022	95 akh

(3)Qualitative classification:- This classification is according to qualities. For example, data classified on the basis of religion, occupation etc. Two types of qualitative classification –

(i) Simple Classification: - Data are divide on the basis of existence of a quality. Male- female, healthy- unhealthy, educated- uneducated are examples.

(ii) Manifold Classification: When classification according to quality of data involves more than one characteristic, it is called manifold classification. As a result of it, there may be more than two classes.

For example Classification of the factory workers: Skilled and unskilled

Skilled workers: - Literate- Rural and Urban, **Illiterate-** Rural and Urban.

Unskilled workers:- Literate- Rural and Urban, **Illiterate-** Rural and Urban.

4. Quantitative classification:- Classification is done on the basis of numerical values of the facts. A number of classes are formed keeping in view the lowest and highest value as well as the range of values in the data.

For example: Annual Profit of Small Scale Firms. Quantitative classification also called classification by variables.

Annual Profit (Rs.in Crore)	No of firms
100 – 200	20
200 – 300	150
Above 300	80

Concept of variable: ‘A characteristic which is capable of being measured and changes its value overtime is called a variable’.

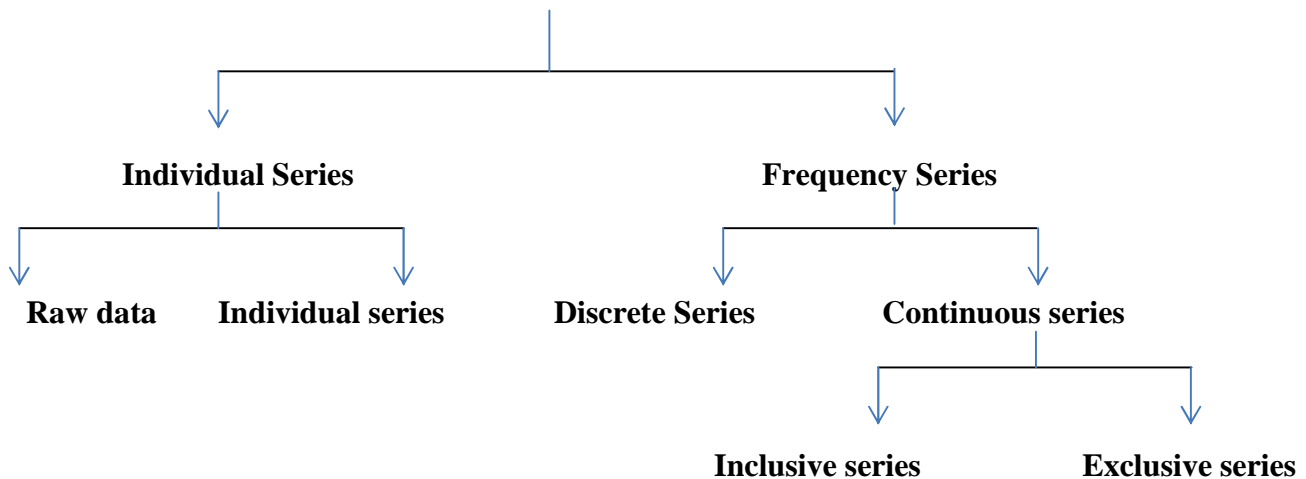
Raw Data:- A mass of data in its crude form is called raw data. It is unorganized mass of the various items. These are yet to be organised by the investigator.

Series:- Row data are classified in the form of series.

‘ A series as used statistically may be defined as things or attributes of things arranged according to some logical order’

Types of statistical series:- Systematic arrangement of statistical data

Statistical Series



I. Individual Series :

i] Raw data: Data collected in original form.

ii] Individual Series: Individual series are those series in which the items are listed singly. For example, if the marks obtained in economics subject by 10 students of class XI are listed singly, the series would be called Individual series. These series may be presented in two ways.

- a] According to serial numbers
- b] Ascending or descending order.

a] According to serial numbers :- One way of presenting an individual series is that all the items are arranged in a serial order. For example, marks obtained in economics subject by 10 students of class XI - 10,20, 16, 26, 22,40, 42, 35, 38 ,28 are presented in table:

S.No	Marks	S.No	Marks
1	10	6	40
2	20	7	42
3	16	8	35
4	26	9	38
5	22	10	28

B] Ascending or Descending order:- The other way of presenting an individual series is a simple ascending or descending order:

Data arranged in ascending and descending order

Ascending order		Descending order	
10	28	42	26
16	35	40	22
20	38	38	20
22	40	35	16

26	42		28	10
----	----	--	----	----

II. Frequency Series

Frequency series may be of two types:

- 1] Discrete Series
- 2] Frequency distribution

Meaning of following terms:

- a] Class : Each given interval is called a class e.g., 0-5, 5-10.
- b] Class limit: There are two limits upper limit and lower limit.
- c] Class interval: Difference between upper limit and lower limit.
- d] Range: Difference between upper limit and lower limit.
- e] $\text{Mid point or Mid Value} = \frac{\text{Upper limit} + \text{Lower limit}}{2}$

f] Frequency: Number of items [observations] falling within a particular class.

g] Tally Bars:- This method of making and counting is known as Four and Cross Method.

1] **Discrete Series:** 'A discrete series or frequency array is that series in which data are presented in a way that exact measurements of items are clearly shown'. In such series there are no class intervals, and a particular item in the series is numbered rather than measured with some range. For example:

20 students of Class XI have secured following the marks :

11, 12, 14, 11, 16, 11, 17, 16, 17, 14, 17, 1
8, 20, 14, 20, 17, 20, 17, 14, 20

Marks	Tally bars of the frequency	Frequency (Total)
11		3
12		1
14		4
16		2
17	/	5
18		1
20		4

2] **Frequency Distribution:** It is that series in which items cannot be exactly measured. The items assume a range of values and are placed within the range or limits. In other words, data are classified into different classes with a range, the range is called class intervals.

Marks Obtained	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of students	5	7	13	20	11	8	6

Types of frequency distribution

- i] **Exclusive Series:** ‘Exclusive series is that series in which every class interval excludes corresponding to its upper limit’ [OR] Excluding the upper limit of these classes, all the items of the class are included in the class itself. E.g., :

Marks	0-10	10-20	20-30	30-40
Number of Students	2	5	2	1

- ii] **Inclusive Series:** ‘ An inclusive series is that series which includes all items up to its upper limit’ [OR] Upper class limits of classes are included in respective classes. E.g.

Marks	10-14	15-19	20-24	25-29	30-34
Frequency	4	5	8	5	4

Conversion of Inclusive series into Exclusive series: Inclusive series are used when there is some definite difference between the values of various items in the population. Following steps are involved in the conversion of an inclusive series into an exclusive series.

- (i) First, we find the difference between the upper limit of class interval and the lower limit of next class interval.
(ii) Half of that difference is added to the upper limit of a class interval and half is subtracted from the lower limit of the class interval.

Marks	9.5-14.5	14.5-19.5	19.5-24.5	24.5-29.5	29.5-34.5
Frequency	4	5	8	5	4

(iii) Open End Series: An open end series in which lower limit of the first class and upper limit of the last class are not given. E.g.,

Marks	Below 20	20-30	30-40	40-50	50 and above
Number of Students	7	6	12	5	3

iv] Cumulative Frequency Series: It is obtained by successively adding the frequencies of the values of the classes according to a certain law.

- a] **‘Less than’ Cumulative Frequency Distribution :**

The frequencies of each class-interval are added successively.

- b] **‘More than’ Cumulative Frequency Distribution:**

More than cumulative frequency is obtained by finding the cumulative totals of frequencies starting from the highest value of the variable to the lowest value. E.g., :

Marks	No. of Students
0-10	2
10-20	5
20-30	10
30-40	12
40-50	17
50-60	4

Marks	No. of Students
Less than 10	2
Less than 20	7
Less than 30	17
Less than 40	29
Less than 50	46
Less than 60	50

Marks	No. of Students
More than 0	50
More than 10	48
More than 20	43
More than 30	33
More than 40	21
More than 50	4

V] Mid- values frequency series : Mid-value frequency series are those series in which we have only mid-values of the class intervals and the corresponding frequencies.

Mid-value	5	15	25	35
Frequency	8	5	10	8

MCQ

Q 1. Frequency is the number of _____ , an observation repeats in the series

- (a) years (b) weeks
(c) days (d) **times**

Q 2. When data is classified on the basis of area, it is

- (a) Qualitative classification (b) **Geographic classification**
(c) Quantitative classification (d) Chronological classification

Q 3. In _____ series, values of all the units are arranged in groups which are exactly measurable.

- (a) Continuous series (b) **Discrete series**
(c) Individual series (d) All of these

Q 4. In chronological classification, data are classified on the basis of

- (a) Area (b) **Time**
(c) Attributes (d) None of these

Q 5. Frequency of variables in an individual series is:

- (a) Same (b) **One**
(c) Zero (d) All of these

ASSERTION & REASON

Alternatives:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
- (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)
- (c) Assertion (A) is true but Reason (R) is false.
- (d) Assertion (A) is false but Reason (R) is true.

Read the following statements carefully – Assertion (A) and Reason (R) and choose the correct alternative.

Q1. Assertion (A): Classification is the process of arranging data into sequence and groups.

Reason (R): Data are classified according to their common characteristics for separating them into different but related parts.

Answer: (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

Q2. Assertion (A): A discrete variable can not take fractional value.

Reason (R): A discrete variable can also take fractional values.

Answer: (d) Assertion A is false but Reason (R) is true.

Q3. Assertion (A): Classification simplifies and condenses the mass of data.

Reason (R): Classification removes complexities and facilitates comparison.

Answer: (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

Q4. Assertion (A): Classification brings order to raw data

Reason (R): Classification should be formed in such a way that the class mark of each class comes as close as possible, to a value around which the observations in a class tend to concentrate

Answer: (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

Q5. Assertion (A): In the case of exclusive class intervals, upper limit is not included

Reason (R): In the case of exclusive class intervals, we have to decide in advance which class limit is to be excluded.

Answer: (d) Assertion (A) is false but Reason (R) is true.

Statement Based Question

Alternatives:

- a) Both the statement are true
- (b) Both the statement are false
- (c) Statement 1 is true and Statement 2 is false
- (d) Statement 2 is true and Statement 1 is false

Q1. (i) Statement 1: Under chronological classification data are classified the basis of qualities.

(ii) **Statement 2:** Quantitative classification is done on the basis of numerical values of the facts.

Ans. d) Statement 2 is true and Statement 1 is false

Q2. (i) Statement 1: A mass of data in its crude form is called raw data.

(ii) **Statement 2:** Quality of data involves less than one characteristic, it is called manifold classification.

Ans. c) Statement 1 is true and Statement 2 is false

Q3. (i) Statement 1: Upper limit of one class interval is the lower limit of the next class interval is called inclusive series.

(ii) **Statement 2:** Exclusive series is that series is the series which includes all items up to its upper limit.

Ans. b) Both the statement are false

SHORT & LONG ANSWER TYPE QUESTION

Q1. What is meant by classification of data? State its objectives.

Classification: 'The process of grouping data according to their characteristics is known as classification of data'.

Objectives of Classification:

(i) To simplify complex data: Classification is to eliminate unnecessary information and organist the complex data in simple form.

(ii) Utility: Classification enhances utility of data as it brings out similarity within the diverse set of data.

(iii) Comparability: Classification solves the problem of unorganized data for comparison.

(iv) Scientific arrangement: Classification facilitates presentation of data scientifically. It further makes the data more reliable.

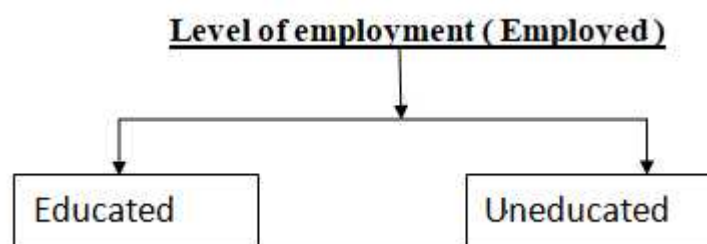
(v) To make analysis and interpretation easy.

(vi) To arrange and put the data according to their common characteristics.

Q2. What is meant by qualitative classification? Explain simple and manifold classification.

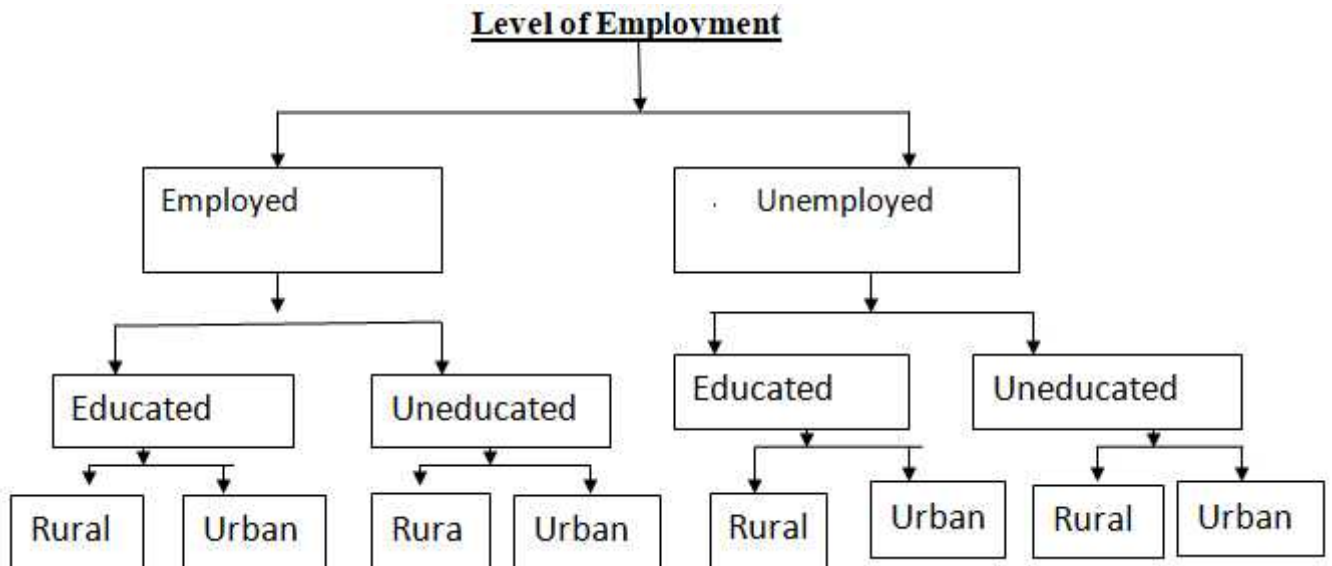
Ans. Qualitative classification:- This classification is according to qualities. For example, data classified on the basis of religion, occupation etc. Two types of qualitative classification –

(i) Simple Classification: - Data are divide on the basis of existence of a quality. Male- female, healthy- unhealthy, educated- uneducated are examples.



(ii) Manifold Classification: When classification according to quality of data involves more than one characteristic, it is called manifold classification. As a result of it, there may be more than two classes.

For example :



Q3. Describe the concept of Discrete series. Give suitable example.

Ans. **Discrete Series:** 'A discrete series or frequency array is that series in which data are presented in a way that exact measurements of items are clearly shown'. In such series there are no class intervals, and a particular item in the series is numbered rather than measured with some range. For example:

20 students of Class XI have secured following the marks :

10, 12, 11, 10, 13, 10, 14, 13, 14, 12, 14, 15
 16, 12, 16, 14, 16, 14, 12, 16

Marks	Tally bars of the frequency	Frequency (Total)
10		3
11		1
12		4
13		2
14		5
15		1
16		4

Q4. Briefly discuss the various types of frequency distribution series. Give suitable example of each.

Ans. **Types of frequency distribution**

i] **Exclusive Series**: ‘Exclusive series is that series in which every class interval excludes corresponding to its upper limit’ [OR] Excluding the upper limit of these classes, all the items of the class are included in the class itself. E.g., :

Marks	0-10	10-20	20-30	30-40
Number of Students	2	5	2	1

ii] **Inclusive Series**: ‘ An inclusive series is that series which includes all items up to its upper limit’ [OR] Upper class limits of classes are included in respective classes. E.g.

(iii) **Open End Series**: An open end series in which lower limit of the first class and upper limit of the last class are not given. E.g.,

Marks	Below 20	20-30	30-40	40-50	50 and above
Number of Students	7	6	12	5	3

iv] **Cumulative Frequency Series**: It is obtained by successively adding the frequencies of the values of the classes according to a certain law.

a] **‘Less than’ Cumulative Frequency Distribution** :

The frequencies of each class-interval are added successively.

b] **‘More than’ Cumulative Frequency Distribution**:

More than cumulative frequency is obtained by finding the cumulative totals of frequencies starting from the highest value of the variable to the lowest value. E.g., :

Marks	No. of Students	Marks	No. of Students	Marks	No. of Students
0-10	2	Less than 10	2	More than 0	50
10-20	5	Less than 20	7	More than 10	48
20-30	10	Less than 30	17	More than 20	43
30-40	12	Less than 40	29	More than 30	33
40-50	17	Less than 50	46	More than 40	21
50-60	4	Less than 60	50	More than 50	4

V] Mid- values frequency series : Mid-value frequency series are those series in which we have only mid-values of the class intervals and the corresponding frequencies.

Mid-value	5	15	25	35
Frequency	8	5	10	8

Q5. Students of class obtained following marks in economics. Conversion of data inclusive series into exclusive series.

Marks	5-9	10-14	15-19	20-24	25-29
Frequency	3	5	10	4	2

Ans. Conversion of Inclusive series into Exclusive series: Inclusive series are used when there is some definite difference between the values of various items in the population. Following steps are involved in the conversion of an inclusive series into an exclusive series.

(j) First, we find the difference between the upper limit of class interval and the lower limit of next class interval.

(ii) Half of that difference is added to the upper limit of a class interval and half is subtracted from the lower limit of the class interval.

Marks	4.5- 9.5	9.5- 14.5	14.5- 19.5	19.5- 24.5	24.5- 29.5
Frequency	3	5	10	4	2

Q6: Construct a discrete series with the help of data given on 20 students of Class XI have secured following the marks :

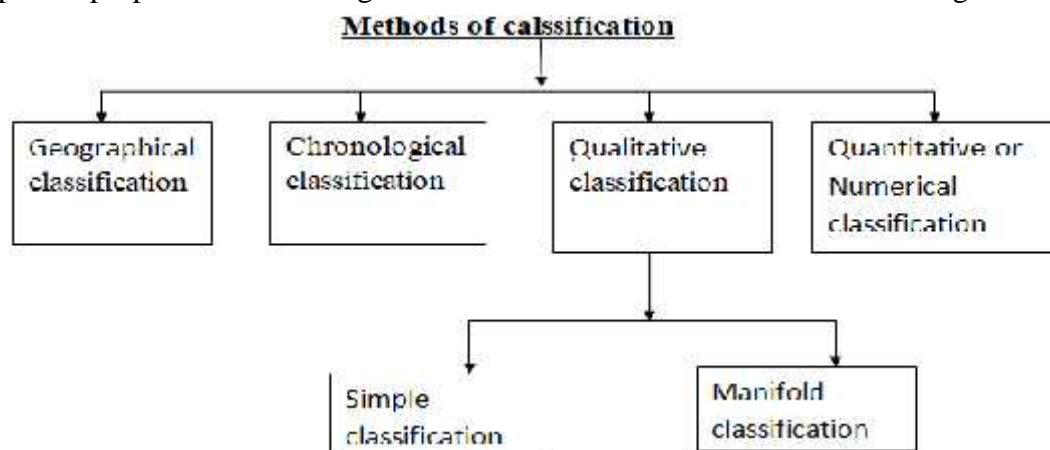
15, 17, 21, 20, 18, 15, 19, 18, 19, 17, 19, 15
21, 17, 16, 19, 21, 19, 17, 21

Ans. (Solution)

Marks	Tally bars of the frequency	Frequency (Total)
15		3
16		1
17		4
18		2
19		5
20		1
21		4

Q7: Explain the different methods of classification.

Ans. Method of classification :- Statistical data is classified after taking into account the scope and purpose of an investigation. Data classified on the basis of following methods.



(1) Geographical classification:- This classification of data is based on the geographical location or region. For example:

Production of Wheat (in thousand tons)

States	Wheat (thousand tons)
Punjab	20
Haryana	12
Uttar Pradesh	10

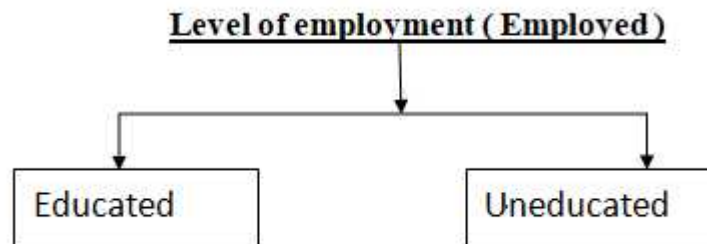
(2) Chronological classification :- When statistical data are classified on the basis of time, such as year, months ect. For example:

Sales of the firm (2022-2023)

Year	Sales(Rs)
2020	80 Lakh
2021	90 Lakh
2022	96 Lakh

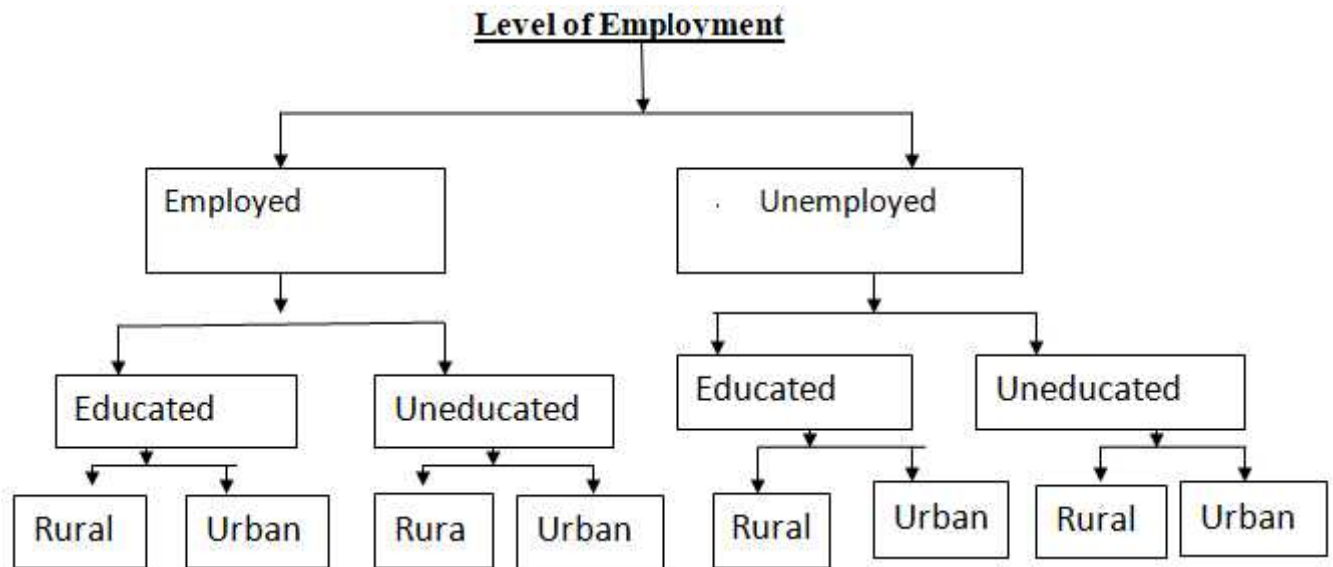
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4. Quantitative classification:- Classification is done on the basis of numerical values of the facts. A number of classes are formed keeping in view the lowest and highest value as well as the range of values in the data.

For example: Annual Profit of Small Scale Firms. Quantitative classification also called classification by variables.

Annual Profit (Rs.in Crore)	No of firms
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200 – 300	150
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Concept of variable: ‘A characteristic which is capable of being measured and changes its value overtime is called a variable’.

Raw Data:- A mass of data in its crude form is called raw data. It is unorganized mass of the various items. These are yet to be organised by the investigator.

Series:- Raw data are classified in the form of series.

‘ A series as used statistically may be defined as things or attributes of things arranged according to some logical order’

UNIT- 2 PRESENTATIONS OF DATA

‘The presentation of data means exhibition of the data in such a clear and attractive manner that these are easily understood and analyses’.

Three form of presentation of data : (1) Textual presentation of data.

(2) Tabular presentation of data. (3) Diagrammatic presentation of data.

(1) Textual presentation of data:- In textual presentation, data are a part of the text of study or a part of the description of the subject matter of study. For example in class XI periodic test -1 2020-21 paper pattern- 40 % question MCQ and 60% subjective question.

(2) Tabular presentation:- ‘A statistical table is a systematic organization of data in columns and rows’.

Objectives of Tabulation:

- a] Helps in understanding and interpreting the data easily.
- b] It helps in comparing data.
- c] It saves space and time.
- d] Tabulated data can be easily presented in the form of diagrams and graphs.

Main parts(Components) of a table:

- a] Title of the table – It is a brief explanation of contents of the table.
- b] Table number – It is given to be used for reference,e.g.,1,2,3 ---
- c] Captions – A word or phrase which explains the content of a column of a table.
- d] Stubs – Stubs are titles of the rows of a table.
- e] Body of the table: Most important part of table as it contains data.
- f] Head note: Head note is inserted to convey complete information of title.
- g] Source note refers to the source from which information has been taken.
- h] Foot note: It is used for pointing exceptions to the data.

FORMAT OF TABLE

Table Number:

Title:

[Head note]

Stub	Caption				Total [Rows]
	Sub-head		Column Head	Column Head	
	Column Head	Column Head			
Stub Entries	←	↑ BODY ↓	→		
Total [columns]					

Source Note:

Foot Note

Features of a good table

- a] Compatible title :- Title of the table must be compatible with the objective of the study.
- b] Comparison
- c] Ideal size

- d] Use of zero
- e] Footnote
- f] Unit
- g] Total
- h] Source of data
- i] Simple, economical and attractive

Kinds (Types) of Table: Three basis of classifying tables.

- 1) According to purpose. 2) According of originality.
- 2) According to construction

(1) According to purpose:-

- (i) **General purpose table:-** General purpose table is that table which is of general use. It does not serve any specific purpose or specific problem under consideration. It is just ‘data bank’ or reference tables.
- (ii) **Special purpose table:-** Is that table which is prepared with some specific purpose in mind. Generally these are small tables limited to the problem under consideration. These tables are also called Summary table.

3) According of originality:-

- (i)**Original table:-** An original table is that in which data are presented in the same form and manner in which they are collected.
- (ii) **Derived table:-** Table is that in which data are not presented in the form or manner in which these are collected instead the data are first converted into ratios or percentage and then presented.

4) According to construction:

- (I) **Simple or one- way table:-** A simple table is that which shows only one characteristic of the data.

Class	No. of students
IX	200
X	150
XI	250
XII	90

- (II) **Complex table:-** A complex table is one which shows more than one characteristic of the data. These tables may be further classified as:

- (a) **Double or Two-way table:-** Data are presented about two interrelated characteristics of a particular variable.

Class	Boys	Girls	Total
X	80	70	150
XI	140	110	250

XII	50	40	90
-----	----	----	----

(b) **Treble Table (Three way table)** – This table gives information regarding three interrelated characteristics of a particular variable.

Class	Boys			Girls			Total		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
X	40	40	80	40	30	70	80	70	150
XI	80	60	140	60	50	110	140	110	250
XII	30	20	50	25	15	40	55	35	90

(c) **Manifold Table** – This table explains more than three characteristics of the data.

Class	Boys				Girls				Total
	Rural		Urban		Rural		Urban		
	Rich	Poor	Rich	Poor	Rich	Poor	Rich	Poor	
XI	40	40	40	20	20	40	20	30	250
XII	15	15	5	15	10	15	5	10	90

Merits of tabular presentation: (1) simple and brief presentation

(2) Economical

(3) Easy analysis

(4) Facilitates comparison.

Diagrammatic Presentation of Data

Kinds (Types) of Diagrammatic Presentation: (1) Geometric Form

(2) Frequency Diagram

(3) Arithmetic Line Graphs

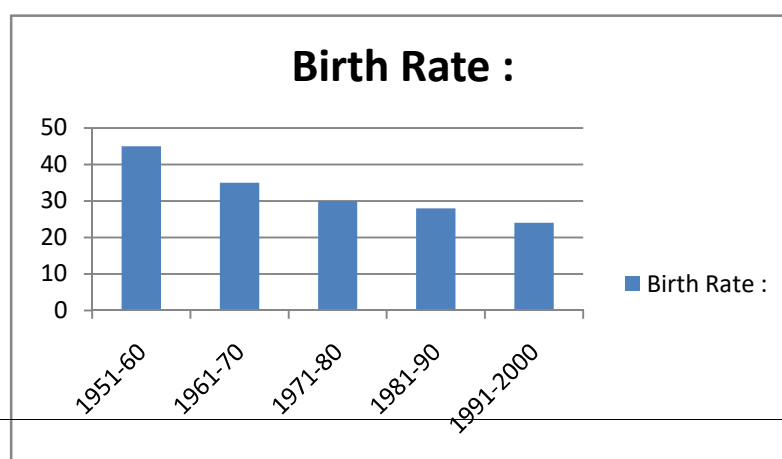
(1) **Geometric Form** :- (i) Bar diagrams (ii) Pie diagrams

(i) **Bar diagram**:- Bar diagrams are those diagrams in which data are presented in the form of bars or rectangles. Bars are also called columns.

Types of bar diagram

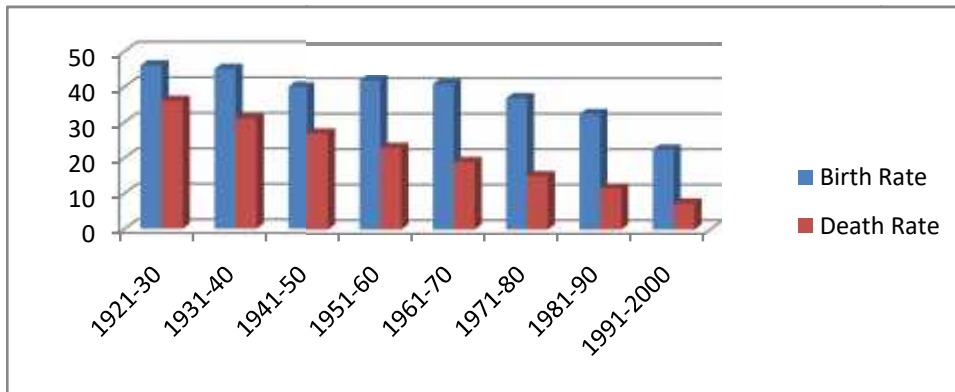
1. **Simple Bar diagrams** – Simple bar diagrams which are based on a single set of numerical data.

Year	1951-60	1961-70	1971-80	1981-90	1991-200
Birth Rate	45	35	30	28	24



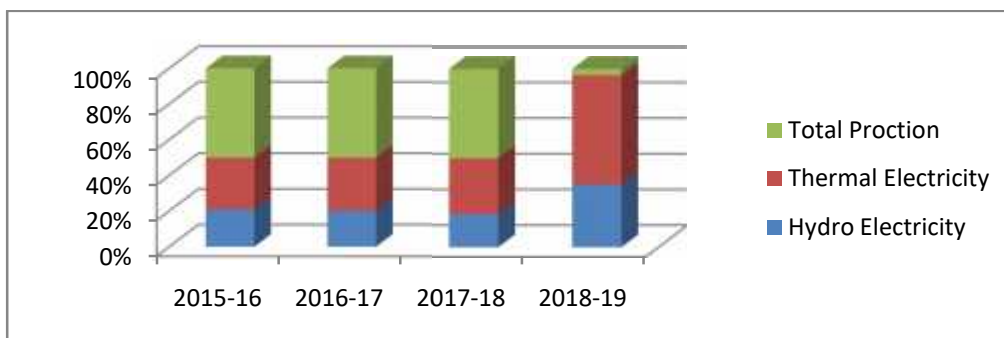
2. Multiple Bar diagrams – Multiple bar diagrams are those diagrams which show two or more sets of data simultaneously.

Year	1921-30	1931-40	1941-50	1951-60	1961-70	1971-80	1981-90	1991-2000
Birth Rate	46	45	40	42	41	37	32.5	22.5
Death Rate	36	31	27	23	19	15	11.5	7.3



2. Sub-divided Bar diagram or Component Bar diagram – These diagrams which simultaneously present, total values as well as parts values of a set of a data. Ex.

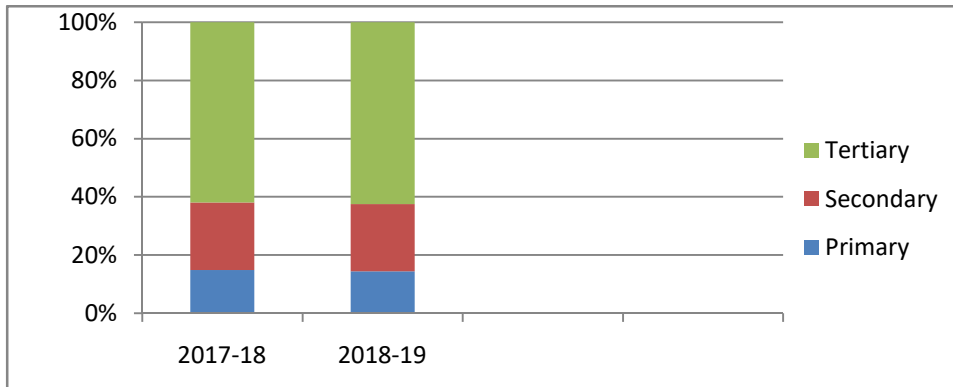
Year	Hydro Electricity	Thermal Electricity	Total Production
2015-16	46	64	110
2016-17	49	72	121
2017-18	48	82	130
2018-19	51	89	140



4. Percentage Bar Diagrams:- Percentage bar diagrams are those diagrams which show simultaneously, different parts of the values of a set of data in terms of percentages.

Sector	Year(2017-18)	Cumulative %	Year(2018-19)	Cumulative %
--------	---------------	--------------	---------------	--------------

Primary	14.9	14.9	14.4	14.4
Secondary	23.2	38.1	23.1	37.5
Tertiary	61.9	100	62.5	100
Total	100		100	



5. Deviation Bar Diagrams:- The deviation bar diagrams are used to compare the net deviation of related variables with respect to time and location. Bars representing positive and negative deviations are drawn above and below the baseline.

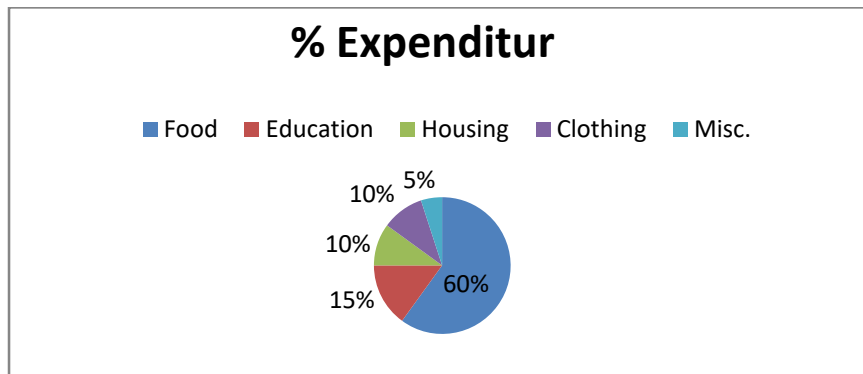
Year	2015	2016	2017	2018	2019
Saving/Deficit (in Rs.)	-20	10	15	-25	20

2. Pie diagrams – Pie diagrams is a circle divided into various segments showing the percent values of the series. This diagram does not show absolute values.

Items of expenditure	Food	Education	Housing	Clothing	Misc.
% of total expenditure	60	15	10	10	5

Solution:

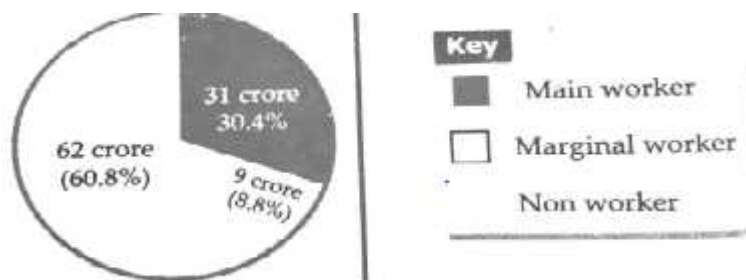
Items of expenditure	% expenditure	Degree measure/360
Food	60	$60 / 100 \times 360 = 216$
Education	15	$15 / 100 \times 360 = 54$
Housing	10	$10 / 100 \times 360 = 36$
Clothing	10	$10 / 100 \times 360 = 36$
Misc.	5	$5 / 100 \times 360 = 18$
total	100	360



Status	Marginal worker	Main worker	Non-worker
Population	9	31	62

Solution

Status	Population	%	Angular component
Marginal worker	9	$9 / 102 \times 100 = 8.8$	$32 (8.8 \times 3.6)$
Main worker	31	$31 / 102 \times 100 = 30.4$	109
Non-worker	62	$62 / 102 \times 100 = 60.8$	219
Total	102	100	360



Utility or uses of diagrammatic presentation:

1. Makes complex data simple.
2. Diagrams are attractive.
3. Diagrams save time when compared to other methods.
4. Diagrams create a lasting impression on the minds of observers.

Limitations of diagrammatic presentation:

1. They do not provide detailed information.
2. Diagrams can be easily misinterpreted.
3. Diagrams can take much time and labour.
4. Exact measurement is not possible in diagrams.
5. Incomplete information.

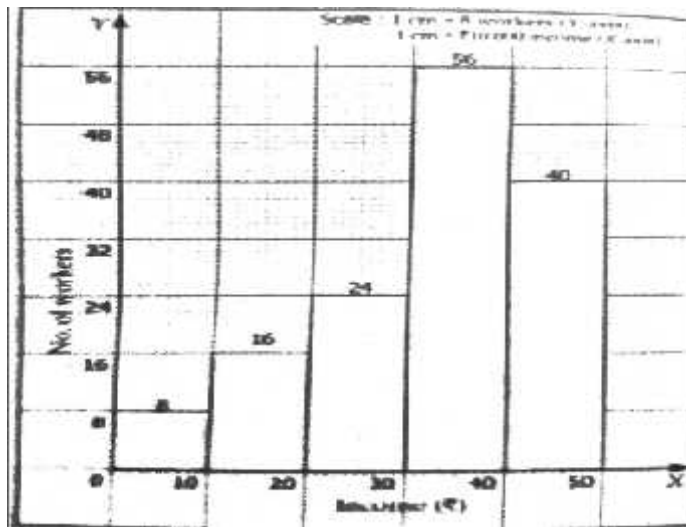
(2) Frequency Diagram

1. **Histogram:-** A histogram is a graphical presentation of a frequency distribution of continuous series or class-interval frequency distribution. A histogram is a two dimensional diagram. Histograms of frequency distribution are of two types.

- (i) Histograms of Equal class-intervals, and
- (ii) Histograms of Unequal class-intervals

(i) **Histograms of Equal class-intervals :-** Histograms of Equal class-intervals are those which are based on the data with equal class-intervals. Ex.

Income	0-10	10-20	20-30	30-40	40-50	50-60
No. of workers	8	16	24	56	40	20



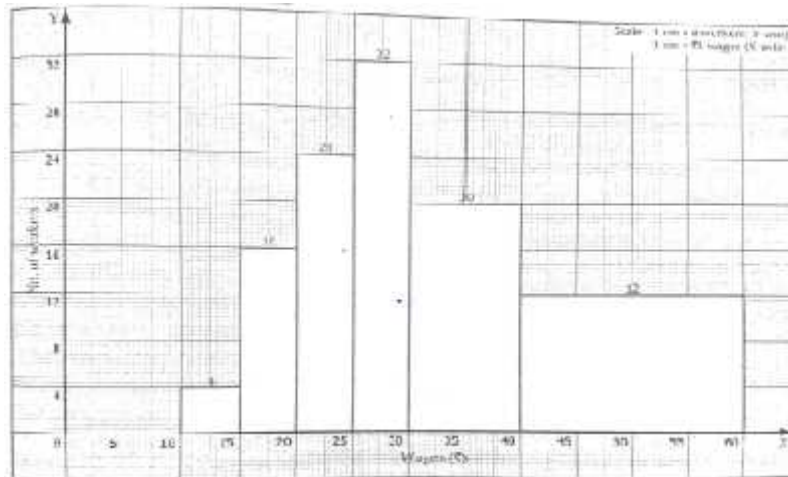
(ii) **Histograms of Unequal class-intervals:-** Histograms of Unequal class-intervals is the one which is based on the data with unequal class-intervals.

Before presenting the data in the form of graphs, frequencies of unequal class intervals are adjusted.

Adjustment Factor For any class=

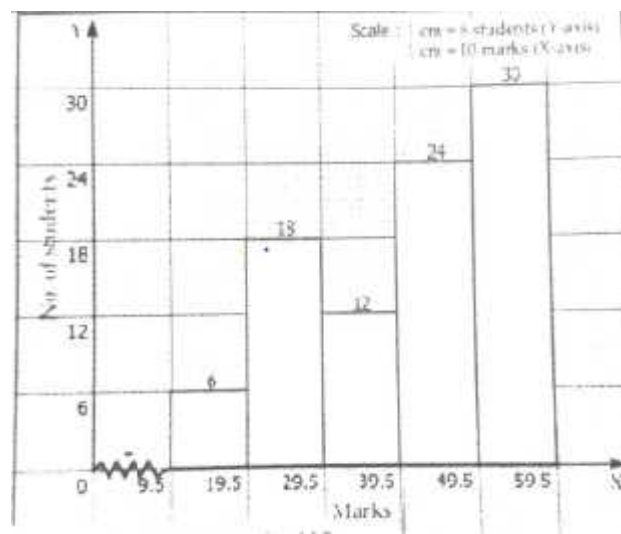
Class intervals of the concerned class / lowest class interval

Weekly wages(Rs)	No of workers	Adjustment factor	Frequency (adjusted)
10-15	4	$5/5=1$	$4/1=4$
15-20	16	$5/5=1$	$16/1=16$
20-25	24	$5/5=1$	$24/1=24$
25-30	32	$5/5=1$	$32/1=32$
30-40	40	$10/5=2$	$40/2=20$
40-60	48	$20/5=4$	$48/4=12$



Histogram when inclusive class intervals are given:- Inclusive must be converted into exclusive series, so that we may have regular class intervals.

Marks	No of students	Marks	No of students
10-19	6	9.5-19.5	6
20-29	18	19.5-29.5	18
30-39	12	29.5-39.5	12
40-49	24	39.5-49.5	24
50-59	30	49.5-59.5	30

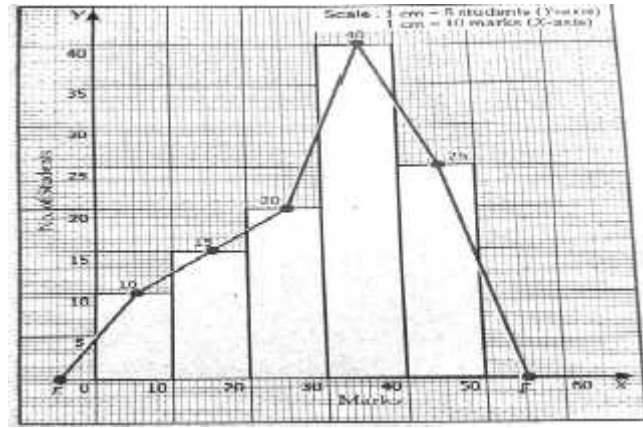


2. **FREQUENCY POLYGON:-** It is formed by joining mid points of the tops of all rectangles in a histogram . However, a polygon can be drawn even without constructing histograms. These points are joined by a straight line. Ex.

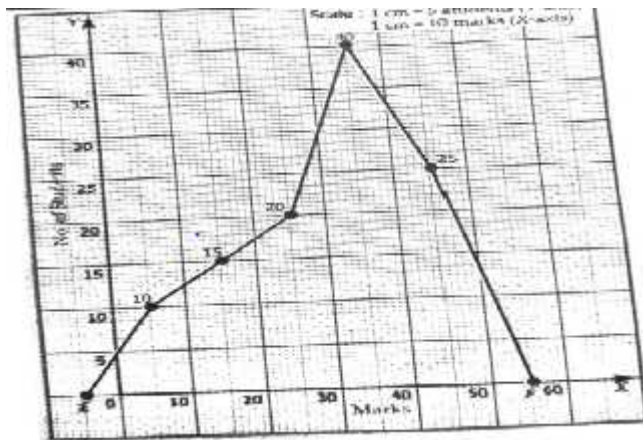
Marks	0-10	10-20	20-30	30-40	40-50
No. of students	10	15	20	40	25

Construct frequency polygon: with histogram and without histogram

With histogram

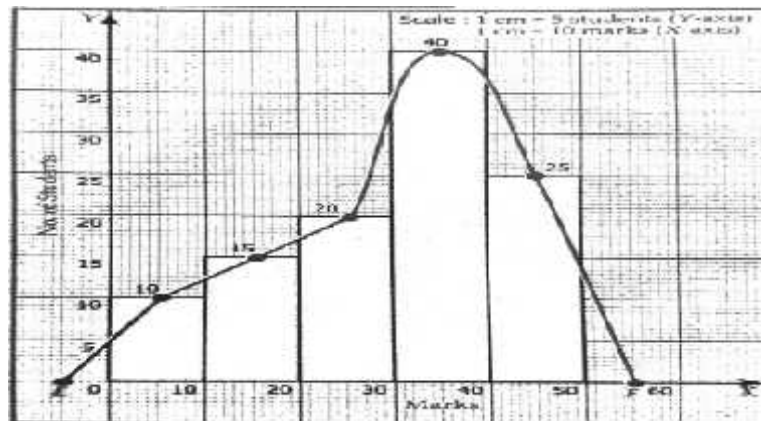


Without histogram



3. Frequency curve: A frequency curve is a curve which is plotted by joining the mid-points of all tops of a histogram by is plotted by freehand smoothed curves and not by straight lines.

Construct frequency curve : with histogram and without histogram



4. Ogive or Cumulative frequency curve: Ogive or Cumulative frequency curve is the curve which is constructed by plotting cumulative frequency data on the graph paper, in the form of a smooth curve.

Ogive may be constructed in two ways.

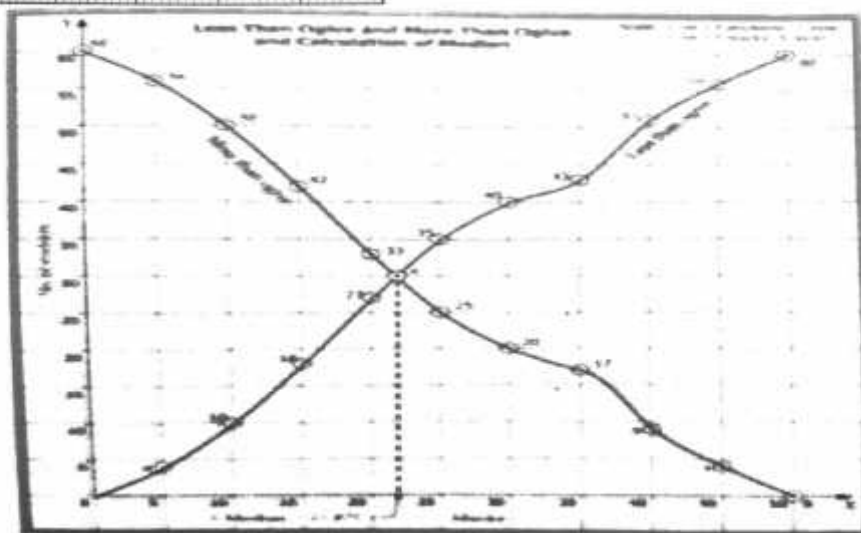
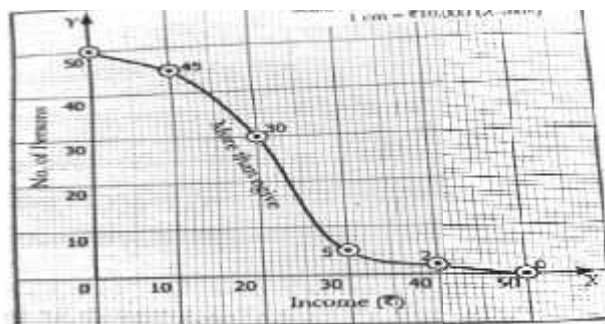
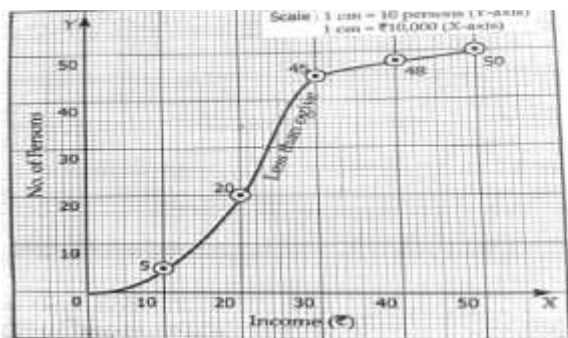
- (i) **Less than method:-** In this method, beginning from upper limit of the first class interval we go on adding the frequencies corresponding to every next upper limit of the series .

(ii) **More than method:** - In this method, cumulative total of the frequencies beginning with lower limit of the first class interval . For example:

Income	0-10	10-20	20-30	30-40	40-50
No. of persons	5	15	25	3	2

Solution

Less than method		More than method	
Income	No. of persons	Income	No. of persons
Less than 10	5	More than 0	50
Less than 20	20	More than 10	45
Less than 30	45	More than 20	30
Less than 40	48	More than 30	5
Less than 50	50	More than 40	2
		More than 50	0



ARITHMETIC LINE – GRAPHS

Rules OR Guidelines for the construction of time series graphs

- (i) Heading
- (ii) Choice of Scale
- (iii) Proportion of Axis
- (iv) Lines of Different types

- (v) Table of data
- (vi) To draw a line or curve

Types of time series graphs:-

- (1) one variable graphs
- (2) Two or more than two variables graphs

(1) one variable graphs:- one variable graphs are those graph in which value of only one variable are shown with respect to some time period.

(2) Two or more than two variables graphs:- these are the graphs in which values of two or more variables are simultaneously shown with respect to some period of time .

General rules for constructing Diagrams and graphs

- (i) Proper size
- (ii) Proper heading
- (iii) Proper scale
- (iv) Use of signs or colors
 - (vii) Simple
 - (viii) Less use of words and figures
 - (ix) Attractive and effective

Advantages Diagrammatic and Graphic presentation:-

- (i) Simple and understandable information.
- (ii) Attractive and effective means of presentation
- (iii) Comparison
- (iv) Study of correlation
- (v) Utility
- (vi) Location of averages

Limitations of diagrammatic presentation:

- (i) Limited use
- (ii) Misuse
- (iii) Only preliminary conclusions
- (iv) Lack of accuracy

MCQ

Q 1. Tabulation is, arranging data in

- (a) Rows and graph
- (b) Rows and columns
- (c) Rows and diagrams
- (d) Diagrams and graphs

Q 2. Captions is the title given to:

- (a) Columns
- (b) Rows
- (c) Head note
- (d) Stubs

Q 3. Special purpose table is also known as:

- (a) Reference table (b) Simple table
(c) Complex table (d) **Summary table**

Q 4. Number of students in a college classified on the basis of class, gender, habitation, pocket money is the part of _____ table.

- (a) One way (b) Double
(c) Treble (d) **Manifold**

5. Bar diagram is:

- (a) Two dimensional diagram (b) **One dimensional diagram**
(c) Three dimensional diagram (d) None of these

Q 6. What will be the degree measure of an angle in the pie diagram if a household spends 80% of his income on goods?

- (a) 180° (b) **228°**
(c) 90° (d) 72°

ASSERTION AND REASON

Alternatives:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

Read the following statements carefully – Assertion (A) and Reason (R) and choose the correct alternative.

Q.1 Assertion(A) :In histogram no space is left between consecutive rectangles.

Reason(R) : Histogram is a Graphical presentation of data and it is drawn for only continuous series.

Ans.(a)Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q.2 Assertion (A): Frequency polygon is the most common method of presenting grouped frequency distribution.

Reason (R) :-Frequency polygon is derived from histogram .

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

Q3. Assertion (A) :-The width of the bars should be equal in bar graph. Reason(R) : Bar graph is two dimensional.

Ans. c. Assertion (A) is true but Reason (R) is false.

**Q4, Assertion (A) :- Table is the Consequence of tabulation
Reason (R) : Tabulation is systematic and logical presentation of numeric Data in row and columns.**

Ans. (a)Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Statement Based Question

Alternatives:

- a) Both the statement are true
- (b) Both the statement are false
- (c) Statement 1 is true and Statement 2 is false
- (d) Statement 2 is true and Statement 1 is false

Q1. (i) Statement 1: In textual presentation, data are described within the numerical.

(ii) Statement 2: Under textual presentation large size of data to be presentation as a part of text.

Ans. (b) Both the statement are false

Q2. (i) Statement 1: Head note completes the information in the title of the table.

(i) **Statement 2:** Stubs are titles of the rows of a table.

Ans. a) Both the statement are true

Q3. (i) Statement 1: Captions is the title given to the rows of a table.

(ii) Statement 2: Footnotes are given for clarification of the reader.

Ans. (d) Statement 2 is true and Statement 1 is false

SHORT ANSWER TYPE QUESTION

Q1. What is a Table? What are the main objectives of tabulation?

Ans : Table : ‘A statistical table is a systematic organization of data in columns and rows’.

Objectives of Tabulation:

- (i) Helps in understanding and interpreting the data easily: Tabulation is a scientific process to present data in an orderly manner.
- (ii) It helps in comparing data: Data presented in a tabular form, having rows and columns, help in comparison of various data.
- (iii) It facilitate statistical analysis: Various statistical measures like averages, correlation, dispersion ect., can be calculated easily from the data which are systematically tabulated.
- (iv) Tabulated data can be easily presented in the form of diagrams and graphs: Various tables uses easily presented in the form of diagrams and graphs.

Q2. Explain the main parts / components of table.

Ans. **Main parts (Components) of a table:**

- (i) Title of the table: It is a brief explanation of contents of the table.
- (ii) Table number: It is given to be used for reference, e.g., 1, 2, 3 ---
- (iii) Captions: A word or phrase which explains the content of a column of a table.
- (iv) Stubs: Stubs are titles of the rows of a table.
- (v) Body of the table: Most important part of table as it contains data.
- (vi) Head note: Head note is inserted to convey complete information of title.
- (vii) Source note refers to the source from which information has been taken.
- (i) Foot note: It is used for pointing exceptions to the data.

Q3. Draw a format of table showing all these parts.

Ans.

FORMAT OF TABLE

Table Number:

Title:

[Head note]

Stub	Caption				Total [Rows]
	Sub-head				
	Column Head	Column Head	Column Head		
Stub Entries	←	↑ BODY ↓	→		
Total [columns]					

Source Note:

Foot Note

Q4. Explain in brief the meaning of simple table and complex table. State the main types of complex table. (OR) Discuss the difference between a simple table and complex table with the help of an example.

Ans. **Simple or one-way table:-** A simple table is that which shows only one characteristic of the data.

Classes	No. of students
X	200
XI	250
XII	90

Complex table:- A complex table is one which shows more than one characteristic of the data. These tables may be further classified as:

(c) **Double or Two-way table:-** Data are presented about two interrelated characteristics of a particular variable.

Classes	Boys	Girls	Total
X	80	70	150
XI	140	110	250
XII	50	40	90

(d) **Treble Table (Three way table) –** This table gives information regarding three interrelated characteristics of a particular variable.

Class	Boys			Girls			Total		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
X	40	40	80	40	30	70	80	70	150
XI	80	60	140	60	50	110	140	110	250
XII	30	20	50	25	15	40	55	35	90

(c) **Manifold Table –** This table explains more than three characteristics of the data.

Class	Boys				Girls				Total
	Rural		Urban		Rural		Urban		
	Rich	Poor	Rich	Poor	Rich	Poor	Rich	Poor	
XI	40	40	40	20	20	40	20	30	250
XII	15	15	5	15	10	15	5	10	90

Q5. Explain the main characteristics of a good statistical table.

Ans. Features of a good table

- (i) **Compatible title:** Title of the table must be compatible with the objective of the study.
- (ii) **Comparison:** The data which are to be compared should be placed closely in the columns.
- (iii) **Ideal size:** Table should be neither too large nor too small. The size of table should be as per objects and features of data.
- (iv) **Use of zero:** Zero should be used only to indicate the quantity of a variable. It should not be used to indicate the non-availability of data.
- (v) **Columns and rows should be numbered:** When there are number of columns and rows in a table, they must be numbered for reference.
- (vi) **Unit :** The unit should be given at below the title like Income (Rs.000's) or (00 tonnes).
- (vii) **Avoid abbreviations:** Abbreviations should be avoided as contents of the table are to be clearly understood.
- (viii) **Source of data:** It must be noted at the foot of table. It is noted next to the footnote.

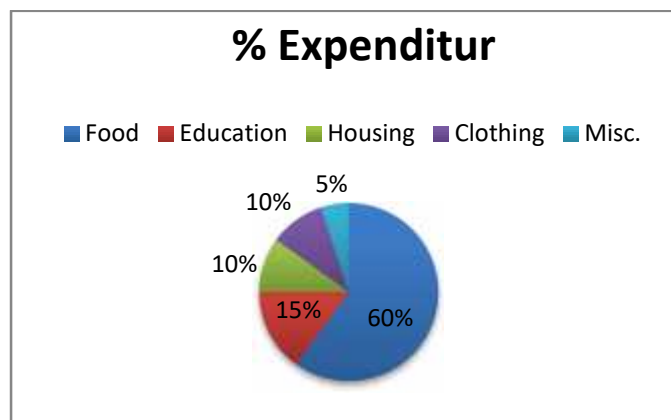
(ix) **Attractive:** A table should have an attractive get up which is appealing to the eyes and mind

Q6.: Draw a pie diagram to represent the following information:

Items of expenditure	Food	Education	Housing	Clothing	Misc.
% of total expenditure	60	15	10	10	5

Solution:

Items of expenditure	% expenditure	Degree measure/360
Food	60	$60/100 \times 360 = 216$
Education	15	$15/100 \times 360 = 54$
Housing	10	$10/100 \times 360 = 36$
Clothing	10	$10/100 \times 360 = 36$
Misc.	5	$5/100 \times 360 = 18$
Total	100	360

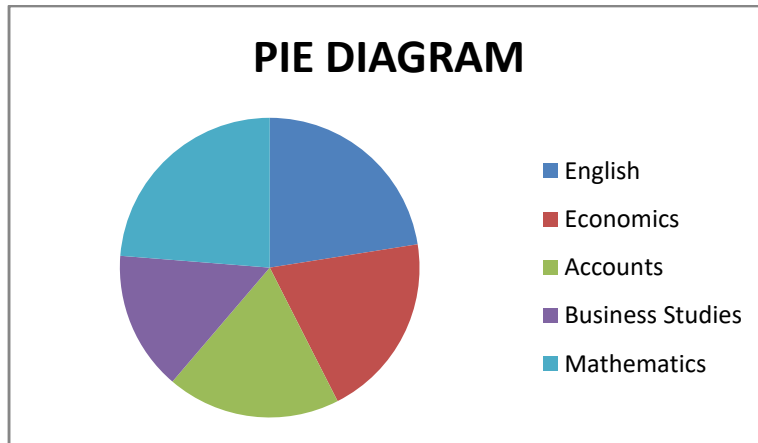


Q7. Draw a pie diagram to represent the following information

Subject	Marks
English	90
Economics	80
Accounts	75
Business Studies	60
Maths	95

Solution

Subject	Marks	Percentage (%)	Angles ($^{\circ}$)
English	90	$90 \times 100/400 = 22.50$	$22.50 \times 360/100 = 81^{\circ}$
Economics	80	$80 \times 100/400 = 20.0$	$20 \times 360/100 = 72^{\circ}$
Accounts	75	$75 \times 100/400 = 18.75$	$18.75 \times 360/100 = 67.5^{\circ}$
Business Studies	60	$60 \times 100/400 = 15.0$	$15 \times 360/100 = 54^{\circ}$
Mathematics	95	$95 \times 100/400 = 23.75$	$95 \times 360/100 = 85.5^{\circ}$
Total	400	100	360°



Q8.Explain the General rules for constructing Diagrams and graphs

General rules for constructing Diagrams and graphs

- (i) Proper axis : Equal distances on the X and Y axis.
- (ii) Proper heading: The graph should be given a proper heading, suitable to the nature of information to be plotted through time series graph.
- (iii) Proper scale: appropriate scale fixed on which data should be presented.
- (iv) Use of signs or colors: If more than one line are to be drawn in the same graph, these signs or lines or colors should be differentiated from each other.
 - (i) To draw a line: The various pointes so obtained are joined by straight lines.
 - (ii) Less use of words and figures: Plot each value of graph by point. Less use of words and figures.

UNIT- 3 MEASURES OF CENTRAL TENDENCY:

ARITHMETIC MEAN

Important Term and Concepts:

Average: ‘An average is a figure that represents the whole group’.

Averages are also called Measures of Central Tendency.

Functions of Average:

- i] Presents complex data in a simple form.
- ii] Facilitates comparison.
- iii] Helps government to form policies.
- iv] Useful in Economic analysis.

Essentials of a good Average:

- i. Simple to calculate.
- ii. It should be easy to understand.

- iii. Rigidly defined.
- iv. Based on all items of observation.
- v. Least affected by extreme values.
- vi. Capable of further algebraic treatment.
- vii. Least affected by sampling fluctuation.
- viii. Graphic measurement possible.

Types of Statistical Averages:

(i) Mathematical Averages

(ii) Positional Averages

(i) Mathematical Averages : Arithmetic mean, Geometric mean, Harmonic mean.

(ii) Positional Averages:- Median : It is the middle value of the series when items are arranged either in ascending order or in descending order.

Mode: Mode is that value of the series which occurs most frequently in a statistical distribution.

ARITHMETIC MEAN

Arithmetic mean of series of items is obtained by adding values of the items and dividing by the numbers of items.

It is the most common type of measures of central tendency.

Types of Arithmetic Mean:-

(1) Simple Arithmetic mean: - In it, all items of a series are given equal importance.

(2) Weighted Arithmetic mean:- Different items of a series are accorded different weights in accordance with their relative importance.

It is obtained by dividing the sum of all observation in a series by the total number of observation.

Calculation of Arithmetic Mean:

	Individual Series	Discrete Series	Continuous Series
Direct Method	$X = \frac{\sum X}{N}$	$X = \frac{\sum fx}{N}$	$X = \frac{\sum fx}{\sum f}$
Assumed Mean Method	$X = A + \frac{\sum X}{N}$	$X = A + \frac{\sum fdx}{N}$	$X = A + \frac{\sum fd}{\sum f}$
Step Deviation Method	$X = A + \frac{\sum d^l}{N} \times I$	$X = A + \frac{\sum fdx}{N} \times I$	$X = A + \frac{\sum fd^l}{\sum f} \times i$

Individual series

Direct Method : - Marks of 10 students is 10,15, 12, 11,20,16,22,25,30 and 35.Fined out the average marks.

Solution :- $X = \sum X / N$

Marks	10	15	12	11	20	16	22	25	30	35	$\sum X =$ 196
-------	----	----	----	----	----	----	----	----	----	----	-------------------

$$\bar{X} = \frac{\sum X}{N} = 196/10 = 19.6$$

Assumed Mean Method :-

No.of students	Marks	AM (d=X-A)
1	10	-12
2	15	-7
3	12	-10
4	11	-11
5	20	-2
6	16	-6
7	22 (A)	0
8	25	3
9	30	8
10	35	13
N=10		<u>d = - 48+24= -24</u>

Solution: $\bar{X} = A + \frac{d}{N}$ Mean = $22 + \frac{(-) 24}{10} = 19.6$

DISCRETE SERISE

Marks	10	20	30	40	50
No of Students	15	10	40	20	15

Solution

Marks	Students	Discrete Method	Short-cut method		Step- devotion method	
			X- A=d(30)	fd	d/c=d'	fd'
10	15	150	-20	-300	-2	-30
20	10	200	-10	-100	-1	-10
30	40	1200	0	0	0	0
40	20	800	10	200	1	20
50	15	750	20	300	2	30
	f=100	fX=3100		fd=100		fd'=10

Discrete Method:- $\bar{X} = \frac{fX}{f} = 3100/100 = 31$

Short-cut method:- $\bar{X} = A + \frac{fd}{f} = 30 + 100 / 100 = 31$

Step- devotion method: $\bar{X} = \frac{fd'}{f} + C = 30 + 10 / 100 \times 10 = 31$

FREQUENCY DISTRIBUTION

Marks	0 - 4	4 - 8	8 - 12	12-16	16 - 20
No of Students	4	8	2	1	5

Solution

Mark s	Students f	Mid-point M	Discrete Method Fm	Short-cut method		Step- devotion method	
				m- A=d(10)	fd	d/c=d'	fd'
0-4	4	2	8	-8	-32	-2	- 8
4-8	8	6	48	-4	-32	-1	- 8
8-12	2	10	20	0	0	0	0
12-16	1	14	14	4	4	1	1
16-20	5	18	90	8	40	2	10
	f=20		fm=180		fd=- 20		fd' = -5

Discrete Method:- $X = \frac{fm}{f} = \frac{180}{20} = 9$

Short-cut method:- $X = A + \frac{fd}{f} = 10 + \frac{(-) 20}{20} = 9$

Step- devotion method: $X = \frac{fd'}{f \times C} = 10 + \frac{(-)5}{20 \times 4} = 9$

Merits of Arithmetic Mean:

1. Easy to calculate
2. Simple to understand
3. Based on all observations
4. Easy mathematical calculations.

Demerits of Arithmetic Mean: 1 Affected by extreme values.

3. _Cannot be calculated in open-end series.
4. Cannot be graphically ascertained
5. Sometimes misleading or absurd result.

Weighted Arithmetic Mean:

Values to be arranged are given varying importance.

$$XW = \frac{WX}{W}$$

Where $X_w =$ Weighted Arithmetic Mean

$W =$ Weight, $X =$ Values of the variables

Median

It is defined as the middle value of the series, when the data is arranged in ascending or descending order.

Calculation of Median For Individual & Discrete Series

$$M = \text{Size of } \frac{(N+1)}{2} \text{th item}$$

Individual series

The following series show Marks of 9 students .Find the median marks.

Marks	17	32	35	33	15	21	41	32	11
-------	----	----	----	----	----	----	----	----	----

Solution:

Ascending order		Descending order	
1	10	1	33
2	11	2	32
3	15	3	32
4	17	4	21
5	20 A	5	20 A
6	21	6	17
7	32	7	15
8	32	8	11
9	33	9	10
N=9		N=9	

M= Size of $(N+1 / 2)$ th item

= Size of $(9+1 / 2)$ th items

Size of 5th items = 20

The following series show Marks of 8 student's .Find the median marks.

Marks	8	10	12	14	18	19	21	22
-------	---	----	----	----	----	----	----	----

M= Size of $(N+1 / 2)$ th item

= Size of $(8+1 / 2)$ th items

Size of 4.5th items

Size of 4th item + Size of 5th items / 2 = $14+18 / 2= 16$ Median marks= 16 marks

DISCRETE SERISE

Calculate median from following set of data:

Size 'X'	5	6	7	8	9
Frequency(f)	4	1	3	7	4

Solution

Size 'X'	Frequency(f)	CF
5	4	4
6	1	5
7	3	8
8	7	15

9	4	19
---	---	----

M= Size of $(N+1 / 2)$ th item

= Size of $(19+1 / 2)$ th item = size of 10th item

Since 10th item falls in cf 15 and the size against this cf is 8. Therefore median of this series is 8.

FREQUENCY DISTRIBUTION

Calculate median from following set of data:

Size 'X'	0-10	10- 20	20 -30	30-40	40 -50
Frequency(f)	3	4	2	7	10

Solution

Size 'X'	Frequency(f)	Cf
0-10	3	3
10 -20	4	7
20 -30	2	9 cf
30 -40 (median class)	7 f	16
40 -50	10	26
	N= f= 26	

Median Item = size of $(N/2)^{th}$ item. = $26/2$ = size of 13th item

$$M = L_1 + \frac{N/2 - c.f}{f} \times i$$

$$= 30 + (13 - 9 / 7) \times 10 = 35.71 \text{ Median} = 35.71$$

Mode

The value of the variable which occurs most frequently in a distribution is called the mode.

Calculation of Mode

Individual Series :

- i. By Inspection
- ii. By conversion into discrete series and then identify the value corresponding to which there is highest frequency.

(I) By Inspection : marks of 10 students, calculate the value of mode:

20, 22, 25, 28, 30 , 32 ,35 ,25, 21, 25

Solution: arranging the series in ascending order : 20 , 21, 22, 25, 25, 25, 28, 30, 30, 35

By inspection, marks 25 occurs the most, hence Mode (Z) is 25 marks.

(ii) By conversion into discrete series :

Marks (X)	20	21	22	25	28	30	35
Frequency	1	1	1	3	1	2	1

Discrete Series:

- i. By Inspection Method.

ii. Grouping Method: By preparing Grouping Table and then preparing Analysis table.

Calculate value of mode:

Marks	40	50	60	70	80	90
No of students	2	4	8	10	5	6

By Inspection Method:- By inspection, we find that 70 occurs most frequently,

Hence Mode marks = 70 marks.

Grouping Method:

Marks	F (column-I)	column-II (1+2)	column-III (2+3)	column-IV (1+2+3)	column-V (2+3+4)	column-VI (3+4+5)
40	2	2+4=6		2+4+8+14		
50	4		4+8=12		4+8+10=22	
60	8	8+10=18				8+10+5=23
70	10		10+5=15	10+5+6=21		
80	5	5+6=11				
90	6					

Since the value 70 has occurred for the maximum number of items, therefore the modal marks are 70.

Continuous Series:

(j) By Inspection Method.

(ii) Grouping Method

Calculate value of mode:

Marks	0-10	10-20	20-30	30-40	40-50
No of students	3	4	15	6	8

By Inspection Method:-

Marks "X"	No. of students 'f'
0-10	3
10-20	4 f₀
20-30	15 f₁
30-40	6 f₂
40-50	8

$$Z = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$Z = 20 + \left(\frac{15 - 4}{2 \times 15 - 4 - 6} \right) \times 10 = 25.5$$

Mode = 25.5

Grouping Method:

Marks	No. of students
10-20	3
20-30	10
30-40	25
40-50	15

50-60	23
60-70	22
70-80	10
80-90	8

Grouping table

Marks	F (column-I)	column-II (1+2)	column-III (2+3)	column-IV (1+2+3)	column-V (2+3+4)	column-VI (3+4+5)
10-20	3	3+10=13		3+10+25=38		
20-30	10		10+25=35		10+25+15=50	
30-40	25	25+15=40				25+15+23=63
40-50	15		15+23=38	15+23+22=60		
50-60	23	23+22=45			23+22+10=55	
60-70	22		22+10=32			22+10+8=40
70-80	10	22+10=32				
80-90	8					

Mode class = 50-60 with frequency 23.

$$Z = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$Z = 50 + \frac{23 - 15}{2 \times 23 - 15 - 22} \times 10 = 58.9$$

So mode (Z) = 58.9

Merits of Mode

- It is easy to understand and simple to calculate.
- Not affected by extreme values.
- Can be located graphically.
- Easily calculated in case of open-end classes.

Demerits of Mode

- Not rigidly defined.
- If mode is ill defined, mathematical calculation is complicated.
- Not based on all items.
- Not suited to algebraic treatment.

Relationship between Mean, Median and Mode

- In case of symmetrical distribution
Mean = Median = Mode
- In case of asymmetrical distribution
Mode = 3 Median – 2 Mean

MCQ

Definition: ‘When the relationship is of a quantitative nature, the appropriate statistical tool for discovering and measuring the relationship and expressing it in a brief formula is known as correlation’.

Kinds of correlation:-

1. Positive and Negative correlation.
2. Linear and non – linear correlation.
3. Simple and multiple correlations.

Positive correlation: When both variables move in the same direction. If one increases, other also increases and vice-versa.

Negative correlation: - When two variables move in the opposite direction, they are negatively correlated.

Linear Correlation: - When two variables change in a constant proportion.

Non- linear correlation: - When two variables do not change in the same proportion.

Simple correlation – Relationship between two variables are studied.

Multiple Correction – Relationship between three or more than three variables are studied.

Degrees of Correlation

Degree	Positive	Negative
Perfect	+1	-1
High	Between +0.75 to +1	Between -0.75 to -1
Moderate	Between +0.25 to +0.75	Between -0.25 to -0.75
Low	Between +0 to +0.25	Between -0 to -0.25
Zero	0	0

1. Perfect Correlation - When values of both variables changes at a constant rate Types – (a) Perfect positive correlation – when values of both variables changes at a constant ratio in the same direction correlation coefficient value (r) is + 1

(b) Perfect negative correlation – When values of both the variables change at a constant ratio in opposite direction. Value of coefficient of correlation is -1

2. Absence of correlation : When there is no relation between the variables $r = 0$

3. Limited degree correlation : The value of r varies between more than 0 and less than 1

Types - a) High : r his between ± 0.7 & 0.999

b) Moderate = r lies between ± 0.5 and + 0.699

c) Low: $r < \pm 0.5$

Different methods of finding correlation

- a) Karl Pearson’s coefficient method

b) Rank method / Spearman's coefficient method

c) Scatter Diagram

(A) **Karl Pearson's Method** : Karl Pearson has given a quantitative method of calculating correlation

$$r = \frac{\sum \phi xy}{N \sigma_x \sigma_y}$$

Where $X = X - \bar{X}$, $Y = Y - \bar{Y}$

N = number of observations

σ_x = Standard deviation of series X

σ_y = Standard deviation of series Y

OR

Actual Mean Method

$$R = \frac{\sum \phi xy}{\sqrt{\sum \phi x^2} \sqrt{\sum \phi y^2}}$$

Where $x = X - \bar{X}$, $y = Y - \bar{Y}$

Assumed Mean Method

$$r = \frac{\sum \phi dx dy - \frac{\sum \phi dx \sum \phi dy}{N}}{\sqrt{\sum \phi dx^2 - \frac{(\sum \phi dx)^2}{N}} \sqrt{\sum \phi dy^2 - \frac{(\sum \phi dy)^2}{N}}}$$

Where $dx = X - A$

$dy = Y - A$

A = assumed mean

Ex. : Calculate coefficient of co-relation given the following data :

X	2	3	4	5	6	7	8
Y	4	7	8	9	10	14	18

Solution:.

X	Deviation ($x = X - \bar{X}$) $\bar{X} = 5$	Square of deviation (x^2)	Y	Deviation ($y = Y - \bar{Y}$) $\bar{Y} = 5$	Square of deviation (y^2)	Multiple of deviation (xy)
2	-3	9	4	-6	36	+18
3	-2	4	7	-3	9	+6
4	-1	1	8	-2	4	+2
5	0	0	9	-1	1	0
6	1	1	10	0	0	0
7	2	4	14	4	16	8

8	3	9	18	8	64	24
$\Sigma X = 35$	$\Sigma X = 0$	$\Sigma X^2 = 28$	$\Sigma Y = 70$	$\Sigma Y = 0$	$\Sigma Y^2 = 130$	$\Sigma XY = 58$
$N = 7$			$N = 7$			
$\bar{X} = 5$			$\bar{Y} = 10$			

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

= +0.96 It is situation of high positive correlation.

Short- Cut Method: Find Karl Pearson's coefficient of correlation By short-cut method.

X	dx(X-A) 60	dx ²	Y	dy(Y-A) 36	dy ²	dx dy
50	-10	100	20	-16	256	160
54	-6	36	22	-14	196	84
56	-4	16	24	-12	144	48
58	-2	4	30	-6	36	12
59	-1	1	32	-4	16	4
60 A	0	0	36 A	0	0	0
61	1	1	38	2	4	2
62	2	4	40	4	16	8
65	5	25	44	8	64	40
75	15	225	54	18	324	270
	dx=0	dx²=412		dy=(-)20	dy²=1056	dx dy=628

$$r = \frac{\Sigma dx dy - \frac{\Sigma dx \Sigma dy}{N}}{\sqrt{(\Sigma dx^2 - \frac{(\Sigma dx)^2}{N})(\Sigma dy^2 - \frac{(\Sigma dy)^2}{N})}}$$

Where dx = X - A
dy = Y - A
A = assumed mean

$$r = \frac{628 - \frac{0 \times 20}{10}}{\sqrt{412 - \frac{(0)^2}{10}} \sqrt{1056 - \frac{(20)^2}{10}}}$$

$$R = 0.97$$

There is high degree of positive correlation between series X and series Y.

Merits of Karl Pearson's Method

1. Helps to find direction of correlation
2. Most widely used method

Demerits of Karl Pearson's method

1. Based on large number of assumptions

Q. Affected by extreme values Find out Karl-Pearson's Coefficient of Correlation :

X	10	20	30	40	50
Y	4	6	8	10	12

Solution

X	dx=X-A	dx ²	Y	dy=Y-A	dy ²	dx.dy
10	-20	400	4	-4	16	80
20	-10	100	6	-2	4	20
30=A	0	0	8=A	0	0	0
40	10	100	10	2	4	20
50	20	400	12	4	16	80
	$\overline{dx=0}$	$\overline{dx^2=1000}$		$\overline{dy=0}$	$\overline{dy^2=40}$	$\overline{dx.dy=200}$

$$r = \frac{\sum dx \cdot dy - \frac{\sum dx \cdot \sum dy}{N}}{\sqrt{\sum dx^2 - \frac{(\sum dx)^2}{N}} \times \sqrt{\sum dy^2 - \frac{(\sum dy)^2}{N}}}$$

$$r = \frac{200 - 0/5}{1000 - (0/5)^2 \times 40 - (0/5)^2} = \frac{200}{\sqrt{40000}} = \frac{200}{200} = +1$$

Perfect Positive degree of rank correlation.

(B) **Spearman's Rank Correlation Method**

Formula : 1) In case of non-repeated ranks :-

$$r_s = 1 - \frac{6\phi D^2}{N^3 - N}$$

r_s = Spearman's rank correlation

ϕD^2 = Sum of squares of difference of ranks

N = Number of observation

2) In case of repeated ranks:-

$$r_s = 1 - \frac{6\phi D^2 \Gamma \frac{1}{12} (m^3 - Zm) \Gamma \frac{1}{12} (m^3 - Zm)}{N^3 - N}$$

M = number of items with repeated ranks.

Ex.: Calculate coefficient of rank correlation between the marks in economics and statistics as indicated by 8 answer books of each of the two examiners.

Statistics	15	10	20	28	12	10	16	18
Economics	16	14	10	12	11	15	18	12

Sol. :

Marks in Statistics (x)	Rank R1	Marks in Economics (y)	Rank R2	D=R1-R2	D ²
15	5	16	2	3.0	9.00
10	7.5	14	4	3.5	12.25
20	2	10	8	-6	36.00
28	1	12	5.5	-4.5	20.25
12	6	11	7	-1	1.00
10	7.5	15	3	4.5	20.25
16	4	18	1	3	9.00
18	3	12	5.5	-2.5	6.25
N = 8					D ² = 114

$$r_s = 1 - \frac{6\phi D^2 \Gamma \frac{1}{12} (m^3 Zm) \Gamma \frac{1}{12} (m^3 Zm)}{N^3 ZN}$$

$$1 - \frac{6[114 \Gamma \frac{1}{12} (2^3 Z2) \Gamma \frac{1}{12} (2^3 Z2)]}{8^3 Z8}$$

$$= 1 - 1.36 = -0.36$$

Merits of Spearman's Rank Correlation

1. Simple and easy to calculate
2. Not affected by extreme values

Demerits of Spearman's Rank Correlation

1. Not Suitable for grouped data
2. Not based on original values of observations

INDEX NUMBERS

Meaning: Index numbers is a statistical tool for measuring relative change in a group of related variables over two or more different times.

Definition : According to Croxton and Cowden, “ index numbers are devices for measuring differences in the magnitude of a group of related variables”.

Features of an Index Number

- a. They are expressed in percentages.
- b. They are special types of averages.
- c. They measure the effect of change over a period of time.

Problems in construction of Index Numbers

- a) Defining the purpose of index numbers
- b) Selection of items
- c) Selection of base period
- d) Selection of prices
- e) Selection of weights
- f) Choice of an average
- g) Choice of the formulae

Advantages/uses/ importance of index numbers

- a) It simplifies of complexity
- b) It facilitates comparative study
- c) Use in business sphere
- d) Helpful and fixation of salary and allowances
- e) To measure the change in value of money

Limitations of Index Number

- a) Not completely true
- b) International comparison is not possible
- c) Difference of time
- d) Limited use
- e) Lack of retail price index number

Price index is of two types

- a. **Simple Index Number:** These are the index numbers in which all items of the series are accorded equal weightage or importance.
- b. **Weighted price Index numbers:** These are the index numbers in which different items of the series are accorded different weightage, depending upon their relative importance.

Construction of simple Index Numbers:-

There are two methods

- a. Simple aggregate Method

$$P_{01} = \frac{\sum P_1}{\sum P_0} \times 100$$

Given the following data and assuming 2011 as the base year. Find out index value of the prices of different commodities for the year 2019.

Commodity	A	B	C	D	E
Price 2011	50	40	10	5	2
Price 2019	80	60	20	10	6

Sol.

Commodity	2011 Price (Rs) (P ₀)	2019 Price (Rs) (P ₁)
A	50	80
B	40	60
C	10	20
D	5	10
E	2	6
	P ₀ = 107	P ₁ = 176

$$P_{01} = \frac{\sum P_1}{\sum P_0} \times 100$$

$$= 164.49$$

Simple Average of price relative method

$$P_{01} = \frac{\sum (P_1 / P_0 \times 100)}{N}$$

.Given the following data and using the price relative method construct and index number for the year 2022 in relation to 2014.

Commodity	Wheat (per qt.)	Ghee(per kg)	Milk (per lt.)	Rice(per qt.)	Sugar(per kg)
2014 Price(Rs.)	100	8	2	200	1
2022 Price (rs.)	200	40	16	800	6

Sol.

Commodity	Base Year 2014 (P ₀)	Current Year 2022 (P ₁)	Price relatives $\frac{P_1 \times 100}{P_0}$
Wheat	100	200	200
Ghee	8	40	500
Milk	2	16	800
Rice	200	800	400
Sugar	1	6	600
N=5			$\left[\frac{P_1 \times 100}{P_0} \right]$ = 2500

$$P_{01} = \frac{\sum (P_1 / P_0 \times 100)}{N}$$

$$2500/5 = 500$$

Weighted Index Numbers

There are two methods:-

a. Weighted Aggregate method:- In this method commodities are assigned weights on the basis of quantities purchased. Some of the well-known are as under

(i) **Laspeyre's Method** : Laspeyre uses base year quantities (q₀) as weights of different items. As formula

$$P_{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$$

(ii) **Paasche's Method:** Paasche's uses current years quantities (q_1) as weight.

$$P_{01} = \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times 100$$

(iii) **Fisher's Method:** Fisher has combined the techniques of Laspeyre's and Paasche's method. He used both base year as well as current year quantities (q_0, q_1) as weight.

$$P_{01} = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_1} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_0}} \times 100$$

Ex.

Items	2014 Base year		2022 Current Year	
	Price	Quantity	Price	Quantity
A	10	10	20	25
B	35	3	40	10
C	30	5	20	15
D	10	20	8	20
E	40	2	40	5

Sol.

Items	2014 Base year		2022 Current Year		$(P_0 Q_0)$	$(P_0 Q_1)$	$(P_1 Q_0)$	$(P_1 Q_1)$
	Price (P_0)	Qty (Q_0)	Price (P_1)	Qty (Q_1)				
A	10	10	20	25	100	250	200	500
B	35	3	40	10	105	350	120	400
C	30	5	20	15	150	450	100	300
D	10	20	8	20	200	200	160	160
E	40	2	40	5	80	200	80	200
Total					635	1450	660	1560

(i) **Laspeyre's Method:**

$$P_{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$$

$$= 103.94$$

(ii) **Paasche's Method:**

$$P_{01} = \frac{\sum P_1 Q_1}{\sum P_0 Q_1} \times 100$$

$$= 107.59$$

(iii) **Fisher's Method:**

$$P_{01} = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_1} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_0}} \times 100$$

$$= 105$$

b. Weighted Average of Price Relative Method:-

Under this method commodities are assigned weight on the basis of base's year value ($W = P_0 Q_0$) or fixed weights (W) are used.

$$P_{01} = \frac{\sum RW}{\sum W} \times 100$$

Where R = $\frac{P_1}{P_0}$

W = value in the base year ($P_0 Q_0$) or fixed weights

Ex. Construct cost of living for 2014 based on 2022 from the following data :

Group	Food	Housing	Clothing	Fuel & light	Misc.
Group Index No. for 2022 (based on 2014)	122	140	112	116	106
Weights	32	10	10	6	42

Sol.

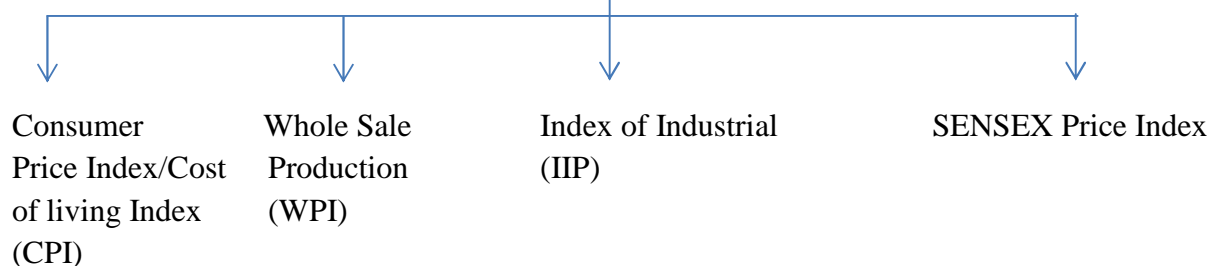
Group	Group Index No.(R)	Weights (W)	Weighted relatives (RW)
Food	122	32	3904
Housing	140	10	1400
Clothing	112	10	1120
Fuel & light	116	6	696
Misc.	106	42	4452
Total		W = 100	RW = 11572

Cost of living index no. =

$$P_{01} = \frac{\sum RW}{\sum W} \times 100$$

$$= 115.72$$

1. Types of Index Numbers



1.Consumer Price Index:- (CPI) The methods of constructing CPI are

- **Aggregate Expenditure Method** = $P_{01} = \frac{\sum P_1 Q_0}{\sum P_0 Q_0} \times 100$

- **Family Budget Method** $P_{01} = \frac{\sum RW}{\sum W}$

Where $R = \frac{P_1}{P_0} \times 100$

$W = P_0 Q_0$ or fixed weights

Uses of Consumer Price Index:- (CPI)

- It is used in calculating purchasing power of money
- It is used for grant of Dearness Allowance.
- It is used by government for framing wage policy, price policy etc.
- CPI is used as price deflator of income
- CPI is used as indicator of price movements in retail market.

2. Wholesale Price Index (WPI):-

- It measures the relative change in the price of commodities traded in wholesale market.
- It indicates the change in the general price level.
- It does not include services

Uses of WPI

- Basis of Dearness Allowance
- Indicator of changes in economy
- Measures the rate of inflation

Uses of Index Numbers.

- Helps us to measure changes in price level
- Help us to know changes in cost of living
- Help government in adjustment of salaries and allowances
- Useful to Business Community
- Information to Politicians
- Information regarding foreign trade

Q. – From the following data, calculate price index number for the years 2022 taking 2021 as a base year, by using Fisher Method.

Commodity (वस्तु)	2021		2022	
	Price	Q	Price	Q
A	20	4	40	6
B	50	3	60	5
C	40	5	50	10
D	20	10	40	20

Ans.

$$P_{01} = \sqrt{\frac{\sum P_1 Q_0}{\sum P_0 Q_1} \times \frac{\sum P_1 Q_1}{\sum P_0 Q_0}} \times 100$$

$$\sqrt{990/630 \times 1840/1170} \times 100$$

$$\sqrt{1.5714 \times 1.5726} \times 100$$

$$\sqrt{2.4711} \times 100$$

$$1.5719 \times 100 = 157.19$$

Q. Construct Laspeyre's and Paasche's price indices for 2022 with 2014 as base year.

Items	2014		2022	
	Price	Quantity	Price	Quantity
A	2	6	4	8
B	0.4	40	1	36
C	0.5	24	0.25	32

Ans. rise in WPI indicates excess demand and fall in WPI implies deficient demand

b)	P_0	Q_0	P_1	Q_1	$P_0 Q_0$	$P_1 Q_0$	$P_1 Q_1$	$P_0 Q_1$
	2	6	4	8	12	24	32	16
	0.4	40	1	36	16	28	36	14.4
	0.5	24	0.25	32	12	8	8	16
					=40	=60	=76	=46.4

$$\text{Laspeyre's} = \frac{P_1 Q_0}{P_0 Q_0} \times 100 = \frac{60}{40} \times 100 = 150$$

$$\text{Paasche's} = \frac{P_1 Q_1}{P_0 Q_1} \times 100 = 163.79$$

PART-'B' MICROECONOMICS

INTRODUCTORY MICRO ECONOMICS

Economics:- Economics is the study of the problem of choice arising out of scarcity of resources having alternative uses.

SCARCITY OF RESOURCES: Scarcity of resources means shortage of resources in relation to their demand.

MICRO ECONOMICS: It is a study of behaviour of individual units of an economy such as individual consumer, producer etc

	Micro economics	Macro economics
1	It studies individual economic unit.	It studies aggregate economic unit
2	It deals with determination of price and output in individual markets	It deals with determination of general price level and output in the economy.
3	Its central problems are price determination and allocation of resources.	Its central problem is determination of level of Income and employment in the economy.
4	Ex. Individual Demand, Individual supply	Ex. Aggregate demand, Aggregate supply

POSITIVE ECONOMICS: Positive economics deals with what is, what was (or) how an economic problem facing the society is actually solved.

NORMATIVE ECONOMICS: It deals with what ought to be (or) how an economic problem should be solved.

POSITIVE ECONOMICS	NORMATIVE ECONOMICS
1. It is that branch of economics which is based on facts and data.	1. It is that branch of economics which is based on opinions, values and judgments.
2. "What it is" or "What was"	2. "What ought to be" or "What should be"
3. Analyses the cause and effect relationship for various economic issues.	3. It passes value judgments for various economic issues.
4. Can be proofed with data.	4. Can't be proofed with data.
5. * Prices are increasing. * Population is growing very fast.	5. * Rising prices must be controlled. * Population must be controlled.

ECONOMIC PROBLEM: "An economic problem is basically the problem of choice" which arises due to scarcity of resources having alternative uses".

CAUSES OF ECONOMIC PROBLEM :

- (i) Scarcity of resources
- (ii) Unlimited wants
- (iii) Limited resources having alternative uses

CENTRAL PROBLEMS OF AN ECONOMY

WHAT TO PRODUCE

It refers to which goods and services are to be produced and how much quantity of each good or services is to be produced i.e. consumption goods or capital goods, with the limited resources.

HOW TO PRODUCE

It refers to the choice of methods of production of goods & services i.e. whether Labour Intensive Technique or Capital Intensive Technique is to be adopted taking into consideration the proportion of capital and labour in an economy.

FOR WHOME TO PRODUCE

It concerns with the distribution of income & wealth which refers to who earns how much or who has more assets than others. It is categorized as Personal Distribution – It refers to income share of individuals and households in the society. Functional Distribution – It relates to income share of different factors of production between labour, capital, land and entrepreneur.

Central Problems in Different Economy

- (i) Capitalist economy / Market economy
- (ii) Socialist economy / Planned economy
- (iii) Mixed economy

MARKET ECONOMY: It is an economic system, in which all material means of production are owned and operated by the private with profit motive.

How are fundamental problems solved in the capitalistic economy.

In a market-oriented or capitalist economy, the fundamental problems are solved by the market mechanism. Price is influenced by the market forces of demand and supply. These forces help to decide what, how and for whom to produce.

PLANNED ECONOMY: In this economy all material means of production are owned by the government or by a centrally planned authority. All important decisions regarding production, exchange and distributions, consumptions of goods and services are made by the government or by a centrally planned authority

How are fundamental problems solved in the planned economy?

In a planned economy all the economic decisions regarding what, how and for whom to produce are solved by the state through planning. Economic planning replaces the price mechanism. The market is regulated by the state. The prices of the various products are fixed by the state called administered prices.

SNo	Planned Economy	Market Economy
1	All the materials means of production are owned by government.	All the materials means of production are owned by private individuals.
2	Main objectives of production is social welfare	Main objectives of production are maximization of profit.
3	Ownership of property is under government	There is no limit to private ownership of

	control.	property.
4	All the economic problems are solved as per direction of the planning commission.	All the economic problems are solved through price mechanism i.e., demand and supply.

(iii) Mixed economy:- Mixed economy combines the merits and avoids the demerits of market and centrally planned economies. In mixed economy both 'market forces' as well as 'central authority' play their role. While market forces allow maximisation of profits, the central authority focuses on social welfare.

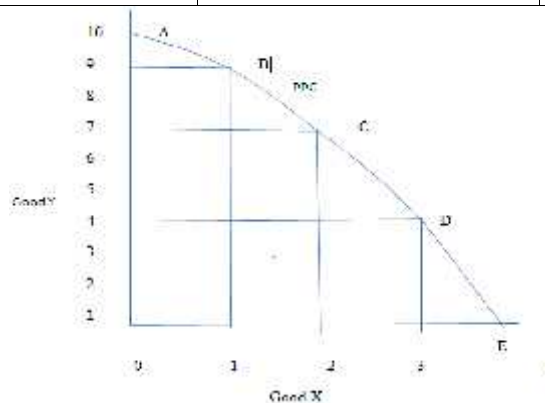
Opportunity cost:- 'Opportunity cost refers to value of a factor in its next best alternative use' Assume that a given set of resources have two uses: Use-1 and Use-2. If value of output in use-1 is Rs. 3000 and value of output in Use-2 is Rs. 5000 (technique of production remaining constant) common sense should dictate use that the resources will be employed in Use-2. Given situation, opportunity cost is Rs.2000 (5000 – 3000).

Production possibility Curve / frontier

It is a boundary line which shows that maximum combination of two goods which can be produced with help of given resources and technology at a given period of time.

Ex: An economy can produce two goods say rice or oil by using all its resources. The different combination of rice and oil are as follows:

Production Possibilities	Good 'X'	Good 'Y'
A	0	10
B	1	9
C	2	7
D	3	4
E	4	0

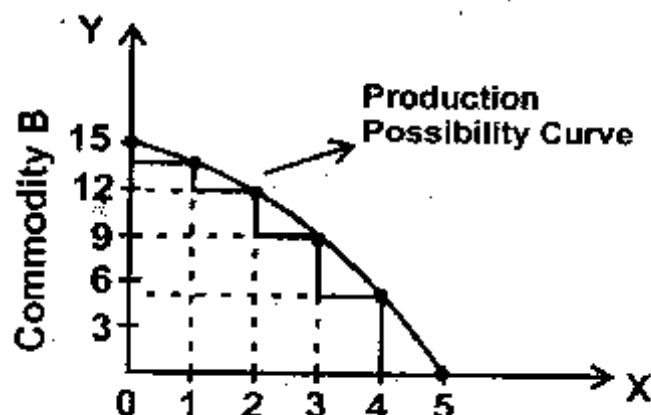


Production Possibility Curve And Opportunity Cost: It refers to a curve which shows the various production possibilities that can be produced with given resources and technology.

Production Possibilities

Production Possibility	Commodity A	Commodity B	Marginal opportunity cost of commodity A
A	0	15	-

B	1	14	15-14=1
C	2	12	14-12=2
D	3	9	12-9=3
E	4	5	9-5=4
F	5	0	5-0=5



If the economy devotes all its resources to the production of commodity B, it can produce 15 units but then the production of commodity A will be zero. There can be a number of production possibilities of commodity A & B. If we want to produce more commodity B, we have to reduce the output of commodity A & vice versa.

Shape of PP curve and marginal opportunity cost.

1) PP curve is a downward sloping curve:

In a full employment economy, more of one good can be obtained only by giving up the production of other goods. It is not possible to increase the production of both of them with the given resources.

2) The shape of the production possibility curve is concave to the origin:

The opportunity cost for a commodity is the amount of other commodity that has been foregone in order to produce the first.

The marginal opportunity cost of a particular good along the PPC is defined as the amount sacrificed of the other good per unit increase in the production of the good in question.

Example: Suppose a doctor having a private clinic in Delhi is earning Rs. 5 lakhs annually. There are two other alternatives for him.

- 1) Joining a Govt. hospital in Bangalore earning Rs. 4 lakhs annually.
- 2) Opening a clinic in his home town in Mysore and earning 3 lakhs annually.

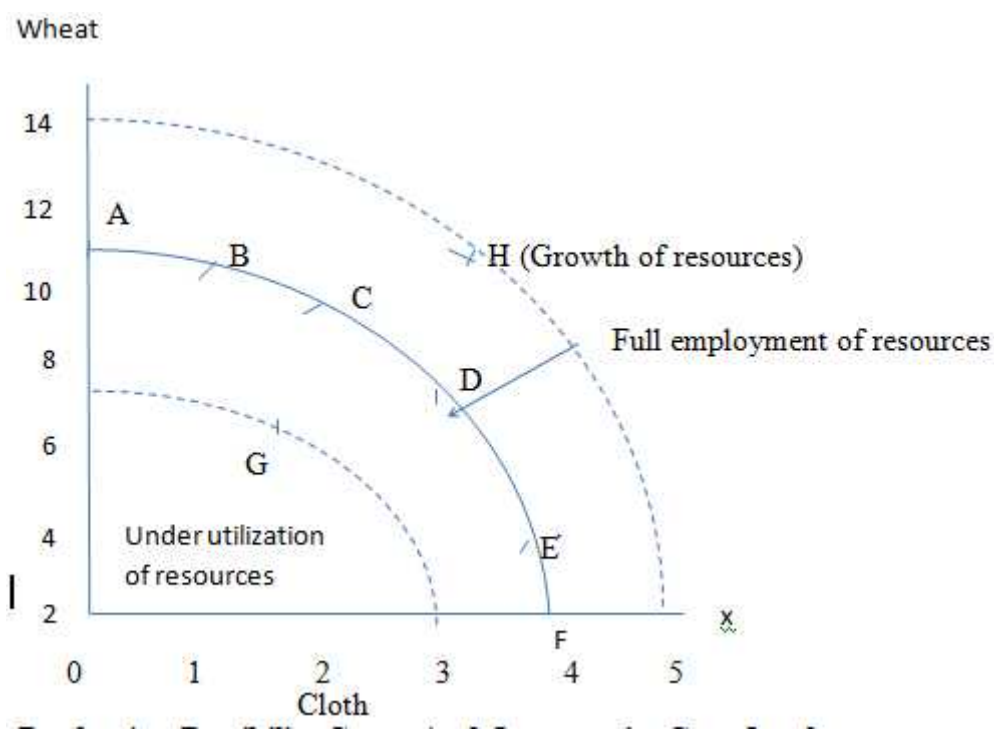
The opportunity cost will be joining Govt. hospital in Bangalore.

Increasing marginal opportunity cost implies that PPC is concave.

Production Possibility Curve

Underutilization of resources, Full employment of resources and Growth of resources

Ans. Every point on PP curve like ABCDEF indicates full employment and efficient uses of resources. Any point below or inside PP curve like G underutilization of resources. Any point above PP curves like H indicates growth of resources.



MCO

Q.1 Give example of micro economic variable is.

- (a) Wholesale price index
- (b) National income
- (c) **Market demand**
- (d) Aggregate demand

Q2. Which of the following is not concerned with the problem of choice?

- (a) **Excessive income**
- (b) Alternative use of resources
- (c) Unlimited wants
- (d) Limited resources

Q3. Economic problem arises because ?

- (a) Wants are unlimited
- (b) Alternative uses of resources
- (c) Resources are scarce
- (d) **All of these**

Q4. Normative economics deals with:

- (a) Facts
- (b) **opinions**
- (c) both (a) and (b)
- (d) none of these

Q5. Which of the following is the example of economic activity?

- (a) Production
- (b) consumption
- (c) exchange
- (d) **all of these**

Q6. Economic problem arises due to:

- (a) Limited wants
- (b) scarce means
- (c) alternative uses
- (d) **both (b) and (c)**

Q7. The problem of 'what to produce' relates to:

- (a) The choice of technique
- (b) distribution of income
- (c) market value of the goods and services
- (d) **the choice of goods and services**

Q8. The shape of transformation curve is changed by:

- (a) Opportunity cost
- (b) total cost
- (c) marginal opportunity cost
- (d) none of these

Q9. Which of the following is related to the problem 'how to produce'?

- (a) Factoral distribution of income
- (b) **the choice of technique**
- (c) the choice of product

- (d) none of these
- Q10. Who controls economic activity under centrally planned economies?
 (a) Industrialists (b) private firms **(c) government** (d) consumers
- Q11. The government does not interfere in the process of decision-making under:
(a) Market economy (b) centrally planned economy (c) mixed economy (d) none of these
- Q12. The resources for satisfying human wants are:
(a) Limited (b) unlimited (c) available at zero prices (d) none of these
- Q13. Positive economic involves statements which are:
(a) Verifiable (b) not verifiable (c) may or may not be verifiable (d) none of these
- Q14. Which of the following is not concerned with the problem of choice?
(a) Excessive income (b) alternative use of resources
 (c) unlimited wants (d) scarce resources
- Q15. In which of the following situations, does scarcity arise? (a) Supply of resources > Demand for resources
(b) Supply of resources < Demand for resources
 (c) Supply for resources = Demand for resources (d) none of these

ASSERTION REASON

Q1. ASSERTION (A): Microeconomics is a study of behaviour of individual units of an economy.

REASONING (R): It deals with determination of general price level and output in the economy

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true..

Q2. ASSERTION (A): Normative economics deals with what ought to be (or) how an economic problem should be solved.

REASONING (R): It is that branch of economics which is based on opinions and judgment .

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

(b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A)

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true..

Q3. **Assertion(A):** 'Both, microeconomics and macroeconomics have same degree of aggregation'.

Reason(R): Micro economics involves limited degree of aggregation and

Macroeconomics involves the highest degree of aggregation.

(a) Both Assertion(A) and Reason (R) are True and Reason(R) is the correct explanation

of Assertion(A)

(b) Both Assertion(A) and Reason (R) are True and Reason(R) is not the correct explanation of Assertion(A)

(c) Assertion(A) is True but Reason(R) is False

(d) Assertion(A) is False but Reason(R) is True

Q4. **Assertion(A):** Opportunity cost is the value of the factor in the next best alternative use.

Reason(R): It refers to the loss of output of Good-Y when resources are shifted from the production of Good-Y to the production of Good-X.

(a) Both Assertion(A) and Reason (R) are True and Reason(R) is the correct explanation of Assertion(A)

(b) Both Assertion(A) and Reason (R) are True and Reason(R) is not the correct explanation of Assertion(A)

(c) Assertion(A) is True but Reason(R) is False

(d) Assertion(A) is False but Reason(R) is True

Q5. **Assertion(A):** Lack of scarcity implies lack of economic problem.

Reason(R): Scarcity is the root cause of economic problem.

(a) Both Assertion(A) and Reason (R) are True and Reason(R) is the correct explanation of Assertion(A)

(b) Both Assertion(A) and Reason (R) are True and Reason(R) is not the correct explanation of Assertion(A)

(c) Assertion(A) is True but Reason(R) is False

(d) Assertion(A) is False but Reason(R) is True

Q6. **Assertion(A):** Most resources are controlled by the government in the centrally planned economy.

Reason(R): The market decides at what price the goods are to be sold in the Bazar.

(a) Both Assertion(A) and Reason (R) are True and Reason(R) is the correct explanation of Assertion(A)

(b) Both Assertion(A) and Reason (R) are True and Reason(R) is not the correct explanation of Assertion(A)

(c) Assertion(A) is True but Reason(R) is False

(d) Assertion(A) is False but Reason(R) is True

STATEMENT BASED

choose the correct answer from the following options

Q25. **Statement-1:** For whom to produce concerns with the distribution of income & wealth.

Statement-2: It is categorized as Personal Distribution and Functional Distribution.

a) Both the statement are true

(b) Both the statement are false

(c) Statement 1 is true and Statement 2 is false

(d) Statement 2 is true and Statement 1 is false

Q26. **Statement-1:** How to produce refers to which goods and services are to be produced and how much quantity of each good or services is to be produced.

Statement-2: What to produce refers to whether Labour Intensive Technique or Capital Intensive Technique.

a) Both the statement are true

(b) Both the statement are false

(c) Statement 1 is true and Statement 2 is false

(d) Statement 2 is true and Statement 1 is false

Short and Long Answer Questions (3/ 4 Marks)

Q1. Explain how scarcity and choice go together.

Ans. : Resources are not only scarce but also have alternative uses. Thus land can be used for producing wheat for constructing factories. Hence, the problem of choice which is the essence of any economic problem. However, if resources were not scarce, one could have anything anytime and there would be no problem of choice.

Q2. “Economics is about making choices in the presence of scarcity”. Explain.

Ans. : If there were no scarcity, there would not have been any economic problem, or the problem related to ‘choice’. In the absence of scarcity the concept of unlimited wants does not exist. When resources are not limited and wants are no longer unlimited, where is the problem of choice? The problem of choice then ceases to exist; accordingly there should be no economic problem and no economic as such.

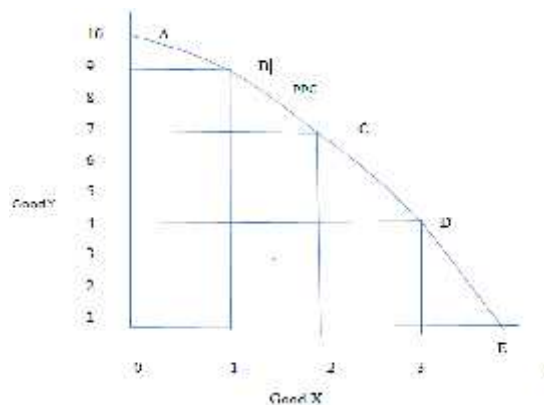
Q3. Does massive unemployment shift the PPC to the left?

Ans:- Massive unemployment will shift the PPC to the left because labour force remains underutilized. The economy will produce inside the PPC indicating underutilization of resources.

Q4. What does the slope of PPC show?

Ans. The slope of PPC indicates the increasing marginal opportunity cost as every next time lesser and lesser efficient resources are utilized.

Production Possibilities	Good ‘X’	Good ‘Y’
A	0	10
B	1	9
C	2	7
D	3	4
E	4	0



Q5. From the following PP schedule calculate MRT of good x.

Production possibilities	A	B	C	D	E
Production of good x units	0	1	2	3	4
Production of good y units	14	13	11	8	4

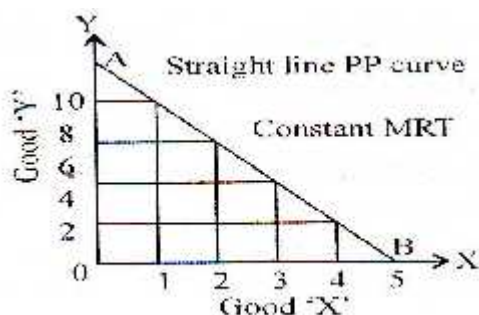
Production of good X units	Production of good Y units	MRT = y / x
0	14	-
1	13	1:1
2	11	2:1
3	8	3:1
4	4	4:1

Q6. Can PP curve be a straight line.

Yes, if we assume that MRT is constant, When marginal rate of transformation remains constant, it means that for every additional unit increase in the production of one good, the sacrifice of the production of other goods remains the same. This happens when resources are equally efficient in the production of different goods in this case we get a downward sloping straight line production possibility curve as shown..

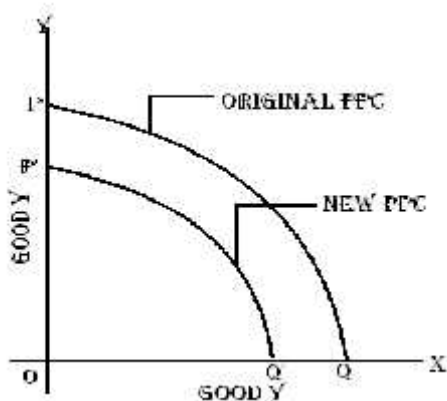
Combination	Production of 'x'	Production of 'y'	MOC/ MRT
A	0	16	-
B	1	12	4
C	2	8	4
D	3	4	4
E	4	0	4

PP curve be a straight line



Q7. A lot of people died and many factories are destroyed because of a severe earthquake in a country. How will it affect the country's PPC.

Ans. With the death of lot of people amount of labour will fall and destruction of factories will cause a reduction in the stock of capital. This decrease in resources causes of shift of production possibility curve to the left showing less production of two goods than before.



SHORT & LONG ANSWER TYPES QUESTION

Q1. Production in an economy is below its potential due to unemployment. Government starts employment generation schemes. Explain its effect using production possibilities curve.

Q2. Explain the meaning of opportunity cost with the help of production possibilities schedule.

Q3. With the help of suitable example explain the problem of for whom to produce.

Q4. Why does an economic problem arise? Explain.

Q5. Explain the problem what to produce.

Q6. Why is production possibilities curve concave? Explain.

Q7. Large number of technical training institutions has been started by the government. State its economic value in the context of production possibilities frontier.

Q8. Why is the production possibilities curve downward sloping ? Explain.

Q9. What will likely be the impact of large scale outflow of foreign capital on production possibilities curve of the economy and why?

Q10. What will likely be the impact of large scale inflow of foreign capital in India on production possibilities curve and why ?

Q11. What will be the impact of Education for all campaign (sarv shiksha abhiyan) on the production possibilities curve of the Indian economy and why ?

Q12. What is likely to be the impact of 'Make in India' appeal to the foreign investors by the Prime Minister of India , on the production possibilities frontier of India ? Explain.

Q13. Give reason comment on the shape of production possibilities frontier based on the following schedule :

Good- X	0	1	2	3	4
Good- Y	30	27	21	12	0

Q14. Give reason comment on the shape of production possibilities frontier based on the following schedule :

Good- X	0	1	2	3	4
Good- Y	4	3	2	1	0

Q15. Assuming that no resource is equally efficient in production of all goods, name the curve which shows production potential of the economy. Explain, giving reasons, its properties.

Q16. Why do central problem of an economy arise ? Explain the central problem of 'for whom to produce' ?

Q17. Explain the concepts of opportunity cost and marginal rate of transformation using a production possibilities schedule based on the assumption that no resource is equally efficient in production of all goods.

UNIT-2 CONSUMER EQUILIBRIUM

Utility :- The term **utility** refers to the want satisfying power of a commodity. Commodity will possess utility only if it satisfies a want. Utility differs from person to person, place to place, and time to time.

CHARACTERISTICS _ 1. Utility is Subjective

2. It is depends on Intensity of Need, It is measurable.
3. It is not essentially useful.

Measurement of utility:- Can we measure satisfaction (utility) in terms of :-

1. **Cardinal measurement** :- Marshall believes that we can measure satisfaction in term of Cardinal numbers, like 1,2,3 ect. The standard unit of measurement used by Alfred Marshall to measure utility is called utils.
2. **Ordinal measurement** :- This approach suggested that utility cannot be measured in terms of units. It can at best be ranked or compared as high or low. This approach is given by Prof. Hicks and Allen.

	Cardinal Utility	Ordinal Utility
1	Given by Prof. Alfred Marshall	Given by Prof. J.R. Hicks
2	Utility can be measured numerically	It cannot be measured numerically
3	Unit of measurement is 'utils'	Possible for a consumer to scale his preferences.

Concepts of Total Utility and Marginal Utility

Total Utility:- It is the sum total of utility derived from the consumption of all the unit of a commodity. (OR) The total satisfaction a consumer gets from a given commodity /service.

$$TU_n = MU_1 + MU_2 + MU_3 + \dots + MU_n \quad \text{OR} \quad TU = \sum MU$$

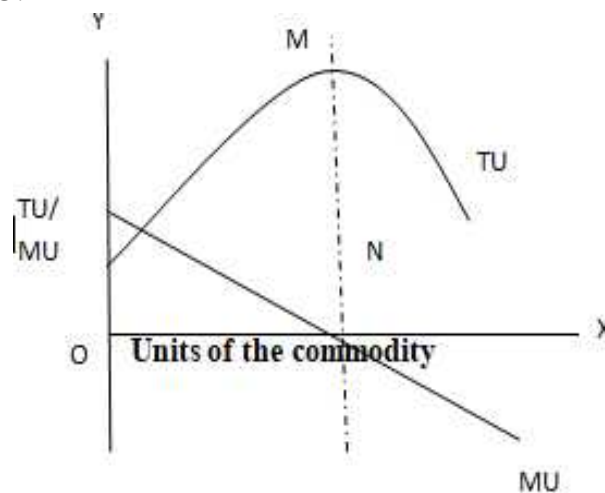
Marginal Utility:- It refers to additional utility on account of consumption of an additional unit of a commodity. (OR) It is the utility derived from the last unit of a commodity consumed. It can also be defined as the addition to the total utility when one more unit of the commodity is consumed.

$$MU_n = TU_n - TU_{n-1} \quad \text{OR} \quad MU_x = \frac{TU_x}{Q_x}$$

Unit	MU _x	TU _x		
1	4	4		
2	3	7		
3	2	10		
4	1	11		
5	0	11		
6	-1	10		

Relation Between Total Utility and Marginal Utility –

1. As long as MU is positive, TU increases.
2. When MU is zero, TU is maximum and constant.
3. When MU is negative, TU decreases.
4. TU is summation of MU.
5. MU is the slope of TU.



LAW OF DIMINISHING MARGINAL UTILITY - As we consume more units of a Commodity, each successive unit consumed gives lesser and lesser satisfaction that is marginal utility diminishes. It is termed as the Law of Diminishing Marginal Utility.

Assumption:- (i) Only standard units of the commodity are consumed. Like a cup of tea not spoon of tea. (ii) Consumption of the commodity is continuous.

Exceptions – Hobbies; Drunkards; Misers; Music and Poetry; Reading.

CONCEPT OF CONSUMER'S EQUILIBRIUM

Consumer's equilibrium refers to situation wherein a consumer gets maximum satisfaction out of his given income and he has no tendency to make any change in his existing expenditure.

Assumptions Relating to Consumer's Equilibrium:- (i) Rational Consumer

(ii) Cardinal Utility (iii) Marginal utility of money is constant

Marginal utility analysis and Consumer's equilibrium :- 1. Consumer's equilibrium: One Commodity Case 2. Consumer's equilibrium: Two Commodity Case.

1. Consumer's equilibrium: One Commodity Case :- It refers to a situation in which a consumer spends his income on purchase of a commodity in such a way that gives him maximum satisfaction. Consumer equilibrium is determined when the following conditions are satisfied.

$MU_x = P_x$ (Price)

Total satisfaction decreases with additional purchase after equilibrium.

$MU_x > P_x$

Consumer gains more satisfaction in comparison to sacrifice. Purchase of X will

Increase, MU_x will fall and become equal to price.

$MU_x = 4,$

$P_x = 3;$

$MU_x > P_x \quad 4 > 3$

$MU_x = P_x$

MU implies Satisfaction. Price implies Sacrifice.

$MU_x = 3;$

$P_x = 3;$

$MU_x = P_x$

$3 = 3$

No change in purchasing or consumption

$MU_x < P_x$

Consumer suffers losses as he is sacrifice more than gain. Purchase of X will reduce,

MU_x will rise and become equal to price.

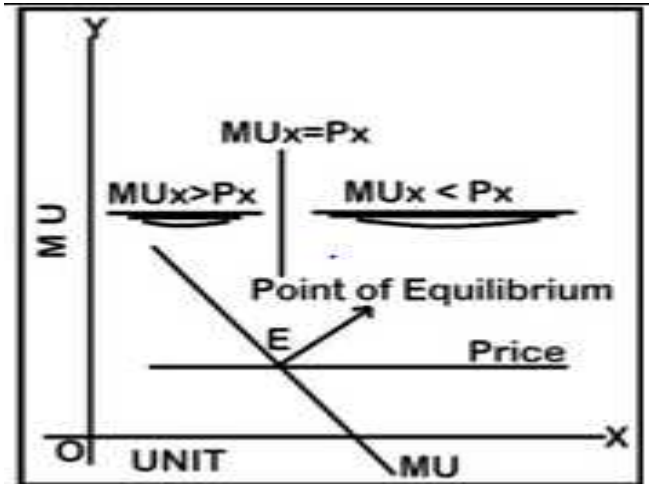
$MU_x = 2,$

$P_x = 3;$

$MU_x < P_x$

$2 < 3$

Unit	P_x	MU_x	Remarks
1	3	5	$MU_x > P_x$
2	3	4	$MU_x > P_x$
3	3	3	$MU_x = P_x$
4	3	2	$MU_x < P_x$
5	3	1	$MU_x < P_x$
6	3	0	$MU_x < P_x$



. Consumer's equilibrium: Two Commodity Case

In actual life a consumer consumes more than one good. In such case Law of Equi-Marginal Utility helps to determine consumer's equilibrium. According to this law a consumer gets maximum satisfaction when ratio of MU of two commodities to their respective prices is equal. A consumer will spend his income in such a way that utility gained from the last rupee spent on each commodity is equal. In case of Two commodities, a consumer attains equilibrium when marginal utilities of both the goods are equal. i.e.,

$$MU_x = MU_y$$

$$MU_x/P_x = MU_y/P_y = MU_m$$

Condition of consumer equilibrium is:

$$MU_x/P_x = MU_y/P_y = \text{MU of last rupee spent}$$

What happens if MU_x/P_x is not equal to MU_y/P_x ?

- (a) **If $MU_x/P_x > MU_y/P_y$,** (i) the consumer gets more MU from the last rupee spent on X as compared to Y .
(ii) He would prefer to buy more of X and less of Y.
(iii) Law of DMU operates.
(iv) It will cause fall in MU_x and rise in MU_y .
(v) The consumer would continue to buy more of X till MU_x/P_x is equal to MU_y/P_x
- (b) **If $MU_x/P_x < MU_y/P_y$,** (i) the consumer gets more MU from the last rupee spent on Y as compared to X .
(ii) He would prefer to buy more of Y and less of X.
(iii) Law of DMU operates.
(iv) It will cause fall in MU_y and rise in MU_x .

(v)The consumer would continue to buy more of Y till MU_x/P_x is equal to MU_y/P_y

The following table is based upon four assumption:

1. Law of DMU is applicable for both the commodities
2. Price of good X is Rs. 10 per unit
3. Price of good Y is Rs. 2 per unit
4. Money income of a consumer is Rs. 30

Unit of X	MU _x	P _x	MU of a Rupee		Unit of Y	MU _y	P _y	MU of a Rupee
1	100	10	10		1	24	2	12
2	80	10	8		2	22	2	11
3	60	10	6		3	20	2	10
4	40	10	4		4	18	2	9
5	20	10	2		5	16	2	8
6	0	10	0		6	14	2	7
7	-20	10	-2		7	12	2	6

Consumer equilibrium is determined at a combination – 2 unit of X and 5 Unit of Y.

CONSUMERS EQUILIBRIUM – INDIFFERENCE CURVE ANALYSIS

Indifference Set and Indifference Curve

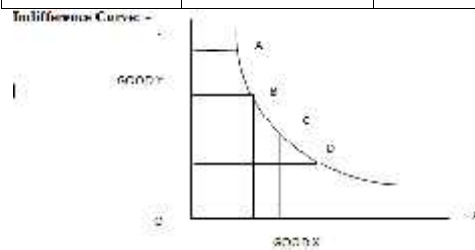
Indifference Set :- Indifference Set is a set of two goods which offers the consumer the same level of satisfaction. So that, the consumer is indifferent across all combinations in the indifference set.

. **Indifference Curve**:- It is diagrammatic presentation of an indifference set of a consumer, It is show different combinations of two commodities offering the same level of satisfaction to the consumer.

Indifference Schedule : Schedule of various bundles of goods that give equal level of satisfaction to the consumer.

Bundles	Good X	Good Y
A	1	12
B	2	8
C	3	5

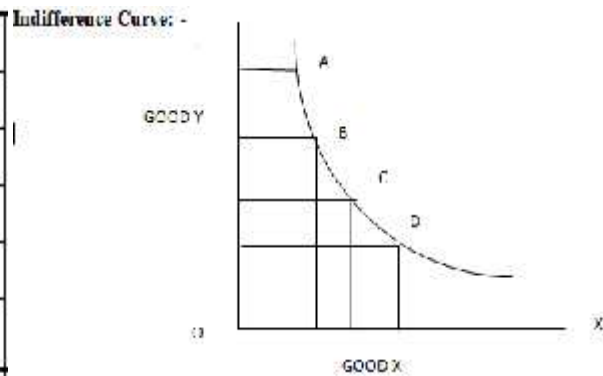
D	4	3
E	5	2



Marginal Rate of Substitution(MRS):- MRS is a tool of IC analysis. It is the amount of good Y that a consumer is willing to (sacrifice the successive unit of one good) give up for one more unit of Good X. It is same as slope of IC. It is determining by consumer himself. It is measured as $\frac{Y}{X}$.

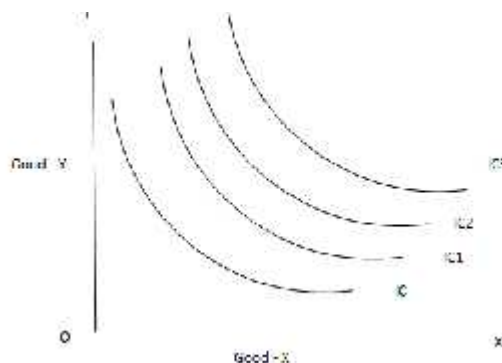
MRS

Bundles	Good A	Good B	MRS _{xy}
A	1	12	--
B	2	8	1X=4Y
C	3	5	1X=3Y
D	4	3	1X=2Y
E	5	2	1X=1Y



MONOTONIC PREFERENCE - When between two consumption bundles, the consumers prefers that bundle in which he has more of at least one good but no less of others. In two bundles $3X+4Y$ and $3X+5Y$, $3X+5Y$ is monotonic.

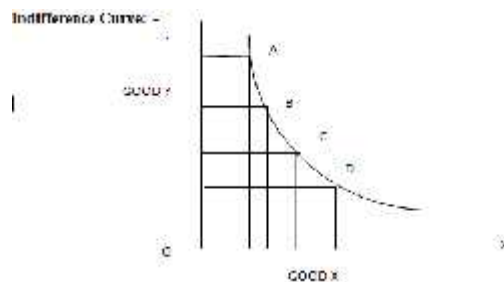
Indifference map - A set of ICs drawn in a graph is known as Indifference map. Its need not to parallel to each other and never touches axis.



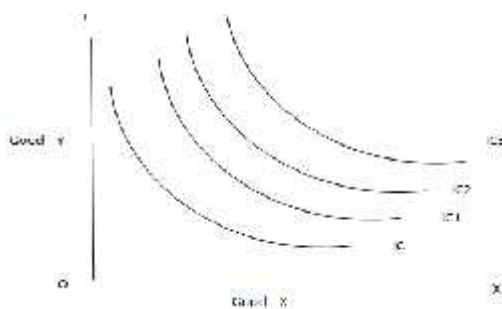
FEATURES/ PROPERTIES OF INDIFFERENCE CURVES:-

1. **SLOPES DOWNWARD –** It indicates that if a consumer wants to have more quantity of one good; he must be ready to give up some quantity of another good to keep his satisfaction level constant.

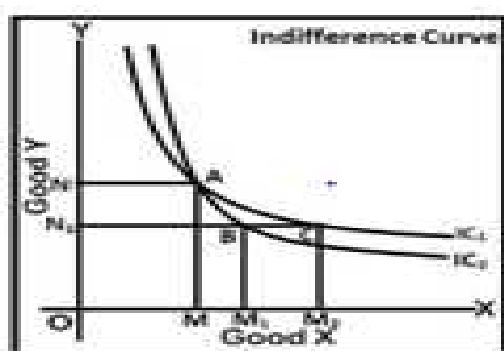
2. **CONVEX TO THE ORIGIN-** Curve can be straight line (when MRS_{xy} is constant), Concave (when MRS_{xy} is increasing) and convex (when MRS_{xy} is diminishing) to the origin. Diminishing MRS_{xy} is responsible for convexity of IC.



3. **HIGHER IC REPRESENT HIGHER LEVEL OF SATISFACTION** – Due to monotonic preference higher IC represent higher level of satisfaction.



4. **IC NEVER INTERSECT EACH OTHER** – Each IC represent an unique level of satisfaction so if two IC intersect each other it will show the distinct scale of satisfaction have a common intersecting point. Satisfaction at A&B is same (IC1) and A&C are same (IC2). If $A=B$ and $A=C$, then B&C should give same level of satisfaction. But when we look at the diagram, we find that satisfaction at $C > B$, So two IC can never be intersect each other.



5. **IC NEVER TOUCHES THE AXIS** – As consumption of one good cannot be zero.

CONSUMER'S BUDGET

Budget Set:- Budget Set refers to attainable combinations of a set of two goods, given prices of goods and income of the consumer. (OR) It refers to all consumption bundles that the

consumer can buy using his money income at the prevailing market price.

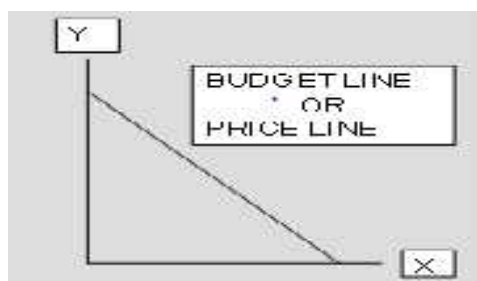
Equation of budget set: $P_1X_1 + P_2X_2 \leq Y$

Budget Set (Table) of the Consumer: - Based upon three assumptions: (a) Price of good X is Rs. 4 per unit (b) Price of good Y is Rs. 2 per unit (c) Money income of the consumer is Rs.20.

Combinations	Quantity of good X	Quantity of good Y	Expenditure = Income
A	0	10	$4*0+2*10=20$
B	1	8	$4*1+2*8 =20$
C	2	6	$4*2+2*6=20$
D	3	4	$4*3+2*4=20$
E	4	2	$4*4+2*2=20$
F	5	0	$4*5+2*0=20$

Budget Line: - A budget line represents the different bundles that the consumer can purchase spending his entire money income at given price.

Equation of budget set: $P_1X_1 + P_2X_2 = Y$



Feature of Budget Line:- 1. Budget line is a straight line assuming that the entire income is spent.

2. Slope of budget line depends upon price of both goods.

Slope of budget line= $(-)\ P_1/P_2$

3. It is negatively sloped curve or downward sloping curve.

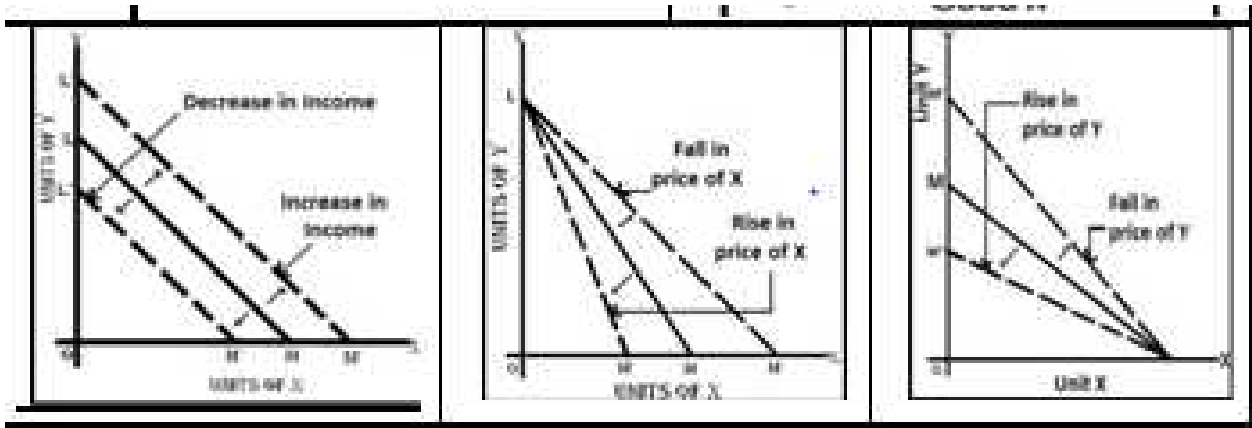
Changes in Budget Line:- (i) Shifts in budget line and (ii) Rotation of budget line

(i) Shifts in Budget Line :- (a) **Budget Line Shift Forward:-** When income of the consumer increases . Price is assumed as constant.

(b) **Budget Line Shift Backward:-** When income of the consumer decreases . Price is assumed as constant.

(ii) Rotation of Budget Line :-(a) **Budget Line Rotates to the Right:** When P_x OR P_y falls.

(b) **Budget Line Rotates to the Left:** When P_x OR P_y rises.

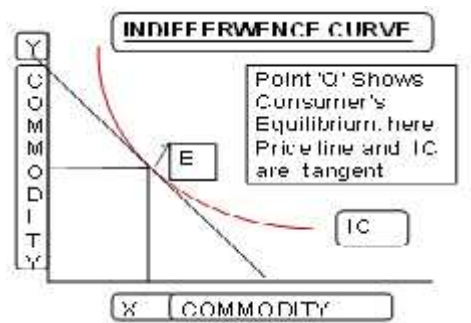
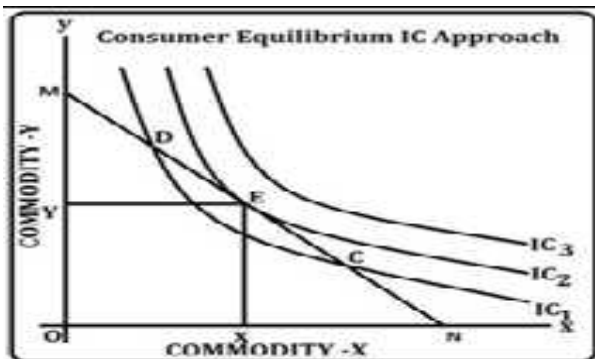


CONSUMER EQUILIBRIUM WITH IC APPROACH (ORDINAL APPROACH)

Consumer’s equilibrium refers to the optimum choice of the consumer when he maximizes his satisfaction.

In IC approach consumer reaches on equilibrium when **three conditions** are satisfied.

1. MRS_{xy} (slope of IC) = P_x/P_y (MRE - slope of Budget Line)
2. IC is convex to the origin at the point of equilibrium – It means MRS_{xy} must be diminishing.
3. Budget line should be tangent to the highest possible IC.



MN is the budget line of consumer. IC1, IC2 and IC3 are various indifference curves representing different scales of satisfaction. Bundle D and C cost the same as bundle E, but D & C lie on a lower IC, so they represent a comparatively lower level of satisfaction. Bundle E is the bundle where both the conditions get satisfied. In equilibrium, the consumer will consume X quantity of good x and Y quantity of good Y.

Alternatively (If consumer not in equilibrium):-

(i) $MRS_{xy} > P_x/P_y$

(ii) $MRS_{xy} < P_x/P_y$

(i) $MRS_{xy} > P_x/P_y$: - Consumer will not be in equilibrium. In this case consumer is willing to pay more than the actual price for good X. As a result, he will increase the consumption of X which leads to fall in the utility of good X and finally, MRS_{xy} starts falling till $MRS_{xy} = P_x/P_y$

(ii) $MRS_{xy} < P_x/P_y$:- Consumer will not be in equilibrium. In this case consumer is willing to pay less than the actual price for good X. As a result, he will decrease the consumption of X which leads to increase in the utility of good X and finally, MRS_{xy} starts rising till $MRS_{xy} = P_x/P_y$

Rational Behind Conditions Of Equilibrium:-

(i) Condition 1: $MRS_{xy} = P_x/P_y$

(ii) IC is convex to the origin at the point of equilibrium

MCQ

Q1. Want satisfying power of a commodity is called:

- (a) Consumption (b) **Utility**
(c) Production (d) Value addition

Q2. In Marginal utility theory, utility is:

- (a) An ordinal concept; (b) **A cardinal concept**
(c) Both ordinal and cardinal concept (d) None of these

Q3. What will you say about MU when TU is maximum?

- (a) Maximum (b) **Zero**
(c) Constant (d) Falling

Q4. Budget line indicates:.

- (a) **Price ratio** (b) Income ratio
(c) Cost ratio (d) None of these

Q5. The slope of indifference curve is measured by:

- (a) Marginal rate of transformation (b) **Marginal rate of substitution**
(c) Marginal rate of technical substitution (d) None of these

Q6. Highest indifference curve means

- (a) Consumer has more income (b) Price of good have reduced
(c) **Higher satisfaction level** (d) All of these

Q7. Given the fact that MRS between goods X and Y is diminishing, IC is:

- (a) **Convex to the origin** (b) Concave to the origin
(c) Straight line (d) None of these

Q8. When MU is negative, TU will be :

- (a) Rising (b) **Falling**
(b) Not changing (d) Maximum

Q9. Slope of TU curve is called

- (a) **Marginal utility** (b) Utility
(c) Average utility (d) None of these

Q10. Positive economics involves statement which is:

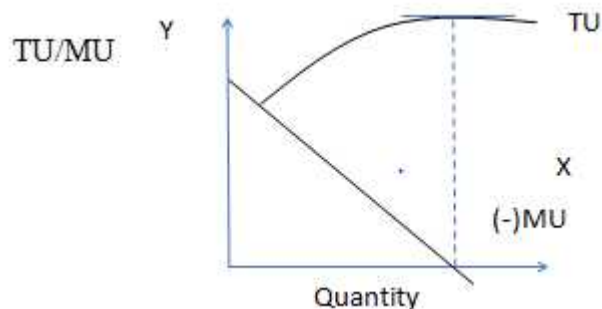
- (a) **Verifiable** (b) Not Verifiable
 (c) May or may not be Verifiable (d) None of these
- Q11. Normative economics deal with:
 (a) Facts (b) **Opinions**
 (c) Both 'A' and 'B' (d) None of these
- Q12. Scarcity is a situation when demand for goods is:
 (a) Equal to supply (b) **More than supply**
 (c) Less than supply (d) None of these
- Q13. P_x/P_y indicates the slope of:
 (a) Budget line (b) Budget set
 (c) Price line (d) **Both 'A' and 'C'**
- Q14. When rupee worth of satisfaction is greater for Y than X, it implies that:
 (a) $MU_x/P_x = MU_y/P_y$ (b) $MU_x/P_x > MU_y/P_y$
 (c) $MU_x/P_x < MU_y/P_y$ (d) None of these
- Q15. According to IC approach, at the point of equilibrium:
 (a) Slope of IC > Slope of price line
 (b) Slope of IC < Slope of price line
 (c) **Slope of IC = Slope of price line**
 (d) None of these
- Q16. In the case of $MU_x/P_x > MU_y/P_y$:
 (a) Consumer will shift some expenditure from X to Y
 (b) **Consumer will spend more on X**
 (c) Consumer will spend less on both X to Y
 (d) Consumer will spend more on both X to Y
- Q17. Which of following is not a macro variable?
 (a) Wholesale price index
 (b) **Output of the firm**
 (c) Aggregate demand
 (d) Aggregate supply

3, 4 & 6 MARKS QUESTIONS & ANSWERS

Q1. Explain the law of Diminishing Marginal Utility with the help of a table and a diagram.

Ans :- The law of diminishing Marginal Utility states that as we consume more and more units of a commodity, the MU derived from the successive units of that commodity goes on decreasing. It is explained with the help of following schedule and diagram.

UNITS	TU	MU
1	10	10
2	18	8
3	24	6
4	28	4
5	30	2
6	30	0
7	28	-2



Q2. What is meant by consumer's equilibrium? State its conditions in case of two commodities approach.

Ans. Consumer's equilibrium: Two Commodity Case

In actual life a consumer consumes more than one good. In such case Law of Equi-Marginal Utility helps to determine consumer's equilibrium. According to this law a consumer gets maximum satisfaction when ratio of MU of two commodities to their respective prices is equal. A consumer will spend his income in such a way that utility gained from the last rupee spent on each commodity is equal. In case of Two commodities, a consumer attains equilibrium when marginal utilities of both the goods are equal. i.e.,

$$MU_x = MU_y$$

$$MU_x/P_x = MU_y/P_y = MU_m$$

Condition of consumer equilibrium is:

$$MU_x/P_x = MU_y/P_y = MU \text{ of last rupee spent}$$

What happens if MU_x/P_x is not equal to MU_y/P_x ?

(c) If $MU_x/P_x > MU_y/P_y$, (i) the consumer gets more MU from the last rupee spent on X as compared to Y .

(ii) He would prefer to buy more of X and less of Y.

(iii) Law of DMU operates.

(vi) It will cause fall in MU_x and rise in MU_y .

(vii) The consumer would continue to buy more of X till MU_x/P_x is equal to MU_y/P_x

(d) If $MU_x/P_x < MU_y/P_y$, (i) the consumer gets more MU from the last rupee spent on Y as compared to X .

(ii) He would prefer to buy more of Y and less of X.

(iii) Law of DMU operates.

(iv) It will cause fall in MU_y and rise in MU_x .

(v) The consumer would continue to buy more of Y till MU_x/P_y is equal to MU_y/P_y

The following table is based upon four assumption:

5. Law of DMU is applicable for both the commodities
6. Price of good X is Rs. 10 per unit
7. Price of good Y is Rs. 2 per unit
8. Money income of a consumer is Rs. 30

Unit of X	MU _x	P _x	MU of a Rupee	Unit of Y	MU _y	P _y	MU of a Rupee
1	100	10	10	1	24	2	12
2	80	10	8	2	22	2	11
3	60	10	6	3	20	2	10
4	40	10	4	4	18	2	9
5	20	10	2	5	16	2	8
6	0	10	0	6	14	2	7
7	-20	10	-2	7	12	2	6

Consumer equilibrium is determined at a combination – 2 unit of X and 5 Unit of Y.

Q3. What is the difference between cardinal and ordinal utility analysis.

	Cardinal Utility	Ordinal Utility
1	Given by Prof. Alfred Marshall	Given by Prof. J.R. Hicks
2	Utility can be measured numerically	It cannot be measured numerically
3	Unit of measurement is 'utils'	Possible for a consumer to scale his preferences.

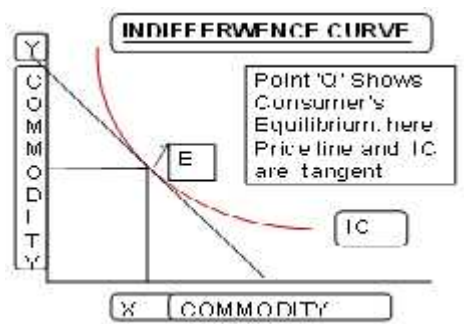
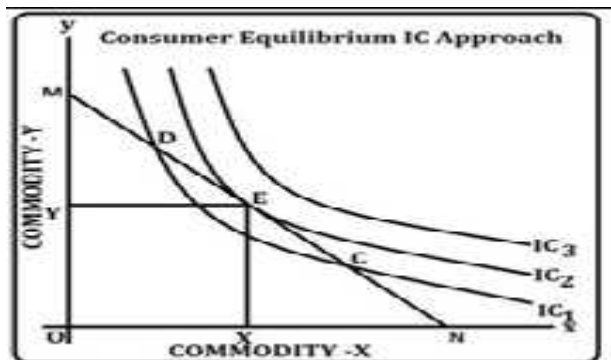
Q4. How is equilibrium achieved with the help of indifference curve analysis?

Ans. CONSUMER EQUILIBRIUM WITH IC APPROACH (ORDINAL APPROACH)

Consumer's equilibrium refers to the optimum choice of the consumer when he maximizes his satisfaction.

In IC approach consumer reaches on equilibrium when **three conditions** are satisfied.

- (1) MRS_{xy} (slope of IC) = P_x/P_y (MRE - slope of Budget Line)
- (2) IC is convex to the origin at the point of equilibrium – It means MRS_{xy} must be diminishing.
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MN is the budget line of consumer. IC1, IC2 and IC3 are various indifference curves

Representing different scales of satisfaction. Bundle D and C cost the same as bundle E, but D & C lie on a lower IC, so they represent a comparatively lower level of satisfaction. Bundle E is the bundle where both the conditions get satisfied. In equilibrium, the consumer will consume X quantity of good x and Y quantity of good Y.

Alternatively (If consumer not in equilibrium):-

- (i) $MRS_{xy} > P_x/P_y$
- (ii) $MRS_{xy} < P_x/P_y$

(i) $MRS_{xy} > P_x/P_y$:- Consumer will not be in equilibrium. In this case consumer is willing to pay more than the actual price for good X. As a result, he will increase the consumption of X which leads to fall in the utility of good X and finally, MRS_{xy} starts falling till $MRS_{xy} = P_x/P_y$

(ii) $MRS_{xy} < P_x/P_y$:- Consumer will not be in equilibrium. In this case consumer is willing to pay less than the actual price for good X. As a result, he will decrease the consumption of X which leads to increase in the utility of good X and finally, MRS_{xy} starts rising till $MRS_{xy} = P_x/P_y$

Rational Behind Conditions Of Equilibrium:-

- (i) Condition 1: $MRS_{xy} = P_x/P_y$
- (ii) IC is convex to the origin at the point of equilibrium

Q5. A consumer consumes only two good X and Y. MU of X and Y are 5 and 4 respectively. Price of X and Y is Rs. 4 per unit. Is consumer in equilibrium? What will be further reaction of the consumer? Give reasons.

Ans. For a consumer to be in equilibrium,

$$MU_x/P_x = MU_y/P_y$$

According to the question

$$MU_x/P_x > MU_y/P_y$$

$$5/4 > 4/4$$

Hence the consumer is not in equilibrium

(i) the consumer gets more MU from the last rupee spent on X as compared to Y .

(ii) He would prefer to buy more of X and less of Y.

(iii) Law of DMU operates.

(iv) It will cause fall in MU_x and rise in MU_y .

(v) The consumer would continue to buy more of X till MU_x/P_x is equal to MU_y/P_y

Q6. A consumer consumes only two goods X and Y. MU of X and Y is 4. Price of X and Y are Rs. 3 and 2 respectively. Is consumer in equilibrium? What will be further reaction of the consumer? Give reasons.

Ans. For a consumer to be in equilibrium,

$$MU_x/P_x = MU_y/P_y$$

According to the question

$$MU_x/P_x < MU_y/P_y$$

$$4/3 < 4/2$$

Hence the consumer is not in equilibrium

(i) the consumer gets more MU from the last rupee spent on Y as compared to X .

(ii) He would prefer to buy more of Y and less of X.

(iii) Law of DMU operates.

(iv) It will cause fall in MU_y and rise in MU_x .

(v) The consumer would continue to buy more of Y till MU_x/P_x is equal to MU_y/P_y

Q7. A consumer consumes only two goods X and Y. The marginal rate of substitution is 2. Price per unit of X and Y are Rs. 5 and 4 respectively. Is consumer in equilibrium? What will be further reaction of the consumer? Give reasons.

Ans. Given, $P_x=5$, $P_y=4$ and $MRS=2$

The consumer attains equilibrium when :

$$MRS = P_x/P_y$$

According to the question: $MRS > P_x/P_y$

Using the given values, $2 > 5/4$

(i) On the assumption that P_x/P_y , remains constant and income of consumer also constant.

(ii) Equilibrium can be struck only when MRS_{xy} starts falling and becomes equal to P_x/P_y

(iii) This happens only when the consumer starts consuming more of X in place of Y.

(iv) He moves downward to the right along the IC

(v) When $MRS_{xy} > P_x/P_y$, the consumer would react to this situation by substituting X for

Y .

(vi) That MRS_{xy} declines and becomes equal price ratio $MRS_{xy} = P_x/P_y$

Q8. Why slope of Budget line is represented by Price Ratio?

Ans.. A point on the budget line indicates a bundle which the consumer can purchase by spending hi entire income. So, if the consumer wants to have one more unit of good 1 then he will have to give up some amount of good 2.

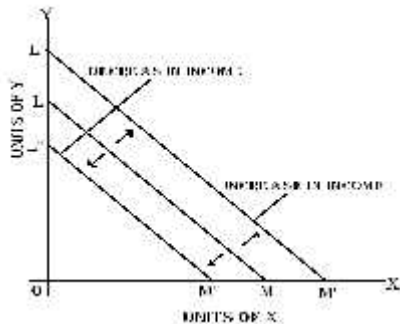
Suppose Apple is priced at RS 4 per Apple and Guavas at RS 2 per Guavas.It means , to reduce his expenditure on guavas by RS 4, i.e. consumer will have to sacrifice 2 units of guava to gain

1unit of apple. P_A/P_G is nothing but the price ratio between apples and guavas. So it is rightly said that Price Ratio indicates the slope of budget line.

Q9. Explain different situation under which budget line shifts. Use diagram.

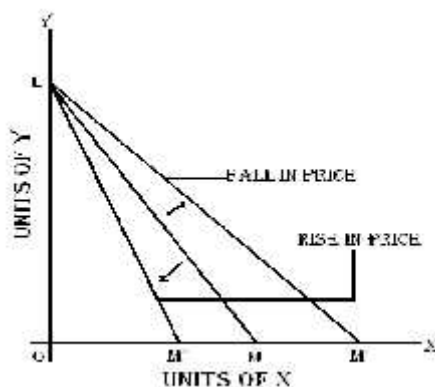
1. **Ans.** Shifts In Budget Line.

Case I – When consumer’s money income increases but price of commodities remains constant.



If LM is the Budget Line. Suppose if money income is increases then consumer will be able to purchase more goods with the new income at the given prices, therefore budget line will shift to the right (L'M'). Suppose if money income is decreases then consumer will be able to purchase less goods with the new income at the given prices, therefore budget line will shift to the left (L''M''). New budget line L'M' and L''M'' is parallel to the original budget line LM because slope of new budget lines remain same since price do not change.

Case II – When prices of good X change and income of consumer’s remain constant.



If LM is the Budget Line. Suppose if price of good X falls but money income and price of Y good remain constant then consumer will be able to purchase more of good X only, therefore budget line will shift to the right (L'M'). Suppose if price of good X rises but

money income and price of Y good remain constant then consumer will be able to purchase less of good X only, therefore budget line will shift to the right (L''M'').

SHORT & LONG ANSWER TYPES QUESTION

Q1. A Consumer consumes only two goods. Explain consumer's equilibrium with the help of utility analysis.

Q.2. A Consumer consumes only two goods A & B and is in equilibrium . Show that when price of Good 'B' falls, demand for 'B' rises . Answer this question with the help of utility analysis.

Q.3. . Explain the conditions of consumer's equilibrium with the help of utility analysis

Q4. Explain the meaning of diminishing marginal rate of substitution with the help of a numerical example.

Q5. Explain the law of marginal diminishing utility with the help of total utility schedule.

Q6.Explain the properties of indifference curves .

Q7. Explain the conditions of consumer's equilibrium with the help of the indifference curves analysis.

Q8. A Consumer consumes only two goods X & Y and is in equilibrium . Show that when price of Good X rises, the consumer buys less of Good X . Use utility analysis.

Q9.Given the price of a good ,how will a consumer decide as to how much quantity of that good to buy ? Use utility analysis.

Q10. State the conditions of consumer's equilibrium in the indifference curves analysis and explain the rational behind these conditions .

Q11. A Consumer consumes only two goods X & Y whose prices are Rs. 5 & 4 respectively . If the consumer chooses a combination of the two good with marginal utility of X equal to 4 and that of Y equal to 5, is the consumer equilibrium? Why or why not? What will a rational consumer do in this situation? Use utility analysis.

Q12. A Consumer consumes only two goods X & Y whose prices are Rs. 4 & 5per unit respectively . If the consumer chooses a combination of the two good with marginal utility of X equal to 5 and that of Y equal to 4, is the consumer equilibrium? Give reasons What will a rational consumer do in this situation? Use utility analysis.

Q13. A Consumer consumes only two goods X & Y both priced at Rs. 3 per unit . If the consumer chooses a combination of these two good with marginal rate of substitution equal to

3 , is the consumer equilibrium ? Give reasons What will a rational consumer do in this situation? Explain .

Q14. Explain the difference between cardinal utility and ordinal utility. Give example in each case .

Q15. Define an indifference curves. Explain why an indifference curves is downward sloping from left to right .

Q16. Define marginal rate of substitution. Explain why an indifference curves is convex.

Q17. What are monotonic preferences? Explain why an indifference curves to the right shows higher utility.

Q18. Explain the concept of budget line equation with the help of a numerical example .

Q19 . Explain why is an indifference curve (a) downward sloping and (b) convex.

Q20. A Consumer consumes only two goods X & Y .Marginal utility of X and Y are 3 and 4 respectively . Price of X and price of Y Rs.4 per unit . Is consumer equilibrium? What will he further reaction of the consumer? Give reasons.

Q21. A Consumer consumes only two goods X & Y . The marginal rate of substitution is 1. Prices of X and Y are Rs.3 & 4 per unit respectively . Is consumer equilibrium ? What will be further reaction of the consumer ? Give reasons.

Q22. A Consumer consumes only two goods X & Y .Marginal utility of each is 2 . Price per unit of X and Y is Rs.1 and 2 respectively. Is consumer equilibrium? What will he further reaction of the consumer ? Give reasons .

THEORY OF DEMAND

DEMAND – Demand refers to a commodity refers to the quantity that a consumer is willing and able to buy at a given price in the market, per time. (Desire + Sufficient Purchasing Power + Willingness to Spend + Time + Price)

Quantity Demand:- Refers to a specific quantity to be purchased against a specific price of the commodity.

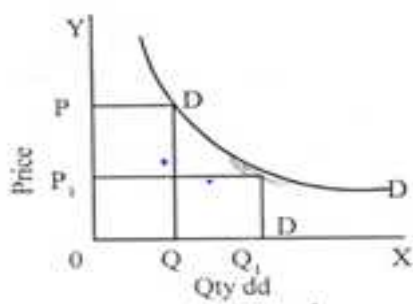
INDIVIDUAL DEMAND - It refers to the quantity of a commodity which an individual consumer is willing to buy at a given price at is given point of time.

INDIVIDUAL DEMAND SCHEDULE - It is table showing various level of quantity demanded of a product that an individual consumer is willing to buy corresponding to each

given level of price.

Price	Quantity Demand
1	5
2	4
3	3
4	2
5	1

INDIVIDUAL DEMAND CURVE :- Individual demand curve is a curve showing different quantities of a commodity that one particular buyer is ready to buy at different possible price of the commodity at a point of time.

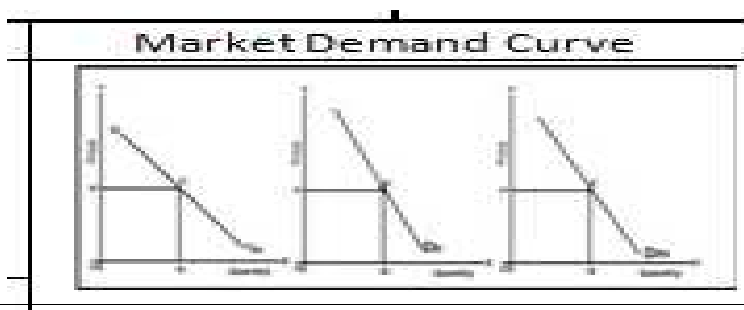


MARKET DEMAND - It refers to the sum total of the quantities demanded by all the individuals' households in the market at a given price and at a given point of time.

MARKET DEMAND SCHEDULE:- Table showing different quantity of commodity that all the consumer in the market are ready to buy at different possible price of the commodity at the point of the time.

Price	QD(consumer A)	QD(consumer B)	Market Demand
1	5	6	11
2	4	5	9
3	3	4	7
4	2	3	5
5	1	2	3

MARKET DEMAND CURVE :- It shows various quantities of a commodities that al the buyers in the market are ready to buy at different possible prices of the commodity at the point of the time.



DEMAND FUNCTION (DETERMINANTS OF DEMAND):-

(1) **Individual Demand Function :-** Individual demand determinants factor:

$$D_x = f(P_x, P_r, Y, T, E)$$

(i) **Own price of commodity (Px) :-** Other things being equal, with rise in on price of commodity , its demand contracts, and with a fall in its own price, the demand extends.

(ii) **Price of Related Goods (Pr) :- (a) Substitute Good:** - Substitute goods are those goods which can be interchanged for use. Increase in the price of one good causes increase in demand for other good. E.g., tea and Coffee **(b) Complementary Goods:-** Complementary goods are those goods which complete the demand for each other. Increase in the price of one good causes decrease in demand for other good. E.g:- Petrol and Car.

(iii) **Income of the consumer (Y):-** Change in the income of the consumer also influences his demand for different goods. **(a) Normal Good:-** Goods which are having positive relation with income. It means when income rises, demand for normal goods also rises.

(b) Inferior Goods:- Goods which are having negative relation with income. It means less demand at higher income and vice versa.

(iv) **Test and preferences:** The Demand for goods and services also depends on individual's tast and preferences.

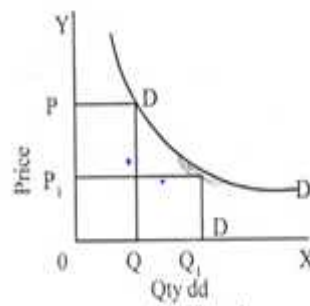
(V) **Expectations:** In consumer expects a significant change in the availability of the concerned commodity in the near future.

LAW OF DEMAND

Law of Demand – Other things remains constant, inverse relationship between price and quantity demanded and vice-versa. It means “Ceteris Paribus, when a product price increases, less quantity of it is demanded and vice-versa.

Demand schedule and Curve:

Price	Qx Unit
1	50
2	40
3	30
4	20
5	10



Assumptions of the law of demand :-

- (1) Tests and preferences of the consumers remain constant
- (2) Prices of the related goods do not change.

(3) There is no change in income of consumer.

(4) Consumer do not expect change in the availability of the commodity in the near future.

Exceptions of the law of demand:- (1)Articles of distinction: These goods are demanded only because their price are very high. If their prices fall, their demand will shrink.

(2) Giffen Goods: Geffen goods are highly inferior goods, showing a very high negative income effect Price of such commodity falls, their demand also falls.

(3) Irrational judgment: Law of demand fails when consumers judge the quality of a commodity by its price.

CHANGE IN QUANTITY DEMAND AND CHANGE IN DEMAND

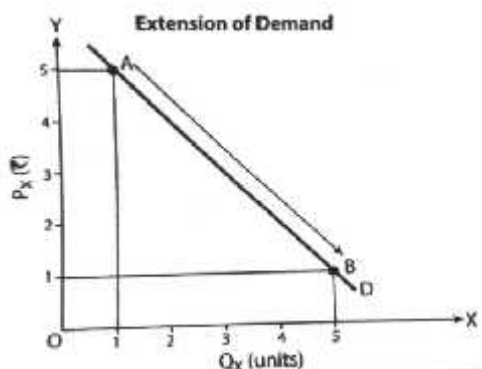
Changes in Demand:- They are of two types:

- 1) **Change in Quantity Demanded (Movement along the same demand curve)** :- When, due to change its own price alone, quantity demanded of a commodity changes. It is also called movement along with a demand curve. Increase in quantity demand do to fall in its own price is called Expansion of demand and decrease in quantity demand due to rise in its own price is called contraction of demand.
- 2) **Change in Demand (Shifts in demand)** :- In this case, the entire demand curve shift either upward or downward. This type of change takes place when quantity demanded change due to change in factor other than own price of the commodity. Due to change in other factor demand falls, it is called Decrease in demand and when demand rises, it is called Increases in demand.

Change in Quantity Demanded: -

Demand changes due to change in price of the commodity alone, other factors remain constant; are of two types;

A) **Expansion of demand** : Other things being equal, when quantity demanded increases due to a fall in own price of the commodity.

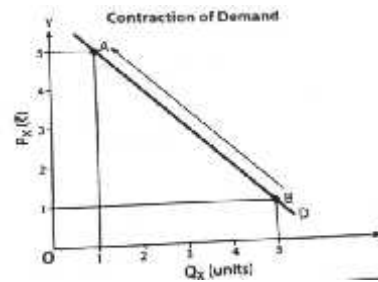


Px	Qx Unit
10	1
1	10

Contraction of demand: Other things being equal, when quantity demanded Decreases due to

A rise in own price of the commodity.

P_x	Q_x Unit
1	10
10	1



EXPANSION IN DEMAND	CONTRACTION IN DEMAND
1. When there is change in Quantity demanded due to fall in Price of its own.	1. When there is change in Quantity demanded due to rise in Price of its own.
2. In this situation consumer move downward on the same demand curve.	2. In this situation consumer move upward on the same demand curve.
3. It is known as “Change in Quantity Demanded”	3. It is known as “Change in Quantity Demanded”

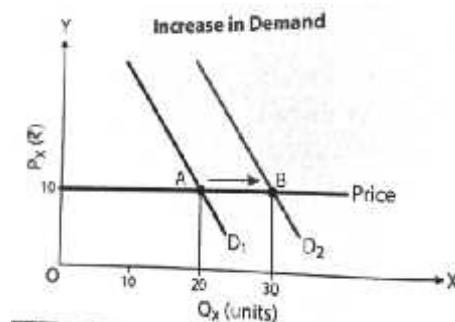
Change in Demand (Shifts in demand) (a) Increase in Demand (b) Decrease in demand

(a) **Increase in Demand:** - When more of commodity is purchased at its existing price, it is a situation of increase in demand or when quantity demanded of commodity increases because of the factors, other than ‘own price of commodity’

Causes of increase in demand [When Demand curve shifts forward]

1. Increase in Income
2. Increase in Price of Substitute
3. Decrease in Price of Complementary
4. Favorable Change in Taste and Preference;
5. Expectation to Rise in Price in Future
6. Favorable Change in Population
7. Favorable Change in Distribution of Income

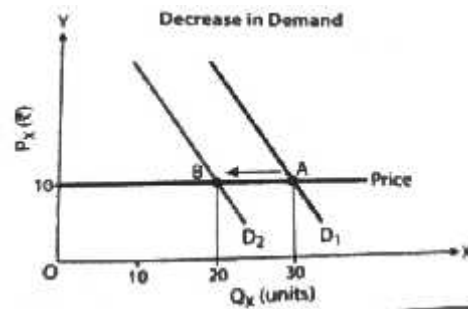
P_x	Q_x
10	10



10	20
----	----

(b) Decrease in demand: When less of commodity is purchased at its existing price, it is a situation of decrease in demand or when quantity demanded of commodity decreases because of the factors, other than 'own price of commodity'

P_x	Q_x
10	20
10	10



INCREASE IN DEMAND	DECREASE IN DEMAND
1. When change in demand due to rise in income, fall in price of comp. Goods, rise in price of substitute goods etc.	1. When change in demand due to fall in income, rise in price of comp. Goods, fall in price of substitute goods etc.
2. In this situation demand curve shift rightward.	2. In this situation demand curve shift leftward.
3. It is known as "Change in Demand"	3. It is known as "Change in Demand"

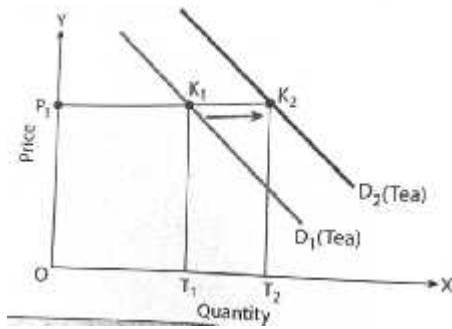
RELATED GOODS PRICE AND AFFECTS DEMAND FOR COMMODITY(CROSS PRICE EFFECTS)

- (1) Substitute goods
- (2) Complementary goods

(1) Substitute goods:- These are the goods which are the goods which can be used in place of each other in consumption e.g. tea and coffee.

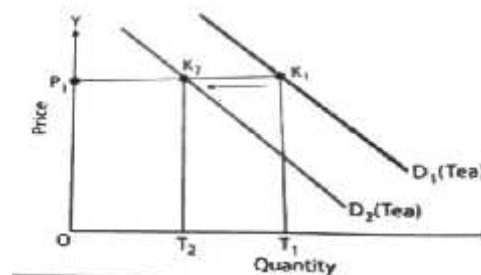
(i) Increase in price of Substitute good:- A rise in price of one good (e.g., Coffee) leads to an increase in demand of its substitute (e.g., Tea). This is because as price of coffee rises, its demand fall causing rise in demand of tea.

P_x	Q_x
10	10
10	20



(i) Decrease in price of Substitute good:- A fall in price of one good (e.g., Coffee) leads to fall in demand of its substitute (e.g., Tea). This is because as price of coffee falls, its demand rises causing fall in demand of tea.

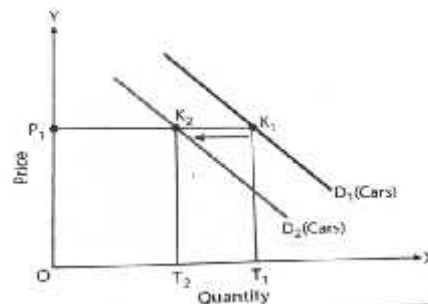
Px	Qx
10	20
10	10



(2) Complementary goods:- These are the goods which should be consumed together to obtain satisfaction e.g., Car and Petrol.

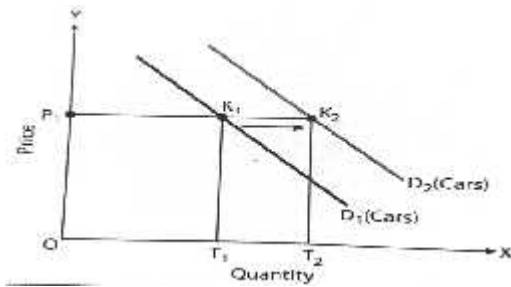
(i) Increase in price of Complementary goods:- With rise in price of complementary good (e.g., Petrol), the demand of the commodity (e.g., Car) falls. This is because of fall in demand of Petrol.

Px	Qx
10	20
10	10



(i) Decrease in price of Complementary goods :- With fall in price of complementary good (e.g., Petrol), the demand of the commodity (e.g., Car) increase. This is because of rise in demand of Petrol.

Px	Qx
10	10
10	20

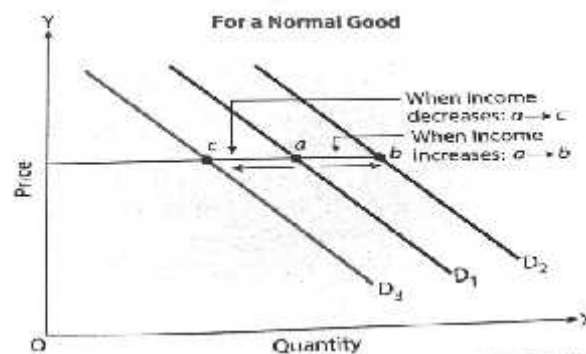


EFFECT OF CHANGE INCOME OF A CONSUMER ON DEMAND OF A COMMODITY:

- (1) Normal Goods
- (2) Inferior goods

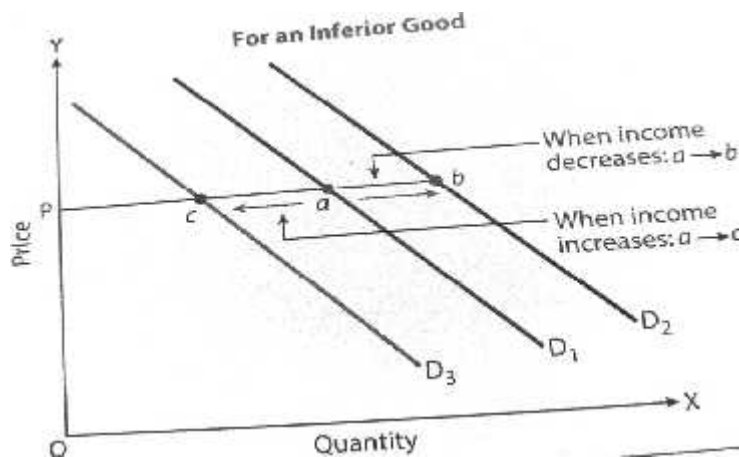
(1) **Normal Goods:** These are the goods, the demand for which increases as income of the buyers rises. There is a positive relationship between income and demand. Income of the buyers may increase or decrease .

- (i) **Increase in Income:** In a situation of increase in income, more of a (Normal) good is purchased even when its price is constant. This refers to situation of increase in demand.
- (ii) **Decrease in Income:** In a situation of decrease in income, less of a (Normal) good is purchased even when its price is constant. This refers to situation of decrease in demand.



(2) **Inferior Goods:** These are the goods, the demand for which decreases as income of the buyers rises. There is a inverse/ negative relationship between income and demand. Income of the buyers may increase or decrease .

- (iii) **Increase in Income:** In a situation of increase in income, less of the (Inferior) good is purchased .The consumer prefers to shift on to superior substitutes, because now he can afford them.
- (iv) **Decrease in Income:** In a situation of decrease in income, the consumer, already consuming an inferior good, is further compelled to depend on it. May be he has to further cut his consumption of superior substitute and buy more of the inferior goods.



PRICE ELASTICITY OF DEMAND

PRICE ELASTICITY OF DEMAND - Elasticity of demand refers to the degree of change in demand in response to a change in own price of the commodity.

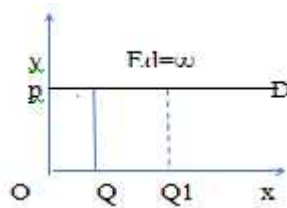
$$E_d = (-) \frac{\% \text{ change in Quantity demanded}}{\% \text{ change in price}} = (-) \frac{Q/Q \times 100}{P/P \times 100}$$

OR

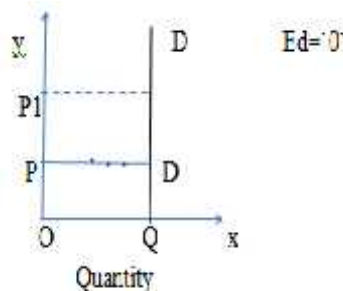
$$E_d = (-) \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

KINDS/DEGREES OF ELASTICITY OF DEMAND:- There are five main degrees of price elasticity of demand.

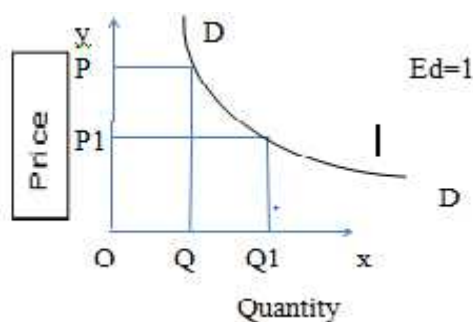
1. Perfectly Elastic Demand:- It refers to a situation when change in price of a commodity causes an infinite in its demand. Thus, small rise in price would lead to zero demand for the commodity.



2. Perfectly Inelastic Demand:- In this case, a change in price of the commodity causes no change in its quantity demanded.



3. **Unitary Elastic demand:-** In this case, percentage change in quantity demanded equal to percentage change in price of the commodity.



4. **Greater than Unitary Elastic demand:-** In this case, percentage change in quantity demanded is greater than percentage change in price of the commodity.
5. **Less than Unitary Elastic demand:-** In this case, percentage change in quantity demanded of a commodity is less than percentage change in price of the commodity.

FACTOR AFFECTING PRICE ELASTICITY OF DEMAND

1. Nature of commodity
2. Availability of substitutes
3. Proportion of income spent on a commodity
4. Habit of consumers
5. Time period
6. Multiple uses
7. Income level of the buyers
8. Price level

FACTORS AFFECTING ELASTICITY OF DEMAND		
<u>LESS ELASTIC DEMAND</u>	<u>FACTORS</u>	<u>HIGH ELASTIC DEMAND</u>
Necessities	NATURE OF COMMODITY	Luxurious
If not Available	AVAILABILITY OF SUBSTITUTE	If Available
Minor Part of Income	PORTION OF TOTAL EXPENDITURE	Major Part of Income
Habituated	HABITS	Not Habituated
Shorter	TIME PERIOD	Longer
Few / Single Use	USES OF COMMODITY	Many Uses
Very High / Low	LEVEL OF INCOME	Middle Income
Low Priced	LEVEL OF PRICE	High Priced

MCQ

1. How are goods X and Y related when, as a result of rise in price of good X, demand for good Y increases

- (a) Substitute good
- (b) Normal good
- (c) Complementary good
- (d) Inferior good

Ans: A

2. In case of normal goods, demand curve shows:

- (a) A negative slope
- (b) A positive slope
- (c) Zero slope
- (d) None of these

Ans: A

3. Inferior goods are those whose income effect is ;

- (a) Negative
- (b) Positive
- (c) Zero
- (d) None of these

Ans: A

4. Shift in demand curve means:

- (a) Fall in demand due to rise in own price of the commodity
- (b) Rise in demand due to fall in own price of the commodity
- (c) Change in demand due to factors other than the change in own price of the commodity
- (d) None of these

Ans: C

5. Which of the following pairs represents substitute goods:

- (a) Car and Petrol
- (b) Coffee and tea
- (c) Bread and butter
- (d) All of these

Ans: B

6. In case of Giffen's Paradox the slope of demand curve is

- (a) Negative
- (b) Positive
- (c) Parallel to X-axis
- (d) parallel to Y-axis

Ans: B

7. As a result of rise in consumer's income, demand curve for coarse grain:

- (a) Shift to the left
- (b) Shift to the right
- (c) Become a horizontal straight line
- (d) Becomes a vertical straight line

Ans: A

8. If two goods are complementary then rise in the price of one results in;

- (a) Rise in demand for the other
- (b) Fall in demand for the other
- (c) Rise in demand for both
- (d) None of these

Ans: B

9. When there is no change in quantity demanded in response to any change in price, It is a situation of :

- (a) Zero price elasticity
- (b) Infinite price elasticity
- (c) Unitary price elasticity
- (d) None of these

Ans: A

10. When total expenditure increases in response to decreases in the price of the commodity, the elasticity of demand is;

- (a) Greater than unitary
- (b) Less than unitary
- (c) Unitary
- (d) Infinity

Ans: A

11. $E_d > 1$ represent;

- (a) elastic demand
- (b) Less than unitary

(c) Unitary elastic demand (d) None of these

Ans;A

12. When demand curve is parallel to X-axis, elasticity of demand is:

- (a) Unitary (b) Zero
(c) Greater than unitary (d) Infinity

Ans: D

13. When percentage change in demand is less than percentage change in price, demand is;

- (a) Perfectly inelastic (b) Perfectly elastic
(c) More than unitary elastic (d) Less than unitary elastic

Ans;D

14. What will the elasticity of demand when demand curve is parallel to Y-axis

- (a) Unitary (c) Zero
(c) Less than unitary (d) More than unitary

Ans;C

15. What will be nature of the product whose Ed=0

- (a) Comfort good (b) Luxurious good
(c) Necessary good (d) All of these

Ans;C

Short and Long Answer Question(3,4 & 6 marks)

Q1. Explain the factors affecting the market demand of a commodity.

Ans :- i) **Meaning:** Market demand is the aggregates of the quantities demanded by all the consumers in the market at different prices.

ii) **Factors affecting market demand :**

- a) **Price of the commodity:** When the price goes up demand for it falls and vice-versa.
b) **Income of the consumers:** When the income of the consumers goes up the demand for a commodity also goes up.
c) **Price of related goods :**
 J Complementary goods :The demand for a commodity rises with a fall in the price of its complementary good (Car and petrol)
 J Substitute goods: Demand for a commodity falls with a fall in the price of other substitute good (Tea& Coffee).
d) **Tastes and preferences:** Any favourable change in consumers' tastes will lead to increase in market demand and any unfavourable change in consumers tastes will lead to decrease in market demand.
e) **Consumer's group:** More the consumers more will be market demand and vice-versa.

Q2. What is the relationship between slope and elasticity of a demand curve?

Ans :- The formula of $E_d = (-) \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

The formula for the slope of the demand curve is, slope = $\Delta P / \Delta Q$

The relationship between slope and elasticity of demand is $E_d = 1/\text{slope} \times P/Q$

Q3. Is the demand for the following elastic, moderate elastic, highly elastic? Give reasons.

- (i) Demand for petrol
(ii) Demand for text books
(iii) Demand for cars

(iv) Demand for milk

Ans :- i) Demand for petrol is moderately elastic , because when the price of the petrol goes up , the consumer will reduce the use of it.

ii) Demand for text books is completely inelastic. In case of text books, even a substantial change in price leaves the demand unaffected.

iii) Demand for cars is elastic. It is a luxury good, when the price of the car rises, the demand for the car comes down.

iv) Demand for milk is elastic, because price of the milk increases then the consumer purchase less quantity milk.

Q4. Price of the commodity X falls from Rs. 5 per unit to Rs. 4 per unit and the demand of the commodity rise from 4 units to 6 units. Calculate price elasticity of demand.

Sol.: $P = 5; P_1 = 4; \Delta P = -1$
 $Q = 4; Q_1 = 6; \Delta Q = 2$

$$Ed = (-) \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$Ed = (-) \frac{2}{-1} \times \frac{5}{4}$$

= 2.5 (greater than unity)

Q5. Explain the determinants or factors influence the Price elasticity of demand for a good.

1) Nature of a good: The demands for the goods, which are most essential for human survival or to satisfy the basic needs, are inelastic in demand, because the consumers are compelled to buy these goods without getting bothered about the changes in their price.

2) Proportion of income spent: The goods on which we spend smaller proportion of our income are inelastic in demand, b'coz the consumers do not bother about the change in their price.

3) Several uses of the good: The goods which have several uses like electricity, coal etc. have elastic demand as the rise in their price will compel the consumers to limit the use of these goods.

4) Future expectation of change in price: If there is an expectation of change in price, the demand for a good is either less responsive.

5) Availability of substitutes- Goods having substitutes are price elastic and vice versa.

6) Postponment of the use- Those goods whose use can be postponed for future are of price elastic demand and goods whose use cannot be postponed for future are of less price elastic demand.

7) Time period- Demand of commodity is less price elastic in short period and more price elastic in long period.

Q6. A consumer buys 80 units of a good at a price of Rs. 5/- per unit.

Suppose price elasticity of demand is (-) 2. At what price will he buy 64 units?

$$1. e_p = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

$$(-)2 = \frac{1}{P} \times \frac{5}{8}$$

$$2 = \frac{1}{\Delta P}$$

$$\Delta P = \frac{1}{2}$$

$$\zeta P = 0.5$$

New price – P + $\zeta P = 5 + 0.5 = \text{Rs } 5.5$ per unit.

Q7. Why does the demand curve slopes downward?

Ans. The demand curve slopes downward because of :- i) Law of diminishing marginal utility : According to this law, as a consumer in a given time, increases the consumption of a thing, the utility from each successive unit goes on diminishing. A Consumer gets maximum satisfaction. When the price of a commodity is equal to its marginal utility. As more units are bought, their marginal utility diminishes. Thus, a consumer will buy more units of a commodity, with fall in its price.

ii) Income effect : Change in the price of a commodity causes a change in the real income of the consumer. With fall in price, real income increases. The increased real income is used to buy more units of the commodity.

iii) Substitution effect : When the price of commodity X falls it becomes cheaper in relation to commodity. Accordingly, X is substituted for the commodity. A consumer in order to get more satisfaction, will buy more units of the commodity whose price has fallen in relation to the commodity.

iv) Uses of commodity : If a commodity has diverse uses, with the fall in the price of product consumer will buy more.

SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain the difference between an inferior good and a normal good.

Q2. Explain the relationship between :

- (i) Price of other goods and demand for given good.
- (ii) Income of the buyers and demand for the good.

Q3. How is demand for a good affected by the rise in the price of related goods ? Explain

Q4. What is market demand for a good ? Name the factor determining market demand.

Q5. What happens to the demand for a good when consumer's income changes? Explain .

Q6. Explain the effect of change in price related goods on demand for the given good .

Q7. Explain the effect of (a) change in own price ,and (b) change price of substitute on demand for a good .

Q8. Distinguish between individual's demand and market demand . Name the factors affecting demand for a good by an individual . (AI 2016)

Q9. Explain the effects of change in income of consumer on demand for a good .

Q10. Why is there an inverse relationship between price and quantity demanded of a commodity ?

Q11. Give four causes of rightward shift (increase in demand) in demand curve of a commodity

Q12. Give four causes of leftward shift (decrease in demand) in demand curve of a commodity

Q13. Distinguish between ' change in quantity demand' (movement)and 'change in demand ' (shift) of a commodity. Use diagrams.

Q14. Explain the law of demand with the help of schedule and diagram . State its exceptions.

ELASTICITY OF DEMAND

Q1. Explain any two factors that affect the price elasticity of demand. Give suitable examples.

Q2. The demand for a good is - 0.4 . If its price increases by 5 percent, by what percentage will its demand fall ? Calculate.

Q3. A 5 per cent fall in the price of a good raises its demand from 300 units to 318 units . Calculate its price elasticity of demand .

Q4 . Price elasticity of demand of a good is – 0.75. calculate the percentage fall in its price that will result in 15 per cent rise in its demand.

Q5. A consumer buys 18 units of good at a price of Rs. 9 per unit. The price elasticity of demand for the good is (-)1 . How many units consumer will buy at a price of Rs. 10 per unit ? calculate.

Q6. When the price of a good falls from Rs. 10 to Rs. 8 per unit, its demand rises from 20 units to 24 units. What can you say about price elasticity of demand of the good through the "expenditure " approach.

Q7. When the price of a good rises from Rs. 10 to Rs. 12 per unit, its demand falls from 25 units to 20 units. What can you say about price elasticity of demand of the good through the "expenditure " approach.

Q8. When the price of a good falls from Rs. 15 to Rs. 12 per unit, its demand rises by 25 per cent. Calculate price elasticity of demand.

Q8. . Price elasticity of demand of two good A & B is (-)3 and (-) 4 respectively. Which of the two goods has higher elasticity and why ?

Q9. A consumer spends Rs.60 on a good priced at Rs.5 per unit . When price falls by 20per cent, the consume continues spend Rs. 60 on the good . Calculate price elasticity demand by percentage method.

Q10 . A consumer spends Rs.1000 on a good priced at Rs.10 per unit . When price falls by 20per cent, the consume spend Rs. 800 on the good . Calculate price elasticity demand by percentage method.

Q11 . A consumer spends Rs.400 on a good priced at Rs.8 per unit . When price rises by 25per cent, the consume spend Rs. 500 on the good . Calculate price elasticity demand by percentage method.

Q12. A consumer spends Rs.400 on a good priced at Rs.4 per unit . When price rises by 25per cent, the consume continues spend Rs. 400. Calculate price elasticity demand by percentage method.

Q13. Price elasticity of demand of two good- X is (-)2 and good - Y is (-)3 . Which of the two more elastic and why ?

Q14. Price elasticity of demand of two good X & Y are Zero and (-) 1 respectively. Which of the two is more elastic and why ?

Q15. What will be the effect of 10 per cent rise in price of a good on its demand if Price elasticity of demand is (a) Zero, (b)-1, (c) -2 .

Q16. State the geometric method of measuring price elasticity of demand.

Q17. Explain the factors affecting the magnitude of price elasticity of demand.

UNIT-3 **PRODUCTION FUNCTION**

PRODUCTION FUNCTION

The production is purely a technical relationship between physical input and physical output of a firm.

$$Q = f(L, Lr, C, E).$$

L = Land; Lr = Labour; C = Capital; E = Entrepreneur.

Fixed and Variable Factors

Factors of production are classified as:

- (i) Fixed factors
- (ii) Variable factors

- (ii) **Fixed Factor:** The factor whose quantity remains fixed with the level of output.
 (iii) **Variable Factor:** Those inputs which change with the level of output.

Difference between Short Run & long Run

Basis	Short Run	Long Run
Meaning	Only variable factors are changed	All factors are changed
Price Determination	Demand is active.	Both demand & supply play an important role.
Classification	Factors are classified as fixed & variable.	All factors are variable.

SHORT PERIOD AND LONG PERIOD PRODUCTION FUNCTION

SHORT PERIOD PRODUCTION FUNCTION	LONG PERIOD PRODUCTION FUNCTION
1. Time period which is less than the minimum period required for the change of inputs.	1. Time period, which is long enough to change all the inputs?
2. Some inputs are variable	2. All inputs are variable
3. Production can be changed only up to level of production by changing variable production.	3. Production can be changed by changing scale or changing all inputs simultaneously.
4. Entry and exit is restricted of New firm in industry.	4. Entry and exit is not restricted of New firm in industry.

TOTAL, MARGINAL AND AVERAGE PRODUCTION OF THE VARIABLE

FACTOR

TOTAL PRODUCT – The Aggregate quantity of a product by a firm with the help of a specific input combination (one variable and other fixed) is called the firm's total product.

$$TP = MP \quad TP = AP \times \text{No of Variable Fact}$$

AVERAGE PRODUCT – AP is defined as the output per unit of variable input. It is obtained by dividing Total Product by the quantity of variable factor.

$$AP = TP / \text{Unit of Variable Factor}$$

MARGINAL PRODUCT – It is defined as change in total product when an additional unit of Variable factor get employed, keeping other factors fixed.

$$MP_n = TP_n - TP_{n-1}$$

$$MP = \frac{TP}{\text{Variable}}$$

LAW OF VARIABLE PROPORTION OR RETURNS TO A VARIABLE FACTOR

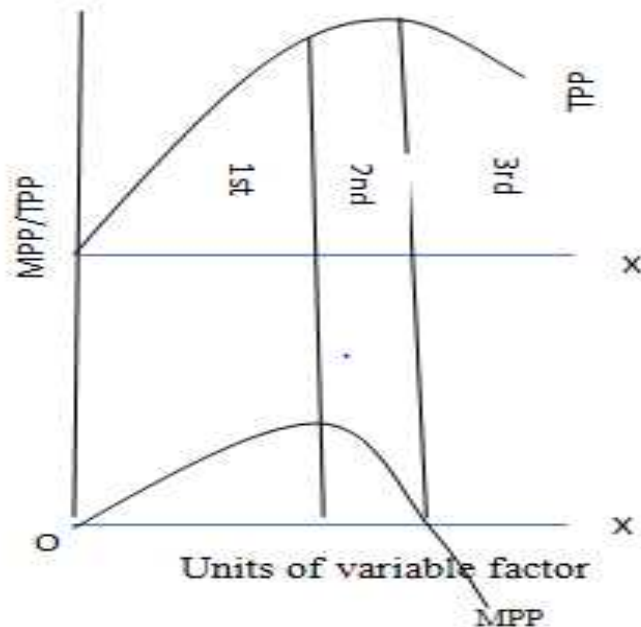
Statement of law of variable proportion: In short period, when only one variable factor is increased, keeping other factors constant, the total product (TP) initially increases at an increasing rate, then increases at a decreasing rate and finally TP decreases.

MPP initially increase then falls but remains positive then 3rd phase becomes negative.

Explanation of law of variable proportion with a schedule and a diagram

Schedule of Law of variable proportion

Fixed factor	Variable factor	Total product	Marginal product	Phase
Land in acres	Labour	Units	Units	Phase
5	0	0	-	I - Increasing returns to a factor
5	1	5	5	
5	2	15	10	
5	3	30	15	
5	4	40	10	II – diminishing returns to a factor
5	5	45	5	
5	6	45	0	
5	7	40	-5	III - Negative returns to a factor



Phase I / Stage I / Increasing returns to a factor.

-) TPP increases at an increasing rate
-) MPP also increases.

Phase II / Stage II / Diminishing returns to a factor

-) TPP increases at decreasing rate
-) MPP decreases / falls
-) This phase ends when MPP is zero & TPP is maximum

Phase III / Stage III / Negative returns to a factor

-) TPP diminishes / decreases
-) MPP becomes negative.

Behavior of Total Product	TP increases With increases rate.	TP increases with diminishing rate.	TP Maximum	TP starts falling
Behavior of Marginal Product	MP Increases	MP decreases	MP becomes zero	MP becomes negative
Behavior of Average Product	AP increases	AP increases and intersects MP and then starts falling.	AP decreases	AP decreases
Stages of Production	Increasing Returns to a Factor	Increasing Returns to a Factor	Constant Returns to a Factor	Negative Returns to a Factors

SHORT RUN PRODUCTION FUNCTION – LAW OF VARIABLE PROPORTION

Causes of Increasing Returns to a factor:-

1. Better utilization of underutilized fixed factors.
2. Labour division benefits.
3. Efficient use / utilization of variable factor.
4. Better coordination

Causes of Diminishing Returns to a factor:-

1. Inadequate factor proportion.
2. Optimum combination.
3. Imperfect substitution of factors
4. Poor Coordination

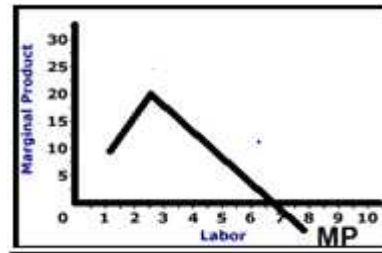
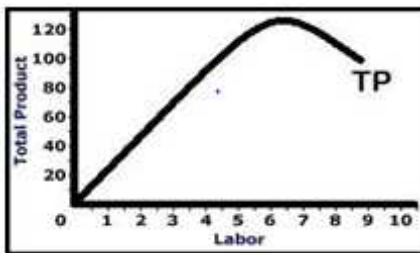
5. Over utilization of Factor

Reasons for negative returns to a factor

1. Limitation of fixed factors
2. Poor coordination between variable and fixed factor
3. Decrease in efficiency of variable factors.

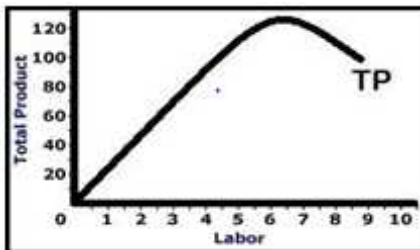
Relation between MP(MPP) and TP(TPP):

1. As long as MPP increases, TPP increases at an increasing rate.
2. When MPP decreases, TPP increases diminishing rate.
3. When MPP is Zero, TPP is maximum.
4. When MPP is negative, TPP starts decreasing.



Relation between TP(TPP) and AP:

1. When TP Increases at increasing rate, AP rises.
2. When TP begins to rise at diminishing rate, AP is maximum and constant
3. When TP increases at diminishing rate, AP falls.
4. When TP is maximum and constant, AP falls.
5. When TP decreases, AP continues to fall.



MCQs

1. When MP is zero, what will happen to TP?

a) rising	b) falling
c) maximum	d) none of these

Ans . c) maximum
2. Identify the phase in which TP increases at an increasing rate and MP also increases.

(a) increasing return to a	b-diminishing return to a factor
----------------------------	----------------------------------

(c) negative return to a factor d-none of these

Ans. a) increasing return to a factor

3. What happens to AP when MP is more than AP?

- a) AP rises b) AP falls
c) AP remains constant d) none of these

Ans. a) AP rises

4. Which of the following is not a reason for operation of increasing return to a factor?

- a) better utilization of fixed factor b) limitation of fixed factor
c) increase in efficiency of variable factor d) indivisibility of fixed factor

Ans. b) limitation of fixed factor

5. At the point of inflexion:

- a) TP is maximum b) AP is
(c) M P is maximum d) MP is zero

Ans. (c) M P is maximum

6. Product per unit labour employed is termed as

- a) average product b) marginal product c)
total product d) none of these

Ans. a) average product

7. Average product cannot be negative because.....

- a) TP can never be zero b) TP can never be negative
c) neither a nor b d) both a and b

Ans. b) TP can never be negative

8. Which one of the followings is correct?

- a) When MP is positive and falling, TP rises at decreasing rate b)
When MP is rising TP rises at an increasing rate
c) When MP is negative and falling, TP falls
d) All of these

Ans. d) All of these

9. Which of the followings is not a phase in the law of variable proportions?

- a) increasing return to a factor b) constant return to a factor
c) diminishing return to a factor d) negative return to a factor

Ans. b) constant return to a factor

10. The total output generated by the first four units of variable input is 100 units, 180 units, 280 units and 480 units. The marginal product of the third unit of input is.....

- a) 80 units b) 100 units c)
120 units d) 180 units

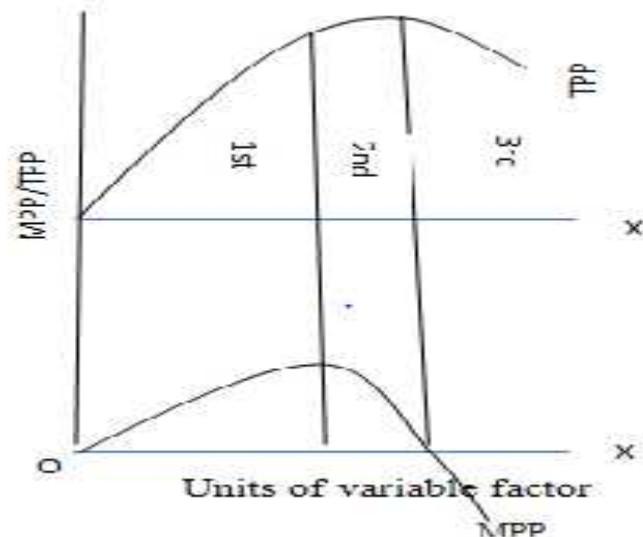
Ans. b) 100 units

SHORT & LONG ANSWER TYPES QUESTION

Q1. State the different phases of change in total production to the law of variable proportions. Use diagram.

Ans.- **law of variable proportion:** In short period, when only one variable factor is increased, keeping other factors constant, the total product (TP) initially increases at an increasing rate, then increases at a decreasing rate and finally TP decreases.

MPP initially increase then falls but remains positive then 3rd phase becomes negative. Total product and marginal product curves:



Phase I / Stage I / Increasing returns to a factor.

-) TPP increases at an increasing rate
-) MPP also increases.

Phase II / Stage II / Diminishing returns to a factor

-) TPP increases at decreasing rate
-) MPP decreases / falls
-) This phase ends when MPP is zero & TPP is maximum

Phase III / Stage III / Negative returns to a factor

-) TPP diminishes / decreases
-) MPP becomes negative.

Q2. Complete the following table:

Unit	Average Productio	Marginal Product
1	16	-
2	20	-
3	-	20
4	18	-
5	-	8

6	14	-
---	----	---

Ans:

Unit	Average Product	Marginal Product	Total Production
1	16	16	16
2	20	24	40
3	20	20	60
4	18	12	72
5	16	8	80
6	14	4	84

Q3. Giving reasons, state whether the following statements are true or false:

- (i) **Average product will increase only when marginal product increases.**
- (ii) **Under diminishing returns to factor, total product continues to increase till marginal product reaches Zero.**

Ans. (i) The statement is false. Average product can rise even when MP falls.

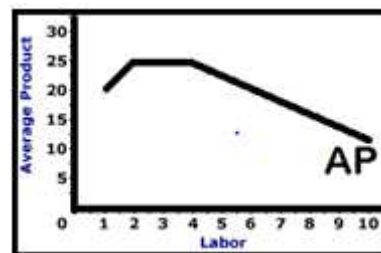
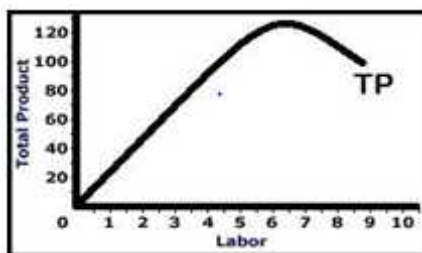
(ii) The statement is true. Under diminishing returns to a factor, MP tends to fall.

Falling MP implies that TP increases at a diminishing rate. TP is maximum when MP= 0

Q4. Explain the relationship between TP and AP with the help of a diagram.

Ans. Relation between TP(TPP) and AP:

1. When TP Increases at increasing rate, AP rises.
2. When TP begins to rise at diminishing rate, AP is maximum and constant
3. When TP increases at diminishing rate, AP falls.
4. When TP is maximum and constant, AP falls.
5. When TP decreases, AP continues to fall.



Q5. What are the different phases in law of variable proportions, in terms marginal product ? Give reasons behind each phase.

Ans. Different phases in law of variable proportions, in terms marginal product

Phase I - Increasing returns to a factor.

) TPP increases at an increasing rate

) MPP also increases.

Phase II - Diminishing returns to a factor

) TPP increases at decreasing rate

) MPP decreases / falls

) This phase ends when MPP is zero & TPP is maximum

Phase III Negative returns to a factor

) TPP diminishes / decreases

) MPP becomes negative.

Reasons Behind Each Phase

Reasons of Increasing Returns to a factor:-

1. Better utilization of underutilized fixed factors.
2. Labour division benefits.
3. Efficient use / utilization of variable factor.
4. Better coordination

Reasons of Diminishing Returns to a factor:-

1. Inadequate factor proportion.
2. Optimum combination.
3. Imperfect substitution of factors
4. Poor Coordination
5. Over utilization of Factor

Reasons for negative returns to a factor

1. Limitation of fixed factors
2. Poor coordination between variable and fixed factor
3. Decrease in efficiency of variable factors.

SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain the law of variable proportions with the help of total product and marginal product curves.

Q2. Complete the following table:

Unit	Average Productio	Marginal Product
1	8	-
2	10	-
3	-	10
4	9	-
5	-	4
6	7	-

Q3. Giving reasons, state whether the following statements are true or false:

- (iii) Average product will increase only when marginal product increases.
- (iv) Under diminishing returns to factor, total product continues to increase till marginal product reaches Zero.

Q4. Explain the behavior of marginal product in the law of variable proportions. Explain the causes of the behavior.

Q5. State the different phases of change in total product according to the law of variable proportions. Use diagram.

Q6. What are the different phases in law of variable proportions in terms of total product? Give reasons behind each phase. Use diagram.

Q7. What are the different phases in law of variable proportions in terms of marginal product? Give reasons behind each phase. Use diagram.

Q9. Define production function. Distinguish between short run and long run production functions. (OR) How 'returns to a factor' is different from 'returns to scale'?

Q10. Define marginal product. State the behavior of marginal product when only one input is increased and other inputs are held constant.

Q11. What type of production function is this in which only one input is increased and others kept constant? State the behavior of total product in this production function. (F 2016)

Q12. Explain the relationship between AP and MP with the help of a diagram.

UNIT-3 COST

'Cost refers to the expenditure incurred by a producer on the factor as well as non-factor inputs for a given output of a commodity'.

Explicit cost : Actual payment made on hired factors of production. It is opportunity cost of purchasing inputs from the market. For example wages paid to the hired labourers, rent paid for hired accommodation, cost of raw material etc.

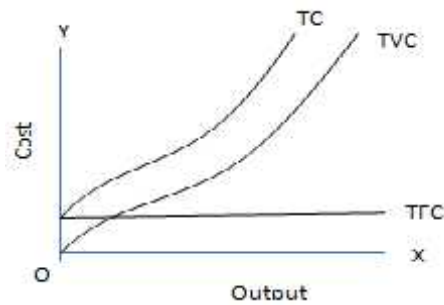
Implicit cost : Cost incurred on the self - owned factors of production. It is opportunity cost of using self owned inputs. For example, interest on owners capital, rent of own building, salary for the services of entrepreneur etc.

Opportunity cost : is the cost of next best alternative foregone / sacrificed.

Money cost: Money expenses incurred by a firm for producing a commodity or service.

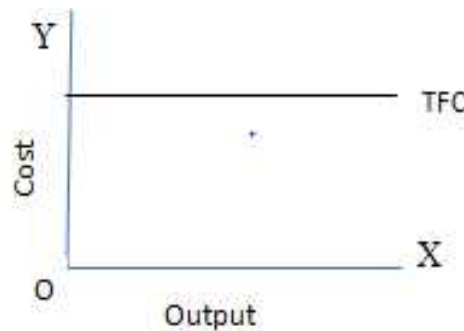
1. Total Cost:- The sum total of expenditure incurred by the firm in production of a given quantity of commodity.

$$TC = TVC + TFC$$



(a) **Fixed Cost (Total fixed/ Indirect cost) :-** Fixed cost refer to the cost which are incurred on the fixed factors of production. These costs remain fixed whatever may be the scale of output. These costs are present even when the output is zero. These costs are present in short run but disappear in the long run.

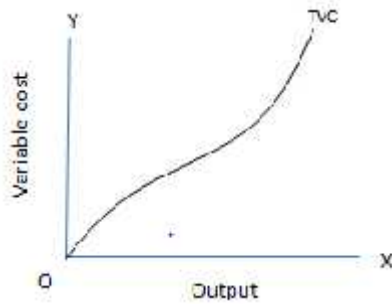
Output	0	1	2	3	4	5
TFC Rs	10	10	10	10	10	10



(b) **Variable Cost (Total Variable / Prime cost/ Direct cost):** TVC or variable cost – are those costs which vary directly with the variation in the output. These costs are incurred on the variable factors of production.

These costs are also called “prime costs”, “Direct cost” or “avoidable cost”. These costs are zero when output is zero.

Output	0	1	2	3	4	5
TVC	0	10	16	25	38	55

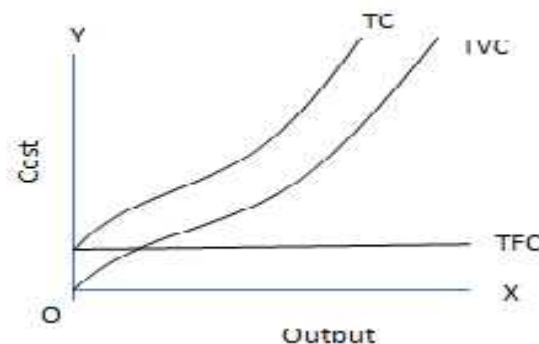


Difference between TVC & TFC

Basis	TVC	TFC
Meaning	Do not vary with the level of output	Vary with the level of output
Time period	Remain fixed in short period	Can be changed in short period
Cost at zero output	Can never be zero	Zero
Factors of production	Cost incurred on fixed factors of production	Cost incurred on all variable factors
Shape of the cost curve	Parallel to x axis	Upward sloping

Relation between TC, TFC and TVC

- (i) Total cost can never be zero, even when the level of output is zero, because fixed cost is positive and constant at zero level of output.
- (ii) As the level of output increases, total cost also increases due to increase in variable cost
- (iii) TFC is horizontal to x axis.
- (iv) TC and TVC are S shaped (they rise initially at a decreasing rate, then at a constant rate & finally at an increasing rate) due to law of variable proportions.
- (v) At zero level of output TC is equal to TFC.
- (vi) TC and TVC curves parallel to each other.



Output(Units)	Total Fixed Cost	Total Variable Cost	Total Cost
0	10	0	10

1	10	10	20
2	10	18	28
3	10	24	34
4	10	28	38
5	10	32	42
6	10	38	48
7	10	46	56
8	10	62	72

2. Average Cost (Average Total Cost): AC is the cost per unit of output produced.

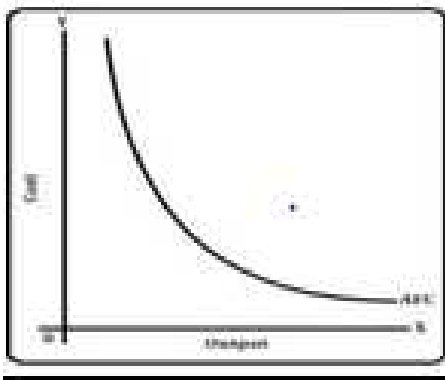
$$ATC = TC/Q$$

$$TC = AFC + AVC$$

(a) **Average fixed cost** It is the fixed cost per unit of output. AFC continuously decreases with increase in output as TFC is remain constant. Its shape is rectangular hyperbola.

$$AFC = TFC / Q \text{ or output}$$

AFC declines with every increase in output. It's a rectangular hyperbola. It goes very close to x axis but never touches the x axis as TFC can never be zero.



Unit	TFC	AFC
1	10	10
2	10	5
3	10	3.3
4	10	2.5

(b) **Average variable cost** : Average variable is the cost per unit of the variable cost of production.

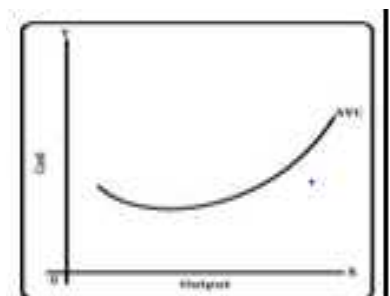
$$AVC = TVC / \text{output.}$$

AVC falls with every increase in output initially. Once the optimum level of output is reached AVC starts rising. Average total cost (ATC) or Average cost (AC) : refers to the per unit total cost of production.

$$ATC = TC / \text{Output}$$

$$AC = AFC + AVC$$

axis as TFC can never be zero.



Unit	TVC	AVC
1	10	10
2	18	9
3	24	8
4	28	7

Phases of AC

I phase: When both AFC and AVC fall , AC also fall

II phase: When AFC continue to fall , AVC remaining constant AC falls till it reaches minimum.

III phase: AC rises when rise in AVC is more than fall in AVC.

Important observations of AC , AVC & AFC

1. AC curve always lie above AVC (because AC includes AVC & AFC at all levels of output).
2. AVC reaches its minimum point at an output level lower than that of AC because when AVC is at its minimum AC is still falling because of fall in AFC.
3. As output increases, the gap between AC and AVC curves decreases but they never intersect.

Marginal Cost :- ‘Marginal cost is the addition to total cost due to the addition of one unit of output’.

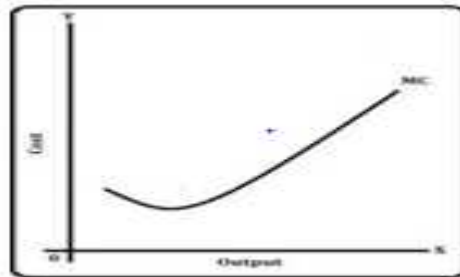
$$MC_n = TC_n - TC_{n-1}$$

$$MC = TC / Q$$

Note : MC is not affected by TFC.

Output(Units)	Total Fixed Cost	Total Variable Cost	Total Cost	Marginal Cost
0	10	0	10	-
1	10	10	20	10
2	10	18	28	8
3	10	24	34	6
4	10	28	38	4
5	10	32	42	4
6	10	38	48	6

7	10	46	56	8
8	10	62	72	16

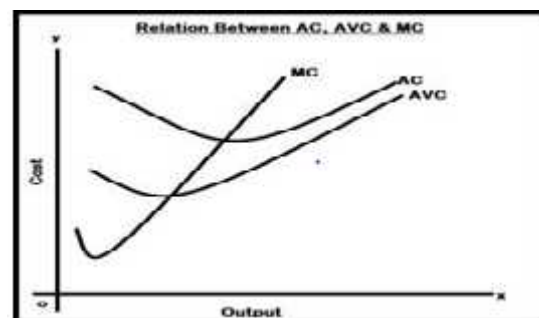


Relationship between AC and MC

1. Both AC & MC are derived from TC
2. Both AC & MC are “U” shaped (Law of variable proportion)
3. When AC is falling MC also falls & lies below AC curve.
4. When AC is rising MC also rises & lies above AC
5. MC cuts AC at its minimum where $MC = AC$

Relation Ship Between (AC), (AVC) and (MC)

1. When AC and AVC declines, MC declines faster than AC and AVC. So that MC curve Remain below AC curve and AVC curve.
2. When AVC increases, MC increases faster than AVC. So that MC is above AVC curve.
3. When AC increases, MC increases faster than AC. So that MC is above AC curve.
4. Since MC declines faster than AC and AVC its reaches its lowest point earlier than AC and AVC. So that MC starts rising even AC and AVC is falling.
5. MC must cut AC and AVC from its lowest point.



Relationship between Total Cost (TC) and Marginal Cost (MC)

1. When MC is falling, TC/TVC increases at a diminishing rate.
2. When MC is minimum, TC/TVC stops increasing at a diminishing rate.
3. When MC is rising, TC/TVC increases at an increasing rate.

Important formulae at a glance

- J $TFC = TC - TVC$ or $TFC = AFC \times \text{output}$ or $TFC = TC$ at zero output.
- J $TVC = TC - TFC$ or $TVC = AVC \times \text{output}$ or $TVC = MC$
- J $TC = TVC + TFC$ or $TC = AC \times \text{output}$ or $TC = MC + TFC$
- J $MC_n = TC_n - TC_{n-1}$ or $MC_n = TVC_n - TVC_{n-1}$
- J $AFC = TFC / Q(\text{Output})$ or $AFC = AC - AVC$ or $ATC - AVC$
- J $AVC = TVC / Q(\text{Output})$ or $AVC = AC - AFC$
- J $AC = TC / Q(\text{Output})$ or $AC = AVC + AFC$

Question:- Complete the following

Output(Units)	TVC(Rs.)	AVC(Rs.)	MC(Rs.)
1	20	-	-
2	-	16	12
3	54	-	-
4	-	20	26

TVC: 20,32,54,80 AVC: 20,16,18,20 MC: 20,12,22,26

Question: Numerical: From the following data on the cost of production of a firm, calculate TFC, AFC, TVC, AVC and MC;

Output(Kg.)	TC(Rs.)
0	60
1	80
2	100
3	111
4	116
5	130
6	150

Ans. TFC: 60 at every level, AFC: , 60, 30, 20,15,12,10
 TVC: 20,40,51,56,70,90 AVC:-,20,20,17,14,14,15
 MC: 20,20,11,5,14,20

MCQ

Q1. Total cost at zero level of output will be :

- (a) TFC
- (b) TVC
- (c) AC
- (d) AFC

Q2. MC curve is _____ shaped.

- (a) L-shaped
- (b) Straight line
- (c) U-shaped
- (d) Inverse S shaped

Q3. Average fixed cost is indicated by:

- (a) Rectangular hyperbola
- (b) A straight line parallel to X-axis

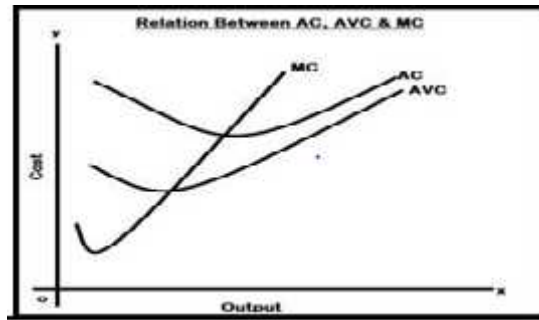
- (c) A straight line parallel to Y-axis (d) U-shaped curve
- Q4. Which of the following indicates fixed cost?
- (a) Electricity bill (b) Expenses on raw material
(c) Wages of daily workers (d) **Interest on fixed capital**
- Q5. When production is zero, total cost will be;
- (a) Zero (b) Equal to variable cost
(c) **Equal to total fixed cost** (d) Equal to marginal cost
- Q6. When MC curve cuts AC curve:
- (a) **AC = MC** (b) AC = MC
(c) AC > MC (d) Both AC and MC are falling
- Q7. When production level is zero, then fixed cost is;
- (a) Zero (b) Negative
(c) **Positive** (d) equal to variable cost
- Q8. AC, AVC and MC curves are 'U' shaped because of :
- (a) Law of Diminishing Marginal Utility (b) **Law of Variable Proportions**
(c) Law of Diminishing Return (d) None of these
- Q9. When AC is rising, MC curve is
- (a) Equal to AC (b) **More than AC**
(c) Less than AC (d) Constant
- Q10. Which cost refers to actual payment made by the entrepreneur to the providers of factor services;
- (a) **Explicit cost** (b) Implicit cost
(c) Variable cost (d) fixed cost

SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain the relationship between Average cost, marginal cost and average variable cost

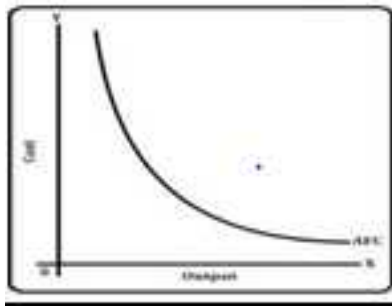
Ans. Relation Ship Between (AC), (AVC) and (MC)

1. When AC and AVC declines, MC declines faster than AC and AVC. So that MC curve Remain below AC curve and AVC curve.
2. When AVC increases, MC increases faster than AVC. So that MC is above AVC curve.
3. When AC increases, MC increases faster than AC. So that MC is above AC curve.
6. Since MC declines faster than AC and AVC its reaches its lowest point earlier than AC and AVC. So that MC starts rising even AC and AVC is falling.
7. MC must cut AC and AVC from its lowest point.



Q2. What is the behavior of (a) average fixed cost, and (b) average variable cost as more and more unit of good are produced?

Ans. (a) As more and more unit of good are produced, AFC goes on diminishing with every increase in output. It's a rectangular hyperbola. It goes very close to x axis but never touches the x axis as TFC can never be zero.



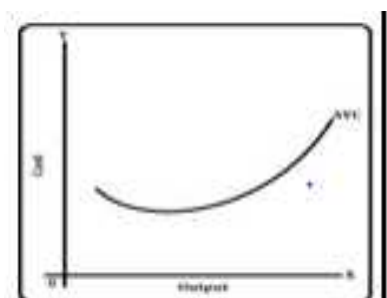
Unit	TFC	AFC
1	10	10
2	10	5
3	10	3.3
4	10	2.5

(b) Average variable cost : As more and more unit of good are produced, AVC initially falls, subsequently stabilises, and ultimately tends to rise, due to increasing and diminishing returns to a factor.

$$ATC = TC / \text{Output}$$

$$AC = AFC + AVC$$

axis as TFC can never be zero.



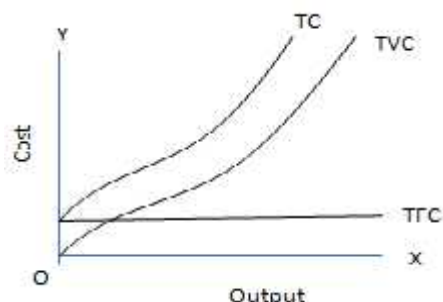
Unit	TVC	AVC
1	10	10
2	18	9
3	24	8
4	28	7
5	38	7.6

Q3. With the help of suitable diagram, explain the relationship between TC, TFC and TVC.

Ans. Relation between TC, TFC and TVC

- (i) Total cost can never be zero, even when the level of output is zero, because fixed cost is positive and constant at zero level of output.

- (ii) As the level of output increases, total cost also increases due to increase in variable cost
- (iii) TFC is horizontal to x axis.
- (iv) TC and TVC are S shaped (they rise initially at a decreasing rate, then at a constant rate & finally at an increasing rate) due to law of variable proportions.
- (v) At zero level of output TC is equal to TFC.
- (vi) TC and TVC curves parallel to each other.



Q4. Distinguish between explicit cost and implicit cost.

Ans. **Explicit cost:** Actual payment made on hired factors of production. It is opportunity cost of purchasing inputs from the market. For example wages paid to the hired labourers, rent paid for hired accommodation, cost of raw material etc.

Implicit cost : Cost incurred on the self - owned factors of production. It is opportunity cost of using self owned inputs. For example, interest on owners capital, rent of own building, salary for the services of entrepreneur etc.

Q5. Complete the following table:

Unit (Output)	Average Variable Cost(Rs.)	Total Cost (Rs.)	Marginal Cost (Rs.)
1	-	50	20
2	18	-	-
3	-	-	18
4	20	110	-
5	22	-	-

Sol.

Unit (Output)	AVC	TC	MC	TVC	TFC
1	20	50	20	20	30
2	18	66	16	36	30
3	18	84	18	54	30
4	20	110	26	80	30
5	22	140	30	110	30

Q6. The Following table shows the MC at different levels of output by a firm. Its TFC is Rs. 120. Find ATC and AVC at each level of output.

Output	1	2	3
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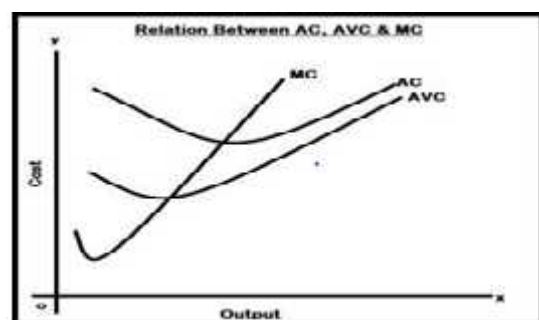
Marginal cost	40	30	26
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SOL.

Output	MC	TFC	TVC	TC	ATC	AVC
0	-	120	0	120	-	0
1	40	120	40	160	160	40
2	30	120	70	190	95	35
3	26	120	96	216	72	32

Q7. Draw average total cost, average variable cost and marginal cost curve in a single diagram.

Ans: single Diagram of ATC (AC), AVC and MC



SHORT & LONG ANSWER TYPES QUESTION

Q1. Complete the following table :

Output	Average cost	Marginal cost
1	12	-
2	10	-
3	-	10
4	10.5	-
5	11	-
6	-	17

Q2. With increase in level of output, average fixed cost goes on falling till it reaches Zero. Is it true? Give reason for your answer.

Q3. Explain the relationship between marginal cost and average variable cost.

Q4. Explain the relationship between marginal cost and average cost.

Q5. Show with the help of a numerical example that average cost is constant when marginal cost equal to it .

Q6. What is the behavior of average fixed cost as a output is increased? Why is it so?

Q7. State the relationship between total cost and marginal cost.

Q8. What is the behavior of (a) average fixed cost, and (b) average variable cost as more and more unit of good are produced?

Q9. What is the relationship between marginal cost and average variable cost when marginal cost is rising and average variable cost is falling?

Q10. Define cost. Distinguish between fixed and variable cost. Give one example of each.

Q11. Define fixed cost. Give example. Explain with reason the behavior of average fixed cost as output increases.

Q12. Define cost. State the behavior of (a) total fixed cost, and (b) total variable cost as output is increased.

Q13. A producer starts a business by investing his own savings and employs a manager to look after it.

Identify implicit and explicit costs from this information. Also, give reasons.

Q14. With the help of a suitable diagram, explain the relationship between TC, TFC and TVC.

Q15. Draw average total cost, average variable cost and marginal cost curves in a single diagram.

Q16. State whether the following statements are true or false. Give reasons for your answer:

- (i) Average cost can fall even when marginal cost is rising.
- (ii) The difference between average total cost and average variable cost is constant.
- (iii) As output is increased, the difference between average total cost and average variable cost falls and ultimately becomes zero.
- (iv) AVC can fall only when MC is falling.
- (v) The difference between total cost and total variable cost rises with increase in output.
- (vi) When MC rises, AVC also rises.

CONCEPT OF REVENUE

Revenue: Money received by a firm from the sale of a given output in the market.

$$\text{Revenue} = \text{Cost} + \text{Profit} \quad (\text{Profit} = \text{Revenue} - \text{Cost})$$

TOTAL REVENUE, MARGINAL REVENUE AND AVERAGE REVENUE

Total Revenue: 'TR refers to money receipts of a firm from the sale of its total output'.

$$\text{TR} = \text{Quantity sold} \times \text{Price} \quad (\text{or}) \quad \text{output sold} \times \text{price}$$

Marginal Revenue: Additional revenue earned by the seller by selling an additional unit of output. OR

MR is the change in the total revenue on account of the sale of an additional unit of output.

$$\text{MR} = \text{TR}_n - \text{TR}_{n-1} \qquad \text{MR}_n = \text{TR} / Q$$

$$TR = MR$$

Average Revenue: AR is the per unit revenue received from the sale of a commodity. It is same as price of the commodity.

$$AR = TR / \text{Output sold}$$

AR and price are the same.

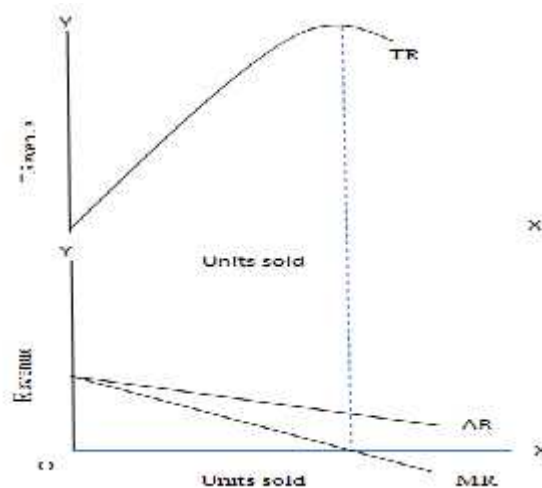
$$TR = \text{Quantity sold} \times \text{price OR output sold} \times \text{price}$$

AR and price are the same - $TR = \text{Quantity sold} \times \text{price}$ or $\text{output sold} \times \text{price}$.

$AR = (\text{output} / \text{quantity} \times \text{price}) / \text{Output/ quantity}$. $AR = \text{price}$. AR and demand curve are the same. Shows the various quantities demanded at various prices.

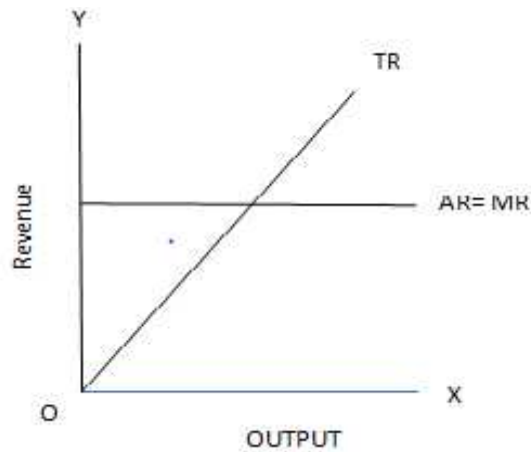
TR,MR,AR WHEN PRICE NOT CONSTANT

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	9	18	8
3	8	24	6
4	7	28	4



TR,MR,AR WHEN PRICE CONSTANT

Output/Sales/ Units	AR Price	TR	MR
1	10	10	10
2	10	20	10
3	10	30	10
4	10	40	10



Complete the following table

Output(Units)	TR	MR	AR
1	-	-	8
2	-	4	-
3	12	-	4
4	8	-	2

Relationship between TR and MR :- (1) When TR is increasing at constant rate, MR should be constant. It happens under perfect competition.

When TR is increasing at diminishing rate, MR should be diminishing. It happens under Monopoly and Monopolistic competition.

When TR is maximum, MR is zero

When TR is diminishing, MR is negative.

Relationship between AR and MR :- (1) When AR is decreasing, MR should be decreasing faster than AR. Thus, downward sloping MR curve is below the downward sloping AR curve. Accordingly, $MR < AR$.

(2) If AR is constant, MR is equal to AR. Both are indicated by the same horizontal straight line.

MR can be negative, but not AR.

FIRM'S REVENUE CURVE IN DEFFERENT MARKET

Perfectly Competitive Market

Monopoly market

Monopolistic Competitive Market

Revenue Curve Under Competitive Market

Under perfect competition, the sellers are price takers. Single price prevails in the market. Since all the goods are homogeneous and are sold at the same price $AR = MR$. As a result AR and MR curve will be horizontal straight line parallel to OX axis. (When price is constant or perfect competition)

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	10	20	10
3	10	30	10
4	10	40	10



Revenue Curve Under Perfectly Monopoly: (i) Under monopoly, the firm's AR curve slopes downward from left to right.

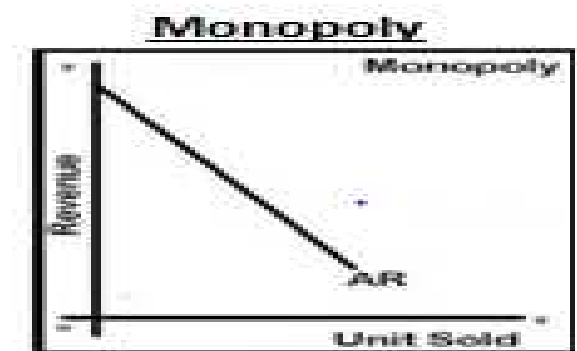
(ii) Monopolist desires to sell more, he has to reduce price of the product.

(iii) Monopolist is a price maker

Firm's AR curve slopes downward.

Table: **Revenue Curve Under Monopoly**

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	9	18	8
3	8	24	6
4	7	28	4

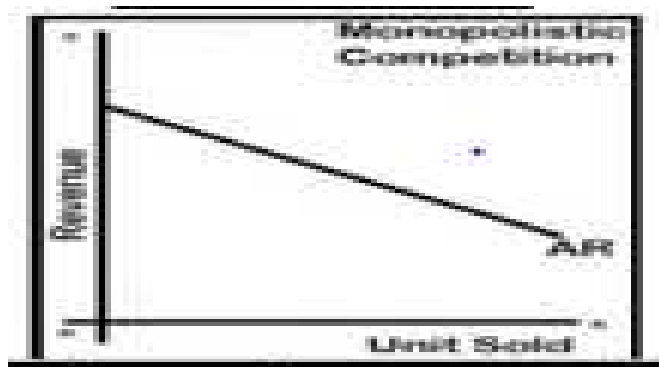


Revenue Curve Under Monopolistic Competition :- (i) Under monopolistic competition, the firm's AR curve slopes downward from left to right.

(ii) Under monopolistic competition, AR curve is more elastic.

(iii) It is because in a monopolistic competitive market, goods have close substitutes.

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	9.5	19	9
3	9	27	8
4	8.5	34	7



MCQ

Q1. AR is always equal to _____

- (a) Revenue (b) Cost
(c) **Price** (d) Profit

Q2. Marginal revenue is defined as :

- (a) Revenue per unit of commodity
(b) **Addition to revenue when one more unit of the commodity is sold**
(c) Proceeds from the sale of the commodity
(d) All of these

Q3. Average revenue is defined as

- (a) **Revenue per unit of commodity**
(b) Addition to revenue when one more unit of the commodity is sold
(c) Proceeds from the sale of the commodity
(d) All of these

Q4. When AR falls, MR. will be ;

- (a) **Falls** (b) Rises
(c) Zero (d) Constant

Q5. What will be the position of TR when MR is zero;

- (a) **Maximum** (b) Minimum
(c) Zero (d) Constant

Q6. When TR be a horizontal Straight line, MR will be?

Maximum

(b) Minimum

(c) Constant

(d) Zero

Q7. If all units are sold at same price how will it affect AR and MR at all level ?

(a) AR = MR

(b) AR > MR

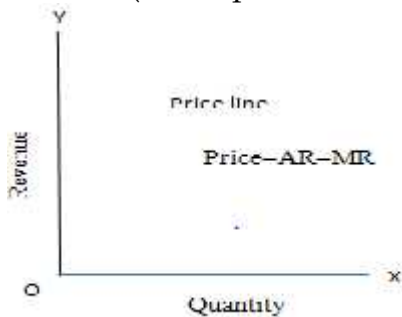
(c) AR < MR

(d) None of these

SHORT & LONG ANSWER TYPES QUESTION

Q1. Under which market form a firm's marginal revenue is always equal to price?

Ans: Under perfect competition market firm's marginal revenue curve always equal price, because Under perfect competition, the sellers are price takers. Single price prevails in the market. Since all the goods are homogeneous and are sold at the same price AR = MR. As a result AR and MR curve will be horizontal straight line parallel to OX axis. (When price is constant or perfect competition)



Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	10	20	10
3	10	30	10
4	10	40	10

Q2. State the relationship between Total revenue and marginal revenue

Ans. Relationship between TR and MR :- (1) When TR is increasing at constant rate, MR should be constant. It happens under perfect competition.

When TR is increasing at diminishing rate, MR should be diminishing. It happens under Monopoly and Monopolistic competition.

When TR is maximum, MR is zero

When TR is diminishing, MR is negative.

Q3. Draw marginal revenue and average revenue curve in a single diagram of a firm which can sell more units of a good only by lowering the price of that good.

Ans: Represent AR and MR curves of a firm's which are downward sloping, it means that the seller intends selling more unit of the commodity, he will have to lower the price. Such situation are found when there is monopoly and monopolistic competition in the market.

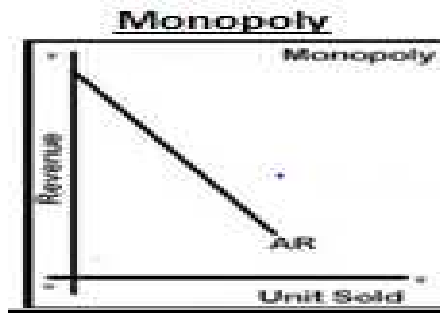
Revenue Curve Under Monopoly: (i) Under monopoly, the firm's AR curve slope downward from left to right (ii) Monopolist desires to sell more, he has to reduce price of the product.

(iii) Monopolist is a price maker (iv) Firm's AR curve slopes downward.

Table: Revenue Curve Under Monopoly

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10

2	9	18	8
3	8	24	6
4	7	28	4

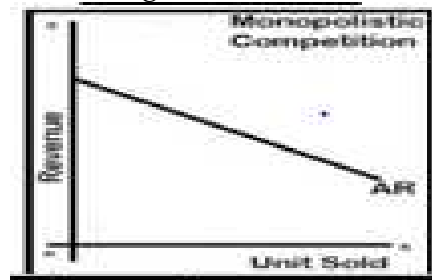


Revenue Curve Under Monopolistic Competition :- (i) Under monopolistic competition, the firm's AR curve slop downward from left to right.

(ii) Under monopolistic competition, AR curve is more elastic.

(iii) It is because in a monopolistic competitive market, goods have close substitutes.

Output/Sales/ Q Units	AR Price	TR	MR
1	10	10	10
2	9.5	19	9
3	9	27	8
4	8.5	34	7



Q4. State whether the following statement are true or false. Give reason for your answer:

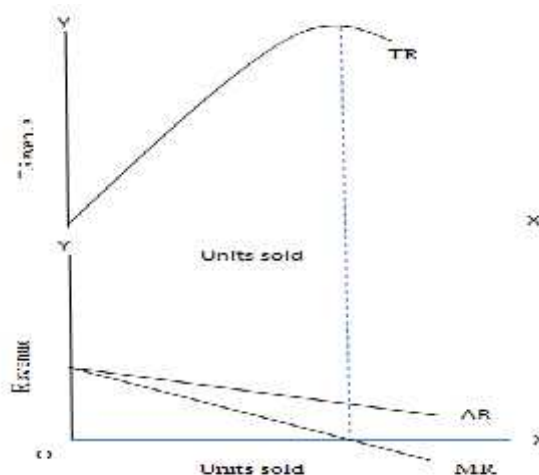
- (i) When marginal revenue is Zero, average revenue will also be zero .
- (ii) Marginal revenue is the price at which the last unit of a commodity is sold.
- (iii) When total revenue is maximum, marginal revenue will also be maximum.
- (iv) When marginal revenue fall to Zero , average revenue should be rising.

Ans:- (i) False. We know that when $MR = 0$, TR is maximum. We also that, $AR = TR/Q$. Thus, when TR is maximum, AR cannot be Zero at any level of output.(Diagram)

(ii) False. MR is not the price at which last unit of the commodity is sold. MR is simply additional revenue accruing to the firm when an additional unit of output is sold.(Diagram)

(iii) False. When total revenue is maximum, marginal revenue is equal to zero (Diagram)

(iv) False. When MR is zero, AR should be diminishing. (diagram)



UNIT-3 **PRODUCER'S EQUILIBRIUM**

PRODUCER'S EQUILIBRIUM

Producer's Equilibrium:- A producer (a firm) is said to be in equilibrium when it earns maximum profits. Profit maximization of a firm means maximizing the difference between total revenue and total cost. When the profits of the firm are maximum, the firm is in equilibrium. Firm attains equilibrium position, i.e., maximizes profits at the level of output where i) $MR=MC$ ii) MC is rising. MC is greater MR after equilibrium level of output.

In a perfectly competitive firm maximizes profits i.e. attains producer's equilibrium when price is equal to the marginal cost. In a perfectly competitive market, the marginal revenue and average revenue of a firm coincide and equal to the market price ($AR=MR=P$.) A competitive firm's equilibrium is, therefore, established at the level of output where i) $MR=MC$, and ii) MC is rising.

CONDITIONS IN MARGINAL REVENUE AND MARGINAL COST APPROACH:

1 $MR=MC$

2. MC is rising that is slope of MC is more than slope of MR

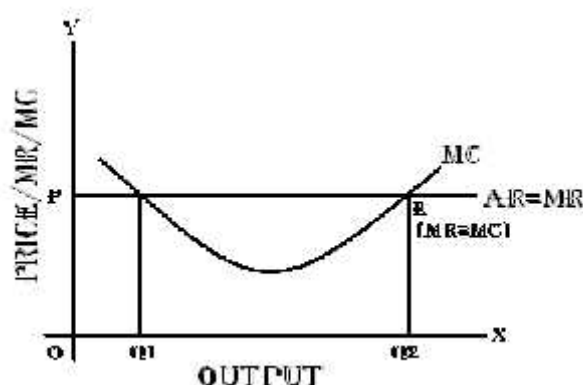
A producer will strike his equilibrium only when MC is rising because when MC is falling it shows there is scope of increasing total profit $MR-MC = \text{Change in total profit}$. Till this change remains positive or equal to Zero producer has all the motive to keep on producing. Hence, we can say $MC > MR$ the change in profit becomes negative which means that total profit will fall from before. Hence, this also can't be behaviour of rational producer.

Units of Output	MR	MC	Change in profit
1	6	7	-1
2	6	6	0
3	6	5	1
4	6	4	2
5	6	6	0
6	6	7	-1

At the 5th unit of output producer is in equilibrium because at this point:

1 $MR=MC$

2. MC is rising that is slope of MC is more than slope of MR



Q. Define Producer's Equilibrium. Explain producers Equilibrium with Marginal Revenue (MR) and Marginal cost (MC) approach under perfect competition

Ans. Producer's Equilibrium:- A producer (a firm) is said to be in equilibrium when it earns maximum profits.

CONDITIONS IN M R AND M C APPROACH:

1 MR=MC

2.MC is rising that is slope of MC is more than slope of MR

A producer will strike his equilibrium only when MC is rising because when MC is falling it shows there is scope of increasing total profit $MR - MC = \text{Change in total profit}$. Till this change remains positive or equal to Zero producer has all the motive to keep on producing. Hence, we can say $MC > MR$ the change in profit becomes negative which means that total profit will fall from before. Hence, this also can't behaviour of rational producer.

At the 4th unit of output producer is in equilibrium because

Units of commodity	MR	MC
1	10	9
2	9	7
3	8	6
4	7	7
5	6	8
6	5	9

At this point:

1 MR=MC

2.MC is rising that is slope of MC is more than slope of MR

UNIT-3 **THEORY OF SUPPLY**

SUPPLY – It is that quantity of a commodity which a seller or producer is ready to sell in the market at a certain price within a given time period.

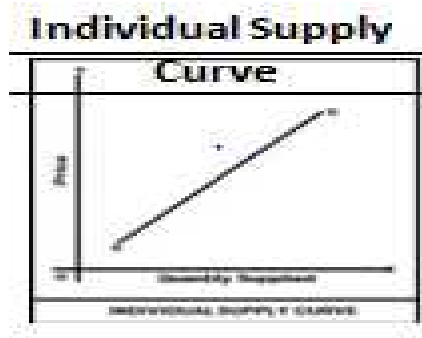
INDIVIDUAL SUPPLY – It refers to quantity of a commodity that an individual firm is willing and able to offer for sale in the market at a given price per time period.

INDIVIDUAL SUPPLY SCHEDULE - It is a table showing various level of quantity of a product that an individual producer is willing to sell corresponding to each given level of price.

Price (Px)	Qx Supply
10	5

20	10
30	15

INDIVIDUAL SUPPLY CURVE: Individual Supply curve is a graphic presentation of supply schedule of an individual firm in the market.

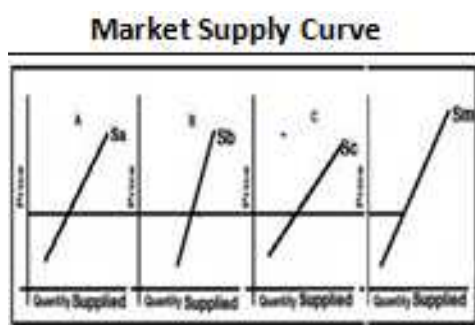


MARKET SUPPLY - It refers to the aggregate quantity of a commodity that all the firms are willing and able to offer for sale together at each possible price during a given period of time.

MARKET SUPPLY SCHEDULE - It is table showing various level of quantity of a product that all the firm together offer to sale at each level of price.

Price (Px)	Qx Firm A	Qx Firm B	Qx Firm C	Market Supply
10	5	0	10	15
20	10	5	15	30
30	15	10	20	45

MARKET SUPPLY CURVE : Market Supply curve is a graphic presentation of supply schedule .



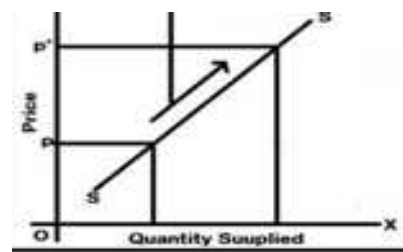
SUPPLY FUNCTION(Determinants og supply) :- $S_x = f(P_x, P_r, N_F, G, P_F, T, E_x, G_p)$

1. **Own price of a commodity(Px):-** Direct relationship between own price of commodity and its quantity supplied. Higher the price, higher the quantity supplied, and lower the price lower the quantity supplied.

2. **Price of related goods(Pr)** Supply of a goods depends upon the price of related goods. Consider a firm selling tea, if price of coffee rises in the market, the firm will be willing to sale less tea at its existing price. vice versa.
3. **Number of firms in the industry(N_F):-** Market supply of a commodity depends upon number of firms in the industry. Increase in the number of firm implies increase in market supply. vice versa.
4. **Goal of the firm** :- If goal of the firm is to maximise profits, more quantity of the commodity will be offered only at higher price vice versa.
5. **Price of factor product (P_F):-** If the factor decreases, cost of production also reduces. According, more of the commodity is supplied at its existing price. vice versa.
6. **State of technology(T)** : Improvement in the technique of the production reduces cost of production. Consequently, more of the commodity is the supplied at its existing price.
7. **Government policy:-** Taxation and subsidy policy of the government also impacts market supply of the commodity. Increase in taxation may decrease supply, while increase in subsidies may increase it.

LAW OF SUPPLY:- The law of supply states that other things remaining constant, quantity supplied increase with increases with increase in own price of a commodity and vice versa.

Price Px	Sx Unit
10	5
20	10
30	15



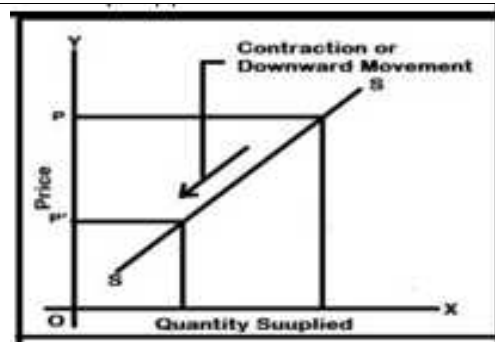
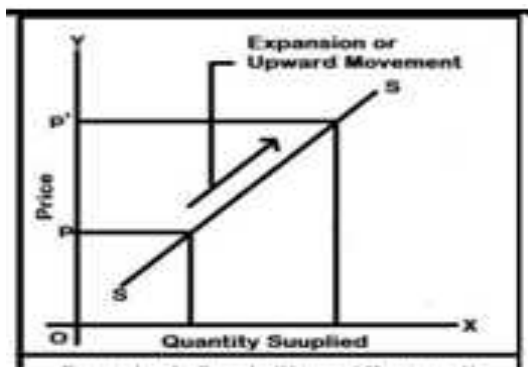
Assumptions of the law of supply:

- (i) There is no change in the price of the factors of production
- (ii) There is no change in the technique of production
- (iii) There is no change in the goal of the firm
- (iv) There is no change in the price of related goods
- (v) There is no change in the price of commodity in near future

CHANGE IN QUANTITY SUPPLIED AND CHANGE IN SUPPLY

CHANGE IN QUANTITY SUPPLY OR MOVMENT ALONG A SUPPLY:- Change own price of the commodity, its quantity supplied changes. Quantity supplied of a commodity due to rise in its own price is called extension of supply and decrease in quantity supplied due to fall in its own price is called contraction of supply.

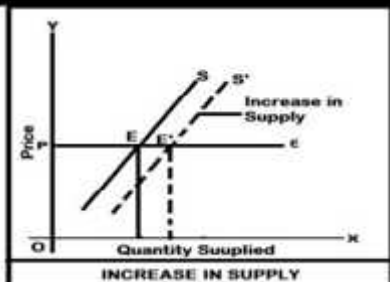
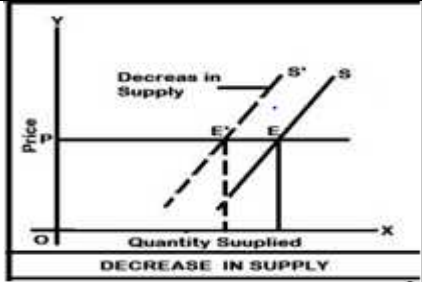
Extension of supply	Contraction of supply
1. When there is rise in supply due to rise in Price of its own.	1. When there is fall in supply due to fall in Price of its own.
2. In this situation producer move upward on the same demand curve	2. In this situation consumer move downward on the same supply curve.
3. Law of supply is applicable	3. Law of supply is applicable
4. More is supplied at more prices other things being equal.	4. Less is supplied at less prices other things being equal.
5. It is known as “Change in Quantity Supplied”	5. It is known as “Change in Quantity Supplied”



Extension of supply		Contraction of supply	
Px	Qx Unit	Px	Qx Unit
10	5	20	10
20	10	10	5

CHANGE IN SUPPLY(Increase and Decrease in Supply):- When supply of a commodity changes due to factors other than its own price, such as change in expectations, technology or goal of the firm then it is called increase or decreases in supply.

Increase in Supply	Decrease in Supply
1. When rise in supply due to fall in price of inputs, rise in price of related Goods, Increase in Excise duty, Up gradation in technology etc.	1. When decrease in supply due to De gradation in Technology, Rise in Price of Inputs, Increase in Excise Duty or tax ,Rise in the Price of Related Goods etc.
2. In this situation supply curve shift rightward.	2. In this situation supply curve shift leftward.
3. More is supplied at same price and	3. Less is supplied at same price and same

same is supplied at fewer prices.	is supplied at more prices.												
4. It is known as “Change in Supply”	4. It is known as “Change in Supply”												
													
<table border="1"> <thead> <tr> <th>Px</th> <th>Qx</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>5</td> </tr> <tr> <td>10</td> <td>10</td> </tr> </tbody> </table>	Px	Qx	10	5	10	10	<table border="1"> <thead> <tr> <th>Px</th> <th>Qx</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>10</td> </tr> <tr> <td>10</td> <td>5</td> </tr> </tbody> </table>	Px	Qx	10	10	10	5
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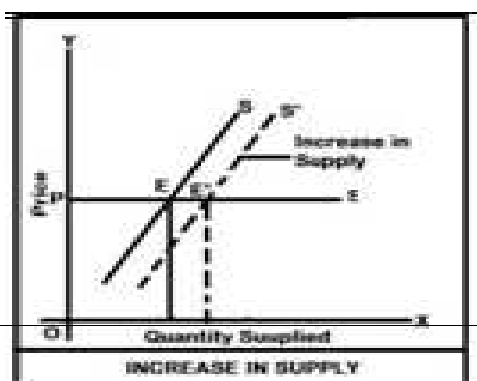
Causes of Increase in Supply(Reasons for Rightward Shift)

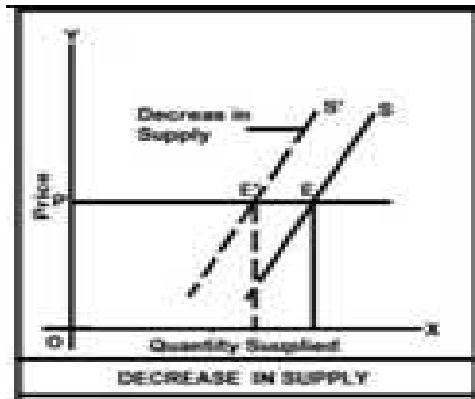
1. Decrease in Price of Substitute Goods
2. Increase in Price of Complementary Goods
3. Decrease in Price of Factors (Input)
4. Improvement in Technology
5. Expectation in fall in Price in Future;
6. Increase in Number of firms
7. Good Transport and Communication
8. Goal of Sale Maximization
9. Decrease in Taxes

Causes of Decrease in Supply (Reasons for Leftward Shift)

1. Increase in Price of Substitute Goods
2. Decrease in Price of Complementary Goods
3. Increase in Price of Factors (Input)
4. Degrade in Technology
5. Expectation in Rise in Price in Future;
6. Decrease in Number of firms
7. Poor Transport and Communication

8. Goal of Profit Maximization
9. Increase in Taxes





PRICE ELASTICITY OF SUPPLY

Elasticity of supply refers to the degree of responsiveness of a commodity with reference to a change in price of such commodity. It is always positive due to direct relationship between price and quantity supplied.

$$\text{Elasticity of supply} = \frac{\text{Percentage Change in quantity supplied}}{\text{Percentage Change in price}}$$

Perfectly elastic supply ($P_{e_s} = \infty$) - When the supply becomes zero with a slight rise in price or when the supply is infinite with slight fall in price.	More than Unitary Elastic ($P_{e_s} > 1$) - When proportionate change in quantity supplied is more than proportionate change in price, it is said to be more than unitary elastic supply.	Unitary elastic Supply ($P_{e_s} = 1$) - When proportionate change in quantity supplied is equal to proportionate change in price, then it is said to be less than unitary elastic supply.	Less than unitary elastic supply ($P_{e_s} < 1$) - When the proportionate change in quantity supplied is less than proportionate change in price, then it is said to be less than unitary elastic supply.	Perfectly inelastic supply ($P_{e_s} = 0$) - When there is no change in quantity supplied with the change in its price, it is perfectly inelastic supply.																																																					
<table border="1" style="width: 100%; text-align: center;"> <tr><th>P.</th><th>Q.S.</th><th>P_{e_s}</th></tr> <tr><td>10</td><td>2</td><td rowspan="3">=0</td></tr> <tr><td>10</td><td>4</td></tr> <tr><td>10</td><td>6</td></tr> </table>	P.	Q.S.	P_{e_s}	10	2	=0	10	4	10	6	<table border="1" style="width: 100%; text-align: center;"> <tr><th>P.</th><th>Q.S.</th><th>P_{e_s}</th></tr> <tr><td>10</td><td>100</td><td rowspan="2"></td></tr> <tr><td>15</td><td>200</td></tr> <tr><td>↑</td><td></td><td></td></tr> </table>	P.	Q.S.	P_{e_s}	10	100		15	200	↑			<table border="1" style="width: 100%; text-align: center;"> <tr><th>P.</th><th>Q.S.</th><th>P_{e_s}</th></tr> <tr><td>10</td><td>100</td><td rowspan="2">—</td></tr> <tr><td>15</td><td>150</td></tr> <tr><td>↑</td><td></td><td></td></tr> </table>	P.	Q.S.	P_{e_s}	10	100	—	15	150	↑			<table border="1" style="width: 100%; text-align: center;"> <tr><th>P.</th><th>Q.S.</th><th>P_{e_s}</th></tr> <tr><td>10</td><td>100</td><td rowspan="3">—</td></tr> <tr><td>15</td><td>120</td></tr> <tr><td>↑</td><td></td></tr> </table>	P.	Q.S.	P_{e_s}	10	100	—	15	120	↑		<table border="1" style="width: 100%; text-align: center;"> <tr><th>P.</th><th>Q.S.</th><th>P_{e_s}</th></tr> <tr><td>10</td><td>2</td><td rowspan="2">—</td></tr> <tr><td>20</td><td>2</td></tr> <tr><td>↑</td><td></td><td></td></tr> </table>	P.	Q.S.	P_{e_s}	10	2	—	20	2	↑		
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FACTORS AFFECTING ELASTICITY OF SUPPLY

LESS ELASTIC SUPPLY	FACTORS	HIGH ELASTIC SUPPLY
Perishable Goods – Vegetables, Milk	NATURE OF COMMODITY	Durable Goods – TV, furniture
Short Period	TIME PERIOD	Long Period
Complex Techniques	TECHNIQUES OF PRODUCTION	Simple Techniques
Influenced by Natural Constraints	NATURAL CONSTRAINTS	Do not have Natural Constraints
Producers Not Willing to take Risk	RISK TAKING	Producers Willing to Take Risk
Specialized Factors	NATURE OF INPUTS USED	Common Factors
Law of Increasing Cost	COST OF PRODUCTION	Law of Diminishing Cost

MCQ

Q1.The rise in supply due to rise in price is called

- (a) Increase in supply (b) Decrease in supply
(c) Extension of supply (d) None of these

Q2.When supply curve is upward sloping, its slope is:

- (a) Positive** (b) Negative
(c) First positive then negative (d) Zero

Q3.Market supply curve is _____ sum of individual supply curve.

- (a) **Horizontal** (b) Vertical
(c) Can be both horizontal or vertical (d) None of these

Q4.Movement along a supply curve is also called:

- (a) Change in supply **(b) Change in quantity supplied**
(c) Contraction in supply (d) Increase in supply

Q5.A upward movement along a supply curve shows;

- (a) Contraction in supply (b) Decrease in supply
(c) Expansion in supply (d) Increase in supply

Q6.A rightward shift in supply curve shows

- (a) Contraction in supply (b) Decrease in supply
(c) Expansion in supply **(d) Increase in supply**

Q7.When same quantity is supplied at a higher price, it shows:

- (a) Contraction in supply **(b) Decrease in supply**
(c) Expansion in supply (d) Increase in supply

Q8. When supply curve is vertical, Es _____?

- (a) Zero** (b) 1
(c) Infinite (d) Ed less than 1

Q9 When supply curve is horizontal, Es= -----?

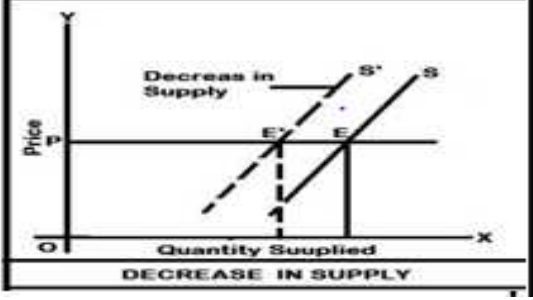
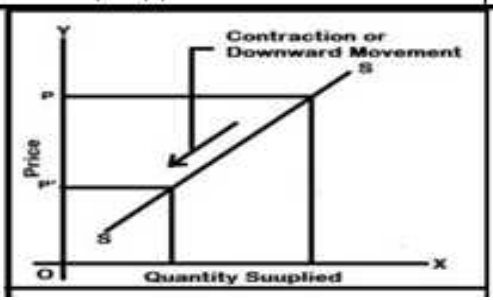
- (a) Zero (b) 1
(c) Infinite (d) Ed is more than unitary

Q10. If 16% rise in price causes 40% increase in supply, elasticity of supply will be:

- (a) 1.5 (b) 2.0
(c) 2.5 (d) 3.5

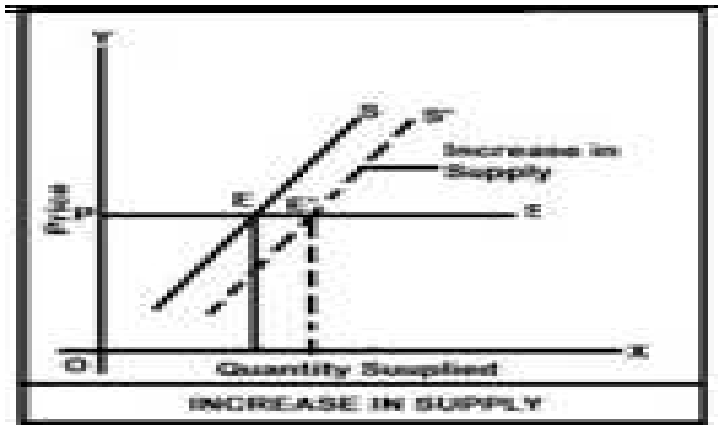
SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain the distinction between ‘decrease in supply’ and ‘contraction of supply’. Use diagrams.

Decrease in Supply	Contraction of supply
1. When decrease in supply due to De gradation in Technology, Rise in Price of Inputs, Increase in Excise Duty or tax ,Rise in the Price of Related Goods etc.	1. When there is fall in supply due to fall in Price of its own.
2. In this situation supply curve shift leftward.	2. In this situation consumer move downward on the same supply curve.
3. Less is supplied at same price and same is supplied at more prices.	3. Law of supply is applicable
4. It is known as “Change in Supply”	4. Less is supplied at less prices other things being equal. It is known ‘Change in quantity supply.
	

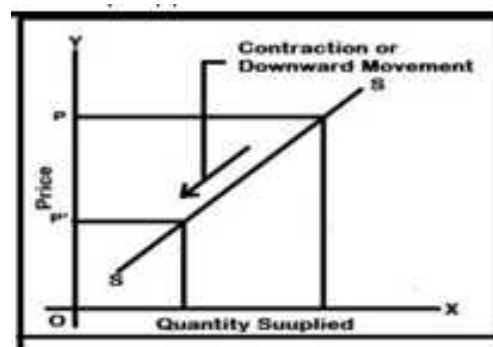
Q2. Explain how technological progress is a determinant of supply of a good by a firm.

Ans. When technological progress on the production of good, Marginal and Average cost of the production tends to fall, Accordingly, producers will supply at the same price or same supply at the lower price. This implies a forward or rightward shift supply curve.

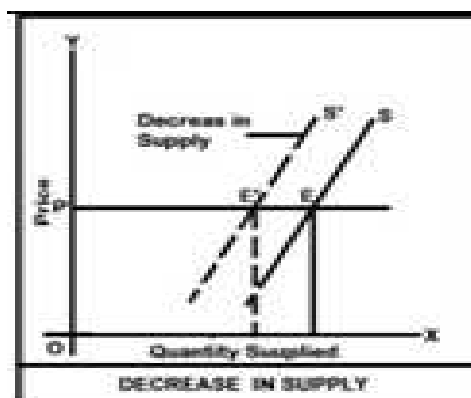


Q3. Examine the effect of (i) fall in the own price of a good X, and (ii) rise in tax rate on Good X, on the supply curve. Use diagram.

Ans:- (i) Fall in the price of a good – X leads to downward movement along the supply curve, other things remaining constant as diagram:



(ii) With rise in tax rate on Good – X, marginal and average costs of production tend to rise, other things remaining constant, it causes a cut in profit. Accordingly, only at a higher price. This implies a backward or leftward shift in supply curve or decrease in supply. Diagram:-



Q4. A producer supplies 80 units of good at a price of Rs.10 per unit. Price elasticity of supply is 4. How much will he supply at Rs. 9 per unit?

Ans : Price elasticity of supply $E_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

$$4 = 10/80 \times (x - 80) / - 1$$

$$4 = (x-80) / - 8$$

$$-32 = (x-80)$$

$$X = 80 - 32 = 48 \text{ Units}$$

Q5. Price elasticity of supply of a commodity is 2 . A firm supplies 100 units of good at a price of Rs.20 per unit. At what price will he supply 80 units?

Ans:- Price elasticity of supply $E_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

$$2 = 20 / 100 * -20/(x - 20)$$

$$2 = - 4 / x-20$$

$$-2 = x - 20$$

$$X = 20-2 = 18$$

The producer will supply 80 units at Rs. 18

Q6. A firm supplies 10 units of good at a price ofRs.5 per unit. Price elasticity of supply is 1.25. What quantity will the firm supply at a price of Rs. 7 per unit?

Ans: Price elasticity of supply $E_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$

$$1.25 = 5/10 * (x-10) / 2$$

$$1.25 = (x-10)/ 4$$

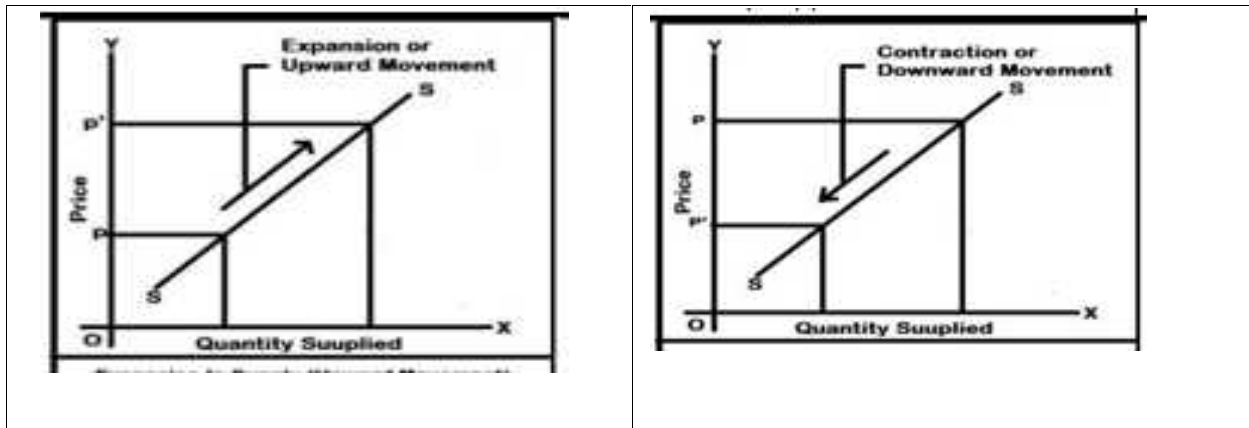
$$X - 10 = 5$$

$$X = 5 + 10 = 15$$

New quantity = 15 units

Q7.Distinction between Extension of supply and Contraction of supply. Use diagram

Extension of supply	Contraction of supply
2. When there is rise in supply due to rise in Price of its own.	2. When there is fall in supply due to fall in Price of its own.
2.In this situation producer move upward on the same demand curve	2.In this situation consumer move downward on the same supply curve.
3.Law of supply is applicable	3. Law of supply is applicable
4.More is supplied at more prices other things being equal.	4. Less is supplied at less prices other things being equal.
5.It is known as “Change in Quantity Supplied”	5.It is known as “Change in Quantity Supplied”



SHORT & LONG ANSWER TYPES QUESTION

Q1. A firm's revenue rises from Rs. 400 to Rs. 500 when the price of its products rises from Rs 20 per unit to Rs. 25 per unit. Calculate the price elasticity of supply.

Q2. When the price of good rises from Rs. 20 per unit to Rs. 30 per unit, the revenue of the firm producing this good rises from Rs. 1000 to Rs. 3000. Calculate the price elasticity of supply. Q3.

The price elasticity of supply of a good is 0.8. Its price rises by 50 per cent. Calculate the percentage increase in its supply.

Q4. A firm supplies 10 units of good at a price of Rs. 5 per unit. Price elasticity of supply is 1.25. What quantity will the firm supply at a price of Rs. 7 per unit?

Q5. Price elasticity of supply of a commodity is 2.0. A firm supplies 200 units of it at a price of Rs. 8 per unit. At what price will it supply 250 units?

Q6. A 15 per cent rise in price of a commodity raises its supply from 300 units to 345 units. Calculate its price elasticity of supply.

Q7. Explain the distinction between 'decrease in supply' and 'contraction of supply'. Use diagrams.

Q8. Explain the distinction between 'movement along the supply curve' and 'shift of supply curve' (change in quantity supplied and change in supply). Use diagrams.

Q9. Price elasticity of supply of a commodity is 2, what percentage should its price rise so that its supply rises by 30 per cent ?

Q10. Explain how technological progress is a determinant of supply of a good by a firm.

Q11. Explain how input price are a determinant of supply of a good by a firm.

Q12. How does change in per unit tax influence the supply of a good by a firm? Explain.

Q13. What is change in supply? Explain the effect of tax imposed on a good on the supply of the good.

Q14. Explain the significance of minus sign attached to the measure of price elasticity of demand in case of normal good, as compared to the plus sign attached to the measure of price elasticity of supply? OR Why is(-)minus sign attached to the measure of price elasticity of demand in case of normal good in compared to the plus sign attached to the measure of price elasticity of supply? Explain.

Q15. A producer supplies 80 units of good at a price of Rs.10 per unit. Price elasticity of supply is 4. How much will he supply at Rs. 9 per unit? .

Q16. Price elasticity of supply of a commodity is 2 . A firm supplies 100 units of good at a price of Rs.20 per unit. At what price will he supply 80 units? .

Q17. Examine the effect of (i) fall in the own price of a good X, and (ii) rise in tax rate on Good X, on the supply curve. Use diagram.

UNIT-4 **FORMS OF MARKET**

Market refers to all such systems or arrangements that bring the buyers and sellers in contact with each other to settle the sale and purchase of goods. It does not refer to any shopping complex.

Perfect Competition: - It refers to the market situation in which there are large no of buyers and

sellers of homogenous product. Price is determined by the industry and only one price prevails in the market. Example – Agricultural Product Market.

Features of Perfect Competition

1. VERY LARGE NO OF BUYERS AND SELLERS - (i) As there are large number of sellers' individual seller cannot influence market supply or price. Similarly one buyer cannot affect market demand or price.

(ii) Firms become price takers as they have to accept the equilibrium price that market demand & supply decide. So market or industry is price maker.

(iii) Due to large number of buyers firm can sell any amount of good at equilibrium price. Hence they have perfectly elastic, horizontal Average Revenue (AR) curve.

2. HOMOGENEOUS PRODUCT - Perfect competition market has homogenous goods which are same in shape, size, colour, price etc. (I) So it is easy for new firms to enter into and exit from the market. (II) There is no selling cost as there is no need for advertising the good. (III) So one firm cannot effect price market decides the price.

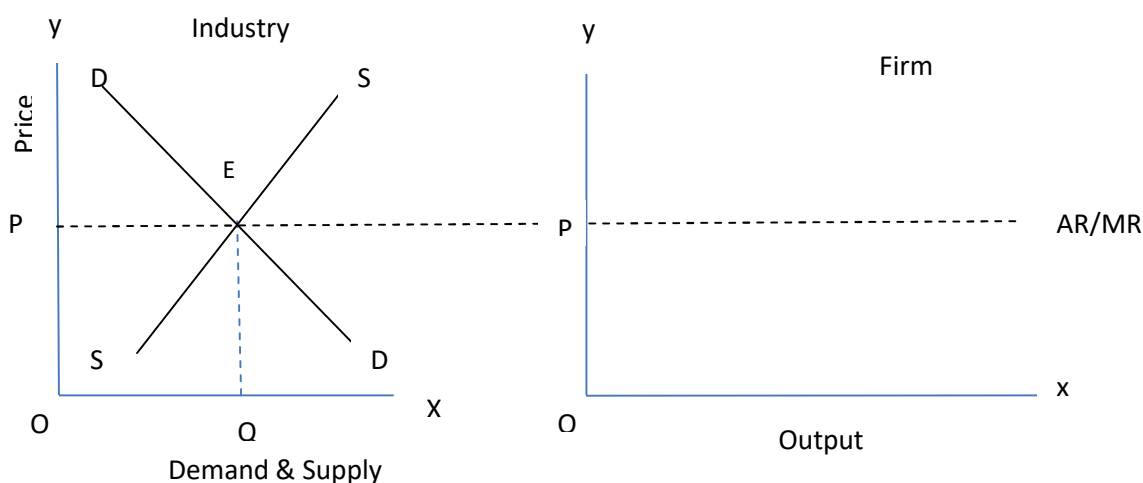
3. FREE ENTRY AND EXIT - If in Short Run there is abnormal profit firms will enter the market & if there are abnormal losses firms will exit the market. Hence in the Long run firms will earn Normal Profits.

4. **PERFECT KNOWLEDGE** - Buyers as well as sellers have complete knowledge of the product.
5. **PERFECT MOBILITY OF FACTORS OF PRODUCTION** - There is no geographical restriction on their movement. The factors are free to move to the industry in which they get the best price.
6. **ABSENCE OF SELLING COST** - No advertisement or selling cost is involved because of homogeneous product.
7. **BSENCE OF TRANSPORTATION COST** - No transportation cost is involved in market because sellers and buyers have the perfect knowledge about the market.

PURE COMPETITION- Pure competition is the one which has following features – (i) Large no of buyers and sellers; (ii) Homogeneous Product; (iii) Free from restriction.

Firm under perfect competition is a price taker not a price maker?

A firm under perfect competition is a price taker not a price maker because the price is determined by the market forces of demand of supply. This price is known as equilibrium price. All the firms in the industry have to sell their outputs at this equilibrium price. The reason is that, number of firms under perfect competition is so large. So no firm can influence the price by its supply. All firms produce homogeneous product.



MCO

1. In which kind of market, a firm is a price taker:

- (a) **Perfect competition** (b) Monopoly
 (c) Monopolistic Competition (d) Oligopoly

Q2. The period of time, when supply is fully adjusted to change in demand is called

- (a) Short period (b) Very short period
 (c) Mid-period (d) **Long period**

Q3. Freedom of entry and exit is possible in the:

- (a) Short -run (B) Long -run
 (c) Both (a) and (b) (d) Neither (a) and (b)

Q4. If the demand curve of a individual firm is perfectly elastic, then

- (a) Firm is a price taker (b) Firm can influence the price
 (b) Firm is a price maker (d) Firm has partial control over price

SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain any four characteristics of perfect competition market.

Ans:- (i) Large number of buyers and sellers : The number of buyers and sellers are so large in this market that no firm can influence the price.

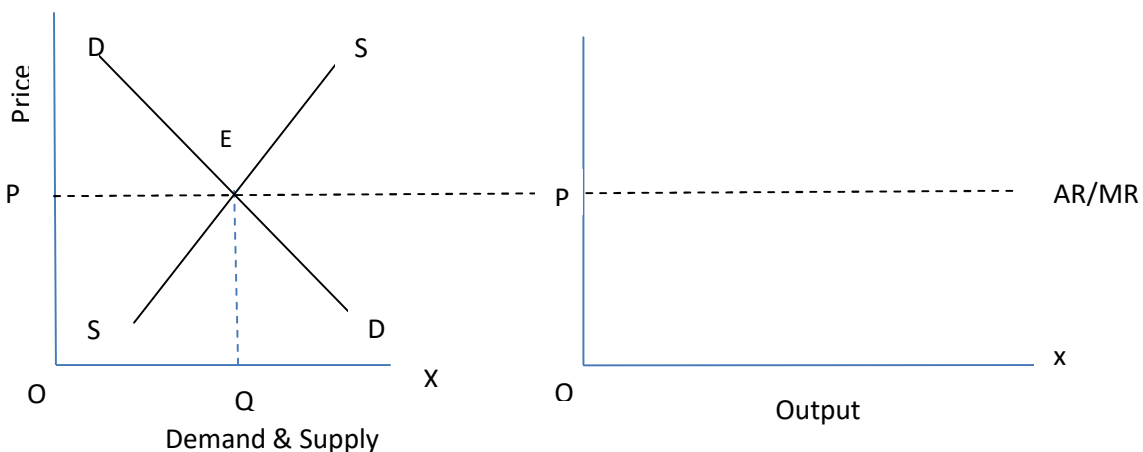
ii) Homogeneous products: Products are uniform in nature. The products are perfect substitute of each other. No seller can charge a higher price for the product. Otherwise he will lose his customers.

iii) Perfect knowledge: Buyers as well as sellers have complete knowledge about the product.

iv) Free entry and exit of firm: Under perfect competition any firm can enter or exit in the market at any time. This ensures that the firms are neither earning abnormal profits nor incurring abnormal losses.

Q2. Explain briefly why a firm under perfect competition is a price taker not a price maker?

Ans:- A firm under perfect competition is a price taker not a price maker because the price is determined by the market forces of demand and supply. This price is known as equilibrium price. All the firms in the industry have to sell their outputs at this equilibrium price. The reason is that, number of firms under perfect competition is so large. So no firm can influence the price by its supply. All firms produce homogeneous product.



Q3. Explain the implication of the feature ‘large number of buyers and sellers’ in perfect competition

Ans: - The number of buyers and sellers is very large under perfect competition market. The number of firms selling a particular commodity is so large that an individual seller contributes only a small part to the market supply. Thus, any increase or decrease in supply by an individual firm hardly impacts the total market supply and consequently, an individual firm cannot influence price of the commodity. Accordingly, like an individual firm, an individual worker is also not able to influence price of the commodity, only normal profits prevail in the long run.

Q4. In a perfectly competitive market the buyers treat products of all the firms as homogeneous. Explain the significance of this feature.

Ans. HOMOGENEOUS PRODUCT:- Perfect competition market has homogenous goods which are same in shape, size, color, price etc.

Feature:- (i) So it is easy for new firms to enter into and exit from the market.

(ii) There is no selling cost as there is no need for advertising the good.

(iii) So one firm cannot effect price market decides the price.

SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain 'large number of buyers and sellers' feature of a perfectly competitive market.

Q2. Why can a firm not earn abnormal profits under perfect competition in the long run? Explain.

Q3. Explain the implication (significance) of large number of buyers in a perfectly competitive market.

Q4. There are 'large number of sellers in a perfectly competitive market. Explain significance of this feature.

Q5. In a perfectly competitive market the buyers treat products of all the firms as homogeneous. Explain the significance of this feature.

Q6. There are no barriers in the way of firms leaving or joining industry in a perfectly competitive market. Explain the significance of this feature.

Q7. Explain the implication of the following in a perfectly competitive market:

- (a) Large number of buyers.
 - (b) Freedom of entry and exit to firms.
 - (a) Barriers to entry of new firms.
 - (b) A few or a big sellers.
-

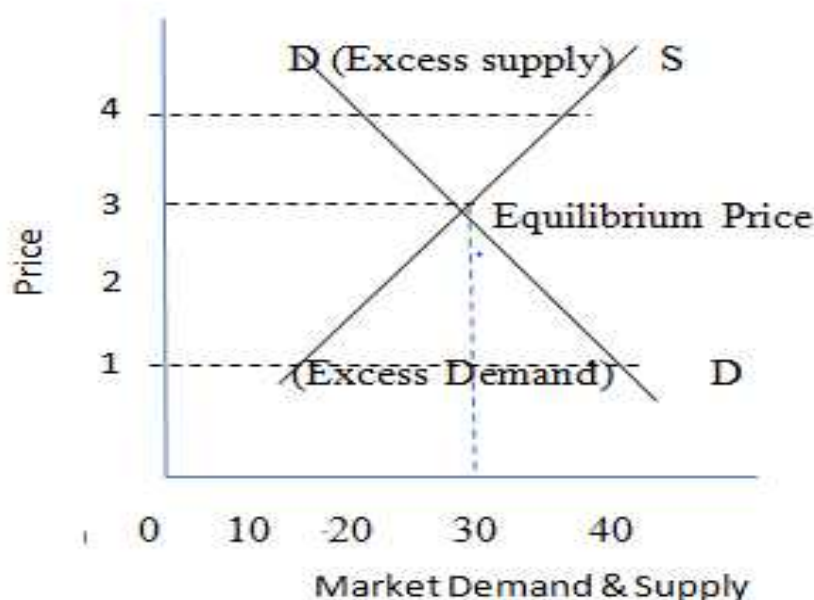
MARKET EQUILIBRIUM UNDER PERFECT COMPETITION

PRICE DETERMINATION: - In a market price of a commodity is decided by the free forces of demand and supply. These free forces of demand and supply act and react in such a manner that the quantity demanded is exactly equal to quantity supplied. In this course price is known as the equilibrium price. Intersection of market demand and market supply curves decides the price of a product.

Market Equilibrium Under perfect competition

Equilibrium price is that price which is determined by market forces of demand and supply. At this price both demand and supply are equal to each other. Diagrammatically it is determined at the point where demand curve and supply curve intersect each other. At this point price is known as equilibrium price and quantity is known as equilibrium quantity.

Price (Rs.)	Quantity Demand (Units)	Quantity Supply(Units)
1	50	10
2	40	20
3	30	30
4	20	40
5	10	50



EXCESS DEMAND: - When Excess Demand in the market at a given price, the competition among the buyers to purchase the required quantity. Hence they start offering higher prices. With rising market prices, demand contracts and supply expands. This market adjustment continues till the market reaches equilibrium.

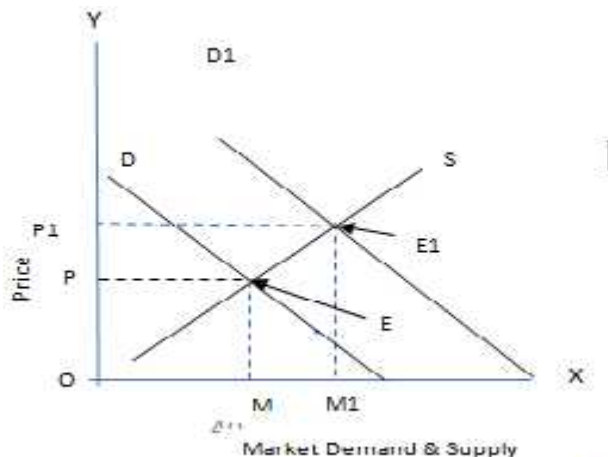
EXCESS SUPPLY: - When Excess Supply in the market at a given price, the competition

among the sellers to dispose-of their output. Hence, they start offering lower prices. With fall in the market prices, demand expands and supply contracts. This market adjustment continues till the market reaches equilibrium.

SHIFT (CHANGE) IN DEMAND AND MARKET EQUILIBRIUM

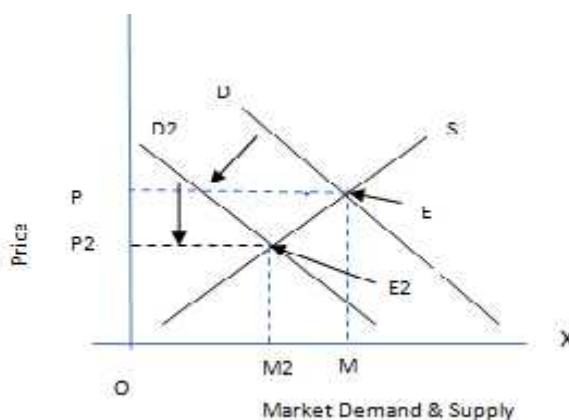
- (1) Increase in Demand (2) Decrease in Demand

(1) **Increase in Demand**:- In case of increase in demand, demand curve shift to the right.



-) Increase in demand shift the demand curve from D to D_1 to right leading to excess demand E E_1 at the given price OP .
-) There will be competition among buyers leading to rise in price.
-) As price rise supply starts rising (along S) demand starts falling.
-) These changes continues till $D=S$ at a new equilibrium at E_1
-) The quantity rises to OM to OM_1 and price rises OP to OP_1

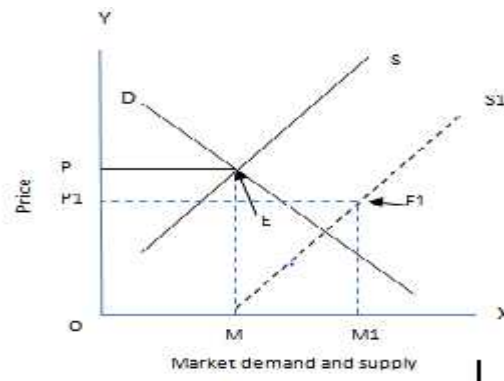
(2) **Decrease in Demand**:- In case of decrease in demand, demand curve shift to the leftward.



-) Decrease in demand shift the demand curve from D to D_2 to left leading to decrease demand E E_2 at the given price OP .
-) There will be competition among buyers leading to fall in price.
-) As price fall supply starts falling (along S).
-) These changes continues till $D=S$ at a new equilibrium at E_2
-) The quantity fall to OM to OM_2 and price fall OP to OP_2 .

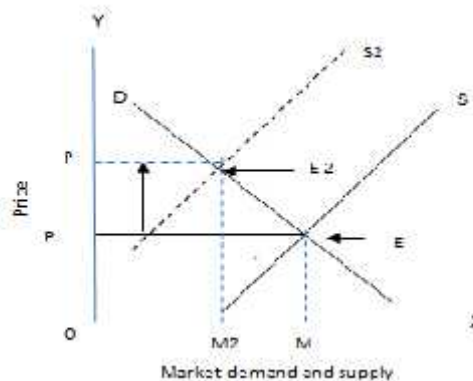
SHIFT (CHANGE) IN SUPPLY AND MARKET EQUILIBRIUM

1. Increase in supply:- In case of increase in supply, the supply curve shifts to the right.



-) Increase in supply shift the supply curve from S to S_1 to right leading to excess supply E_1 at the given price OP .
-) There will be competition among buyers leading to fall in price.
-) As price fall supply starts rising (along D).
-) These changes continues till $D=S$ at a new equilibrium at E_1
-) The quantity rises to OM to OM_1 and price fall OP to OP_1

2. Decrease in supply:- In case of decrease in supply, the supply curve shifts to the leftward.



-) decrease in supply shift the supply curve from S to S_2 to left leading to fall supply E_2 at the given price OP .
-) There will be competition among buyers leading to increase in price.
-) As price increase supply starts falling (along D).
-) These changes continues till $D=S$ at a new equilibrium at E_2
-) The quantity fall to OM to OM_2 and price rises OP to OP_2 .

SIMULTANEOUS SHIFT (CHANGE) IN DEMAND AND SUPPLY AND MARKET EQUILIBRIUM

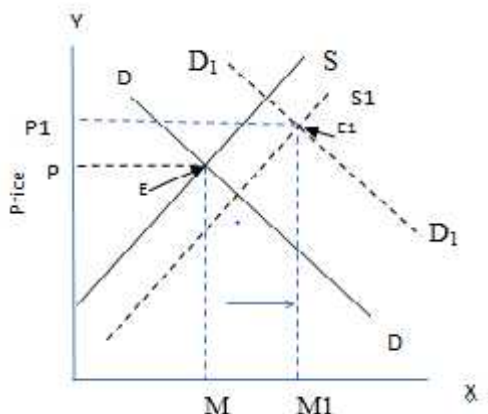
(1) SIMULTANEOUS INCREASE IN DEMAND AND SUPPLY (OR)

Equilibrium price may or may not change with Increases in both demand and supply

Simultaneous increase in demand and supply must lead to increase in equilibrium quantity of commodity. But change in price depends on whether: (i) Increase in demand > Increase in

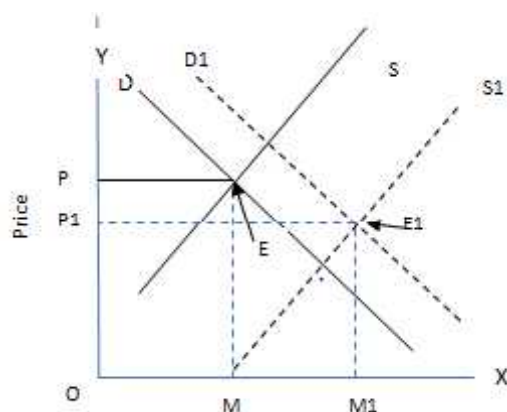
supply. (ii) Increases in demand < Increases in supply, and (iii) Increases in demand = Increase in supply

(i) Increase in demand > Increase in supply :- When demand increases more than supply price and quantity both will increase.



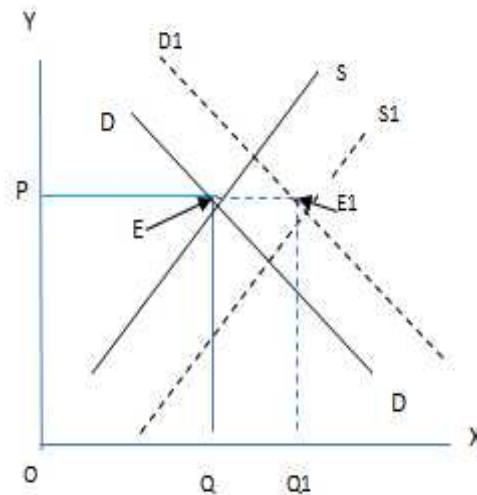
When increase in demand is more than increase in supply price increases from OP to OP1. Quantity increases from OM to OM1. Increase in price is less than increase in quantity.

(ii) Increases in demand < Increases in supply:- When demand increases less than supply, price will fall but quantity will rise



When supply increases more than demand price falls from OP to OP1 and quantity demand increases from OM to OM1. Decrease in price is less than increase in quantity.

(iii) Increases in demand = Increase in supply:- When demand and supply increases equally then equilibrium price remain same.



When increase in demand is equal to increase in supply price remains unchanged at OP. Quantity exchanged increases from OQ to OQ₁.

(2) SIMULTANEOUS DECREASE IN DEMAND AND SUPPLY (OR)

Equilibrium price may or may not change with Decreases in both demand and supply:-

Simultaneous decrease in demand and supply must lead to increase in equilibrium quantity of commodity. But change in price depends on whether: (i) Decrease in demand > Decrease in supply. (ii) Decreases in demand < Decreases in supply, and (iii) Decreases in demand = Decrease in supply

(i) Decrease in demand > Decrease in supply: When demand decreases more than supply, price and quantity both will decrease.

(ii) Decreases in demand < Decreases in supply:- When demand decreases less than supply, price will increase but quantity will rise

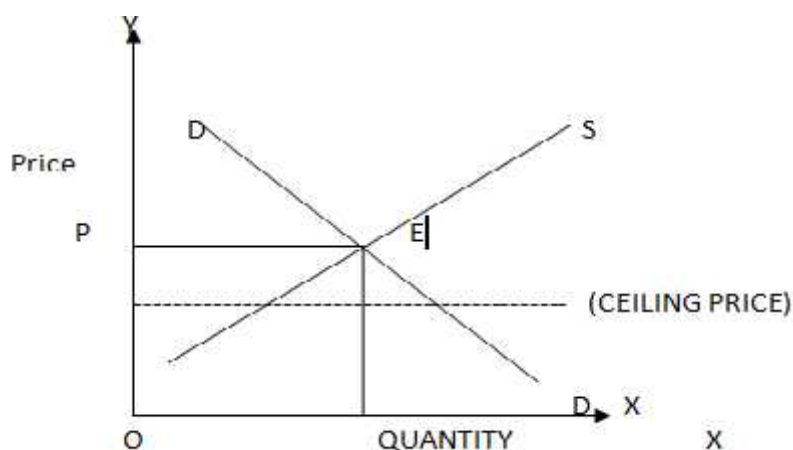
(iii) Decreases in demand = Decrease in supply:- When demand and supply decrease equally then equilibrium price remain same but quantity will fall.

SIMPLE APPLICATION OF DEMAND AND SUPPLY

Price ceiling : Price ceiling means maximum price of a product that the sellers can charge from the buyers. Often, the government fixes this price much below the equilibrium market price so that the essential commodities are within the reach of the poorer section of the society . In terms of demand and supply curves, price ceiling means fixing price by the government below the equilibrium price when the equilibrium price is presumed to be too high.

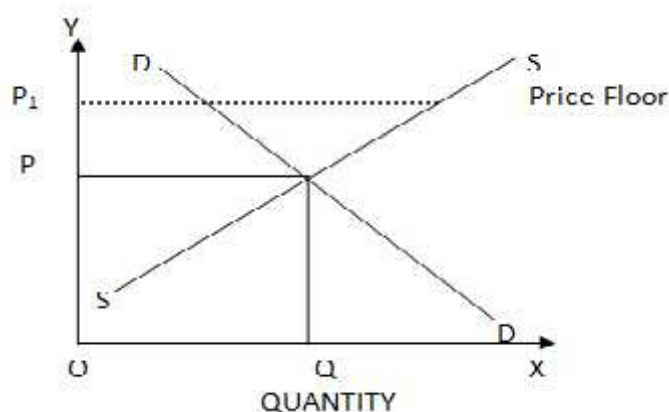
-) Price ceiling is generally imposed by the govt. on necessary items wheat, rice, kerosene, sugar, medicines during in times of 'shortages'
-) To ensure availability of the product to everyone ration coupons are issued to the buyers so that no individual can buy more than a certain amount of the

commodity and this stipulated amount of the commodity is sold through ration shops or fair price shops.



Price floor

-) When the government imposed lower limit on the price that they may be charged for the particular commodity is called price floor. In other words price being fixed above the equilibrium price.
-) Most well-known examples of imposition of price floor are agricultural price support programme and the minimum wage legislation.
-) These programmes are meant to insulate farmers and labours from income fluctuations resulting from price variations in the free market.
-) Through an agricultural price support programmes, the govt. imposes a lower limit on the purchase price for some of the agricultural goods and the floor is normally set at a higher level than the equilibrium price of these goods.

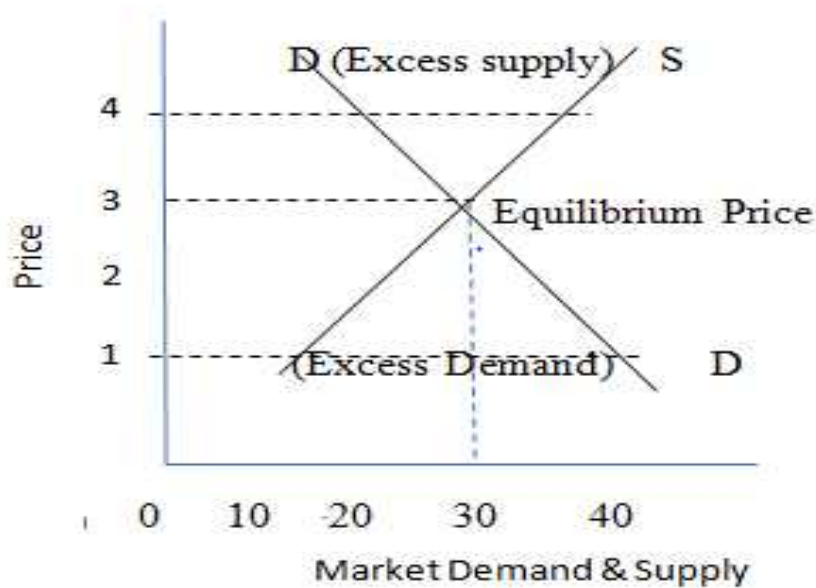


SHORT & LONG ANSWER TYPES QUESTION

Q1. Explain the process of price determination under perfect competition with the help of schedule and a diagram.

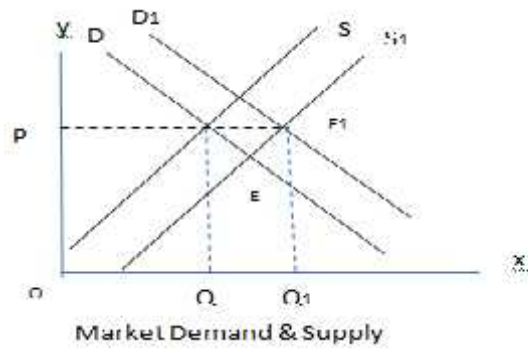
Ans:-Equilibrium price is that price which is determined by market forces of demand and supply. At this price both demand and supply are equal to each other. Diagrammatically it is determined at the point where demand curve and supply curve intersect each other. At this point price is known as equilibrium price and quantity is known as equilibrium quantity.
price and quantity is known as equilibrium quantity.

Price (Rs.)	Quantity Demand (Units)	Quantity Supply(Units)
1	50	10
2	40	20
3	30	30
4	20	40
5	10	50



Q2. When will equilibrium price not change even if demand and supply increase?

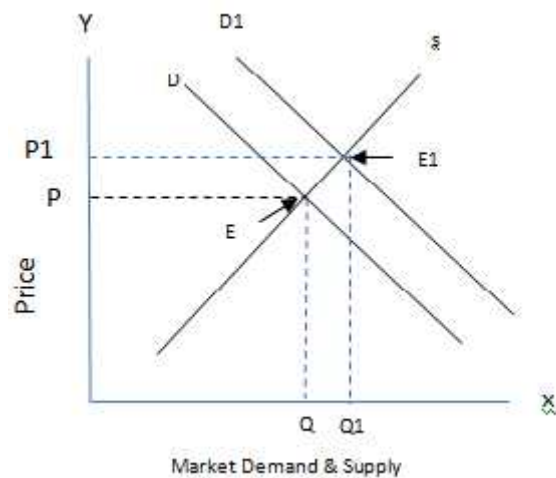
Ans:- When proportionate increase in demand is just equal to proportionate increase in supply. Equilibrium price will not change. It can be shown in the following diagrams.



In the above diagram increase in demand is just equal to increase in supply. Demand curve shift from D to D_1 and supply curve shift from S to S_1 which intersect at point E. Thus equilibrium price remain unchanged at OP though equilibrium quantity increased from OQ to OQ_1 .

Q3. How does increase in price of substitute goods in consumption affect the equilibrium price of a good? Explain with a diagram.

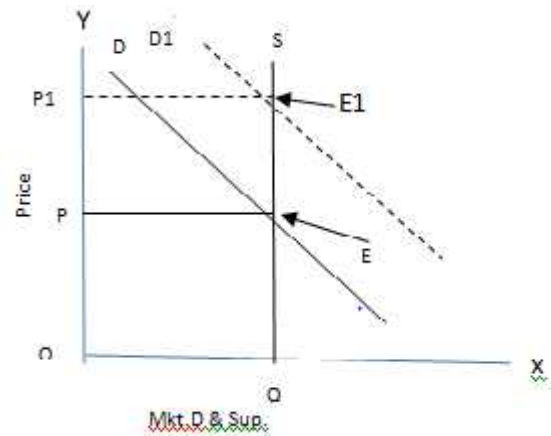
Ans:- An increase in price of substitute goods (coke) will cause increase in demand for its related goods (Pepsi) . The demand curve for Pepsi will shift to the right side. The supply curve of Pepsi remains the same. It will lead to an increase in equilibrium price of Pepsi and increase in quantity also.



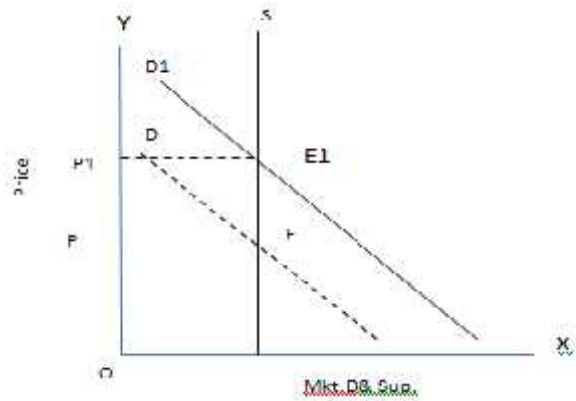
Result: Price increases from OP to OP_1 . Quantity demand increases from OQ to OQ_1

Q4. Show with the help of diagram the effect on equilibrium price and quantity when supply is perfectly inelastic and demand increases and decreases?

Ans.



When supply is perfectly inelastic and demand increases. Demand curve shift to towards right. The new demand curve D_1 intersects the supply curve at point E_1 .
 Result : Price increases from OP to OP_1 and quantity demand remains unchanged.

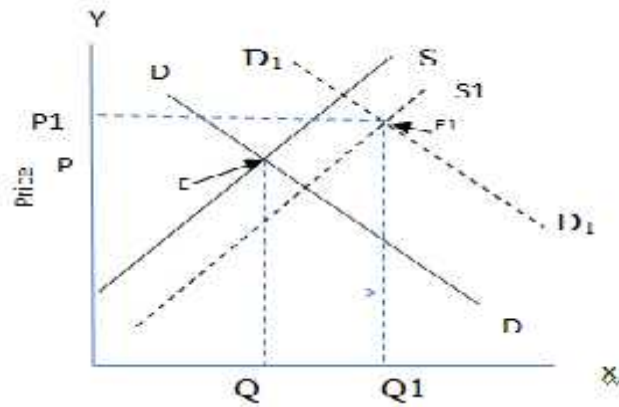


In the above diagram demand curve shift left wards from D to D_1 Price falls from OP to OP_1 , but quantity remains same.

Q5. Equilibrium price may or may not change with shifts in both demand and supply curve.
Comment.

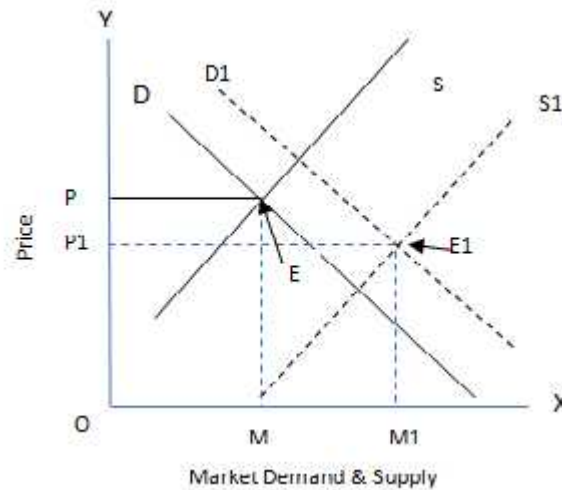
Ans:- There can be Three situations of a simultaneous right wards shift of supply curves and demand curves.

(i) **When demand increases more than supply price and quantity both will increase:**



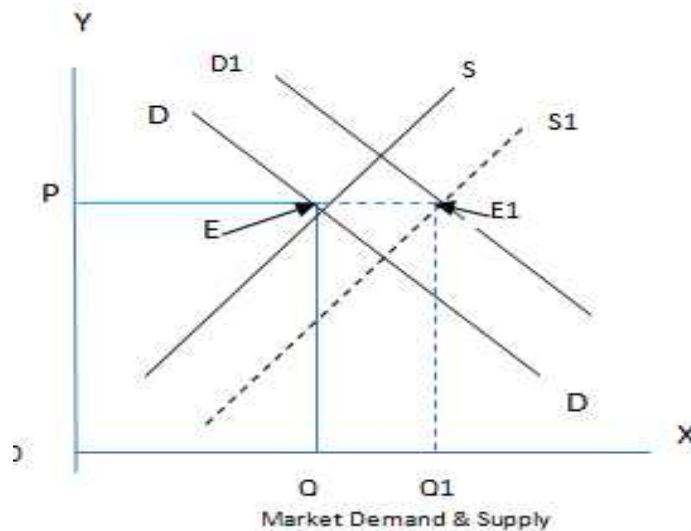
- (a) When increase in demand is more than increase in supply price increases from OP to OP1.
- (b) Quantity increases from OM to OM1. (c) Equilibrium point shift rightward from E to E1.

(ii) **When demand increases less than supply, price will fall but quantity will rise:**



- (a) When supply increases more than demand price falls from OP to OP1.
- (b) Q quantity demand increases from OM to OM1.
- (c) Equilibrium point shift rightward from E to E1.

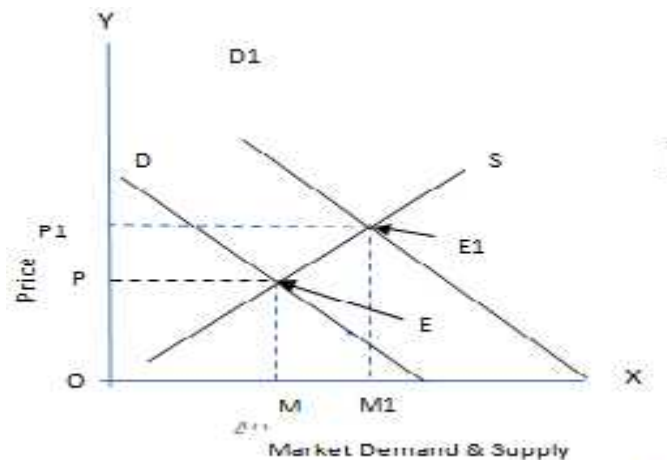
(iii) **When demand and supply increases equally then equilibrium price remain same:**



- (a) When increase in demand is equal to increase in supply price remains unchanged at OP.
- (b) Quantity exchanged increases from OQ to OQ₁.
- (c) Equilibrium point shift rightward from E to E₁.

Q6. Market for a good is in equilibrium. There is increase in demand for the goods. Explain the chain effect of this change.

Ans. Increase in Demand:- In case of increase in demand, demand curve shift to the right.

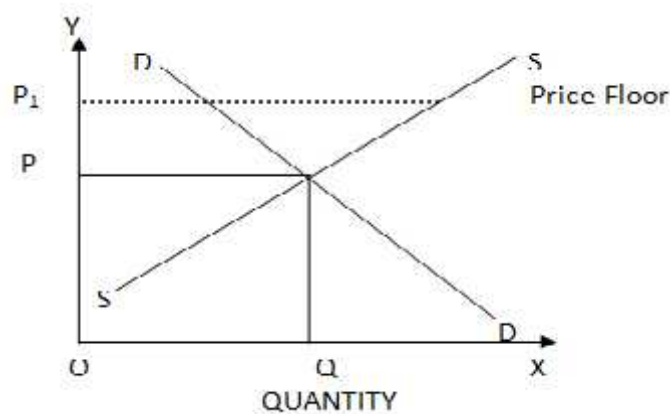


-) Increase in demand shift the demand curve from D to D₁ to right leading to excess demand E E₁ at the given price OP.
-) There will be competition among buyers leading to rise in price.
-) As price rise supply starts rising (along S) demand starts falling.
-) These changes continues till D=S at a new equilibrium at E₁
-) The quantity rises to OM to OM₁ and price rises OP to OP₁

Q7. What are the effects of price floor (minimum price ceiling) on the market of a good ? Use diagram.

Ans: Price floor: When the government imposed lower limit on the price that they may be charged for the particular commodity is called price floor. In other words price being fixed above the equilibrium price.

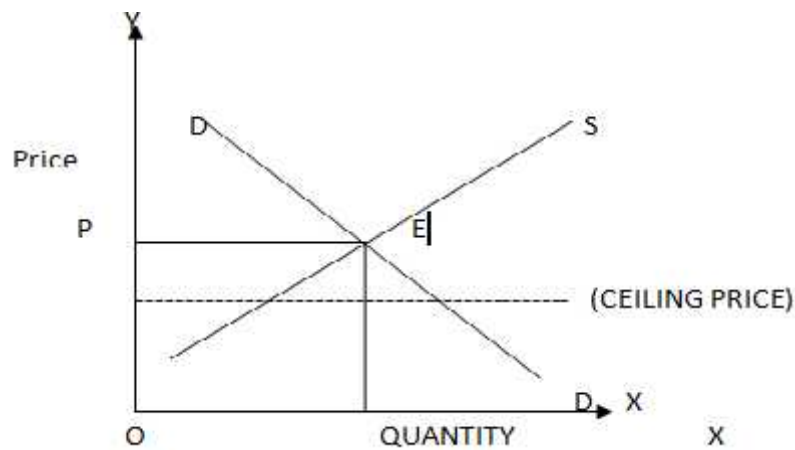
-) Most well-known examples of imposition of price floor are agricultural price support programme and the minimum wage legislation.
-) These programmes are meant to insulate farmers and labours from income fluctuations resulting from price variations in the free market.
-) Through an agricultural price support programmes, the govt. imposes a lower limit on the purchase price for some of the agricultural goods and the floor is normally set at a higher level than the equilibrium price of these goods.



Q8. Explain the effects of maximum price ceiling on the market of a good. Use diagram.

Ans. **Price ceiling:** Price ceiling means maximum price of a product that the sellers can charge from the buyers. Often, the government fixes this price much below the equilibrium market price so that the essential commodities are within the reach of the poorer section of the society. In terms of demand and supply curves, price ceiling means fixing price by the government below the equilibrium price when the equilibrium price is presumed to be too high.

-) Price ceiling is generally imposed by the govt. on necessary items wheat, rice, kerosene, sugar, medicines during in times of 'shortages'
-) To ensure availability of the product to everyone ration coupons are issued to the buyers so that no individual can buy more than a certain amount of the commodity and this stipulated amount of the commodity is sold through ration shops or fair price shops.



Q9: Market for a good is in equilibrium. There is simultaneous decrease both in demand and supply but there is no change in price. Explain how it is possible. Use schedule.

Ans.

From

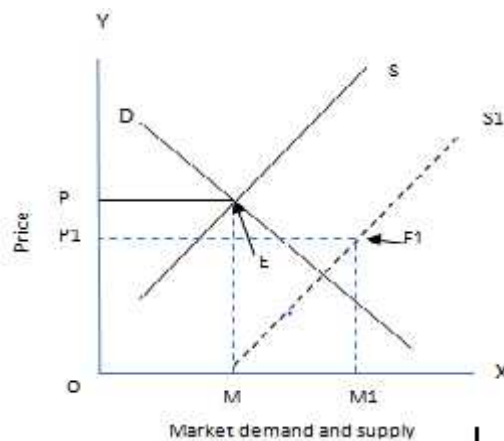
the

Price (Rs.)	Quantity Demand (Units)	Quantity Supply (Units)
5	40	80
4	60	60
3	80	40
After simultaneous Decrease in Demand & Supply		
5	20	40
4	30	30
3	40	20

above schedule, its clear that at price Rs.4, the market demand is equal to market supply of 60 Units. Hence at Rs. 4, the market is in equilibrium. For market price to remain unchanged. Decrease in demand should be exactly equal to decrease in supply.

Q10. Market for a good is in equilibrium .Supply of the good increases. Explain the chain of effects of this change.

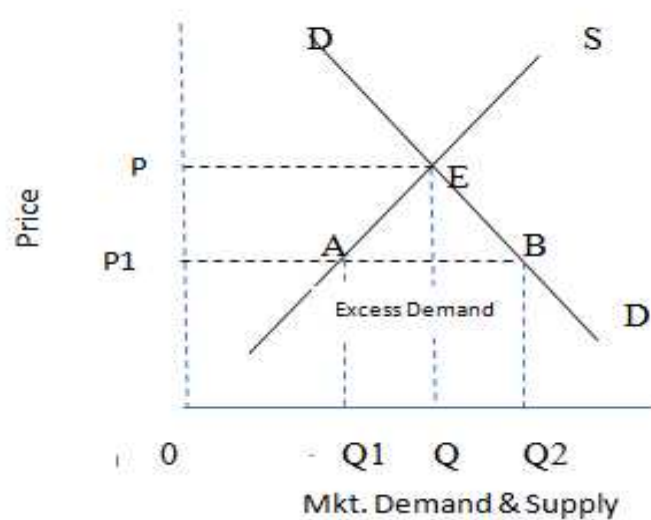
Ans.Increase in supply:- In case of increase in supply, the supply curve shifts to the right.



-) Increase in supply shift the supply curve from S to S_1 to right leading to excess supply E at the given price OP .
-) There will be competition among buyers leading to fall in price.
-) As price fall supply starts rising (along S).
-) These changes continues till $D=S$ at a new equilibrium at E_1
-) The quantity rises to OM to OM_1 and price fall OP to OP_1

Q11. If the equilibrium price of a good is greater than its market price, explain all the changes that will take place in the market. Use diagram.

Ans. Market demand and market supply are equal at point E . Thus point E shows the equilibrium price. The point signifies that equilibrium price is OP and equilibrium quantity is OQ .



In this diagram, OP is the equilibrium price which is greater than the market price OP_1 . At the given market price, there is a excess demand = AB . This triggers a rise market price. In response to the rise in price the quantity supplied tends to rise, leading to upward movement along the supply curve from A to E , Also rise in the price lead to backward movement along the demand curve , from point B to E , indicating the fall quantity demand movement along supply and demand curve would continue to occur till excess demand is eliminated, and equilibrium is restored. This occurs at point E , where market demand = market supply and equilibrium price = OP .

SHORT & LONG ANSWER TYPES QUESTION

Q1. If the equilibrium price of a good is greater than its market price, explain all the changes that will take place in the market. Use diagram.

Q2. Explain the effect of increase in demand for a good on its equilibrium price and equilibrium quantity.

Q3. Market of commodity is in equilibrium. Demand for the commodity increases. Explain the change of effects of this change till the market again reaches equilibrium. Use diagram. **(OR)** Market for a good is in equilibrium. The Demand for the good increase . Explain the change of effects of this change.

Q4. Market of commodity is in equilibrium. Demand for the commodity decreases. Explain the change of effects of this change till the market again reaches equilibrium. Use diagram. **(OR)** Market for a good is in equilibrium. Demand for the good decreases. Explain the change of effects of this change.

Q5. Market for a product is in equilibrium. Supply of the product decreases. Explain the change of effects of this change till the market again reaches equilibrium. Use diagram. **(OR)** Market for a good is in equilibrium .Supply of the good decreases. Explain the change of effects of this change on the market for the good. Use diagram.

Q6. What is meant by excess supply of a good in a market? Explain its chain of effects on the market for the good .Use diagram.

Q7. Market for a good is in equilibrium, Supply of the good increases. Explain the chain of effects of this change.

Q8. Explain the effects of maximum price ceiling on the market of a good. Use diagram.

Q9. What are the effects of price floor (minimum price ceiling) on the market of a good ? Use diagram.

Q10. What is maximum price ceiling? on what type of goods is it normally imposed. Use diagram.

Q11. What is minimum price ceiling? Explain its implications.

Q12. What is maximum price ceiling? Explain its implications.

Q13. If the prevailing market price is above the equilibrium price, explain its chain of effects.

Q14. Explain through a diagram the effect of a rightward shift of both the demand and supply curves on equilibrium price and quantity. **OR** Market for a good is in equilibrium. There is simultaneous increase both in demand and supply of the good. Explain its effect on market price.

Q15. How the equilibrium price of a commodity determined under perfect competition? Explain with the help of a schedule and diagram.

Q16. Market for a good is in equilibrium. There is simultaneous decrease both in demand and supply of the good. Explain its effect on market price.

Q17. Market for a good is in equilibrium. There is simultaneous increase both in demand and supply but there is no change in price. Explain how is it possible. Use schedule.

Q18. Market for a good is in equilibrium. There is simultaneous decrease both in demand and supply but there is no change in price. Explain how it is possible. Use schedule.

Q19. What happens if the market price is more than and less than the equilibrium price. Use a schedule and diagram.
