

DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2023-2024)

ECONOMICS

Class : XI

Under the Guidance of

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अशोक कुमार, भा.प्र.से
सचिव (शिक्षा)

ASHOK KUMAR, IAS
Secretary (Education)



राष्ट्रीय राजधानी क्षेत्र, दिल्ली सरकार

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D.O. NO. : DE.5/228/Exam/Message/SM

Dated : 24.11.2023 / 2018/1095

Message

"Children are like wet cement, whatever falls on them makes an impression."

Haim Ginott

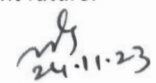
Embracing the essence of this quote, the Directorate of Education, GNCT of Delhi is unwavering in its commitment to its core mission of delivering high-quality education to all its students. With this objective in mind, DoE annually develops support materials meticulously tailored to suit the learning needs of students from classes IX to XII.

Every year, our expert faculty members shoulder the responsibility of consistently reviewing and updating the Support Material to synchronize it with the latest changes introduced by CBSE. This continuous effort is aimed at empowering students with innovative approaches and techniques, fostering their problem-solving skills and critical thinking abilities. I am confident that this year will be no exception, and the Support Material will greatly contribute to our students' academic success.

The support material is the result of unwavering dedication of our team of subject experts. The Support Material has been specially curated for our students, with the belief that its thoughtful and intelligent utilization will undoubtedly elevate the standards of learning and will continue to empower our students to excel in their examinations.

I wish to congratulate the entire team for their invaluable contribution in creating a highly beneficial and practical Support Material for our students.

I extend my best wishes to all our students for a promising and bright future.


24.11.23
(Ashok Kumar)

HIMANSHU GUPTA, IAS
Director, Education & Sports

No. PS/DE/2023/349
Date: 29/11/2023



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MESSAGE

It brings me immense pleasure to present the support material for students of classes IX to XII, meticulously crafted by our dedicated subject experts. Directorate of Education is committed to empower educators and students alike by providing these resources free of cost for students of all government and government aided schools of Delhi.

The support material is an appreciable effort to align the content with the latest CBSE patterns. It has been carefully designed as a resource to facilitate the understanding, acquisition and practice of essential skills and competencies outlined in the curriculum.

The core of this support material lies in providing a framework for adopting an analysis-based approach to learning and problem-solving. It aims to prompt educators to reflect on their teaching methodologies and create an interactive pathway between the child and the text.

In the profound words of Dr A.P.J. Abdul Kalam, **“Educationists should build the capacities of the spirit of inquiry, creativity, entrepreneurial and moral leadership among students and become their role model.”**

The journey of education is ongoing; it's the process, not just the outcome, which shapes us. This support material endeavours to be that catalyst of change for each student of Directorate of Education.

Let us embark on this transformative journey together, ensuring that every student feels equipped not only with the knowledge but also, with the skills and mindset to thrive in the 21st century.

I wish you all the best for all your future endeavours.


(HIMANSHU GUPTA)

Dr. RITA SHARMA
Additional Director of Education
(School/Exam)



सत्यमेव जयते

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D.O. No. DE.:5/22.8/Exam/Mexay/SH/
2013/1096
Dated:24.11.2023.....

MESSAGE

The persistent efforts of the Directorate in making the course material more accessible and student-friendly are evident in the conscientious preparation of the Support Material. Our team consistently adapts to the evolving educational landscape, ensuring that the Support Material for the various subjects of classes 9 to 12 align with the latest CBSE guidelines and syllabi prescribed for the annual examinations.

The Support Material encapsulates crucial subject-specific points and facts, tailored to suit the students, all presented in a lucid language. It is our firm belief that these resources will significantly augment the academic prowess of our students, empowering them to excel in their upcoming examinations.

I extend my heartfelt congratulations to the diligent officials and teachers whose dedication and expertise have played a pivotal role in crafting this invaluable content/resource.

I convey my best wishes to all our students for a future brimming with success. Remember, every page you read is a step towards an enlightened tomorrow.

Rita Sharma

(Dr Rita Sharma)

DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2023-2024)

ECONOMICS
Class : XI

NOT FOR SALE

PUBLISHED BY : DELHI BUREAU OF TEXTBOOKS

भारत का संविधान

उद्देशिका

हम, भारत के लोग, भारत को एक ¹[संपूर्ण प्रभुत्व-संपन्न समाजवादी पंथनिरपेक्ष लोकतंत्रात्मक गणराज्य] बनाने के लिए, तथा उसके समस्त नागरिकों को :

सामाजिक, आर्थिक और राजनैतिक न्याय,
विचार, अभिव्यक्ति, विश्वास, धर्म
और उपासना की स्वतंत्रता,
प्रतिष्ठा और अवसर की समता

प्राप्त कराने के लिए,
तथा उन सब में

व्यक्ति की गरिमा और ²[राष्ट्र की एकता
और अखंडता] सुनिश्चित करने वाली बंधुता
बढ़ाने के लिए

दृढ़संकल्प होकर अपनी इस संविधान सभा में आज तारीख
26 नवंबर, 1949 ई. को एतद्वारा इस संविधान को
अंगीकृत, अधिनियमित और आत्मार्पित करते हैं।

1. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से) "प्रभुत्व संपन्न लोकतंत्रात्मक गणराज्य" के स्थान पर प्रतिस्थापित।
2. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से) "राष्ट्र की एकता" के स्थान पर प्रतिस्थापित।

THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a ¹**[SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC]** and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the ²[unity and integrity of the Nation];

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Sovereign Democratic Republic" (w.e.f. 3.1.1977)
2. Subs. by the Constitution (Forty-second Amendment) Act, 1976, Sec.2, for "Unity of the Nation" (w.e.f. 3.1.1977)

भारत का संविधान

भाग 4क

नागरिकों के मूल कर्तव्य

अनुच्छेद 51 क

मूल कर्तव्य - भारत के प्रत्येक नागरिक का यह कर्तव्य होगा कि वह -

- (क) संविधान का पालन करे और उसके आदर्शों, संस्थाओं, राष्ट्रध्वज और राष्ट्रगान का आदर करे;
- (ख) स्वतंत्रता के लिए हमारे राष्ट्रीय आंदोलन को प्रेरित करने वाले उच्च आदर्शों को हृदय में संजोए रखे और उनका पालन करे;
- (ग) भारत की संप्रभुता, एकता और अखंडता की रक्षा करे और उसे अक्षुण्ण बनाए रखे;
- (घ) देश की रक्षा करे और आह्वान किए जाने पर राष्ट्र की सेवा करे;
- (ङ) भारत के सभी लोगों में समरसता और समान भ्रातृत्व की भावना का निर्माण करे जो धर्म, भाषा और प्रदेश या वर्ग पर आधारित सभी भेदभावों से परे हो, ऐसी प्रथाओं का त्याग करे जो महिलाओं के सम्मान के विरुद्ध हों;
- (च) हमारी सामासिक संस्कृति की गौरवशाली परंपरा का महत्त्व समझे और उसका परिरक्षण करे;
- (छ) प्राकृतिक पर्यावरण की, जिसके अंतर्गत वन, झील, नदी और वन्य जीव हैं, रक्षा करे और उसका संवर्धन करे तथा प्राणिमात्र के प्रति दयाभाव रखे;
- (ज) वैज्ञानिक दृष्टिकोण, मानववाद और ज्ञानार्जन तथा सुधार की भावना का विकास करे;
- (झ) सार्वजनिक संपत्ति को सुरक्षित रखे और हिंसा से दूर रहे;
- (ञ) व्यक्तिगत और सामूहिक गतिविधियों के सभी क्षेत्रों में उत्कर्ष की ओर बढ़ने का सतत् प्रयास करे, जिससे राष्ट्र निरंतर बढ़ते हुए प्रयत्न और उपलब्धि की नई ऊँचाइयों को छू सके; और
- (ट) यदि माता-पिता या संरक्षक है, छह वर्ष से चौदह वर्ष तक की आयु वाले अपने, यथास्थिति, बालक या प्रतिपाल्य को शिक्षा के अवसर प्रदान करे।



Constitution of India

Part IV A (Article 51 A)

Fundamental Duties

It shall be the duty of every citizen of India —

- (a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers, wildlife and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
- * (k) who is a parent or guardian, to provide opportunities for education to his child or, as the case may be, ward between the age of six and fourteen years.

Note: The Article 51A containing Fundamental Duties was inserted by the Constitution (42nd Amendment) Act, 1976 (with effect from 3 January 1977).

* (k) was inserted by the Constitution (86th Amendment) Act, 2002 (with effect from 1 April 2010).

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CLASS XI

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ECONOMICS (030)
CLASS XI (2022-23)

Theory: 80 Marks

3 Hours

Project: 20 Marks

Units		Marks	Periods
Part A	Statistics for Economics		
	Introduction	15	10
	Collection, Organisation and Presentation of Data		30
	Statistical Tools and Interpretation	25	50
		40	
Part B	Introductory Microeconomics		
	Introduction	04	10
	Consumer's Equilibrium and Demand	15	40
	Producer Behaviour and Supply	15	35
	Forms of Market and Price Determination under perfect competition with simple applications	06	25
		40	200
Part C	Project Work	20	20

Part A: Statistics for Economics

In this course, the learners are expected to acquire skills in collection, organisation and presentation of quantitative and qualitative information pertaining to various simple economic aspects systematically. It also intends to provide some basic statistical tools to analyse, and interpret any economic information and draw appropriate inferences. In this process, the learners are also expected to understand the behaviour of various economic data.

Unit 1: Introduction**10 Periods**

What is Economics?

Meaning, scope, functions and importance of statistics in Economics

Unit 2: Collection, Organisation and Presentation of data 30 Periods

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: (1) Geometric forms (bar diagrams and pie diagrams). (1) Frequency diagrams (histogram, polygon and Ogive) and (ii) Arithmetic line graphs (time series graph).

Unit 3: Statistical Tools and Interpretation**50 Periods**

For all the numerical problems and solutions, the appropriate economic interpretation may be attempted. This means, the students need to solve the problems and provide interpretation for the results derived.

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, Simple aggregative Method.

Part B: Introductory Microeconomics**Unit 4: Introduction****10 Periods**

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

40 Periods

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 Behaviour and Supply

35 Periods

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. 25 Periods

Perfect competition Features; Determination of market equilibrium and effects of shifts in demand and supply. (Short Run Only)

Simple Applications of Demand and Supply: Price ceiling, price floor.

Part C: Project in Economics 20 Periods

Guidelines as given in class XII curriculum

$$\frac{40}{100} \times 80 = 32 \text{ Competency} \quad \frac{16}{2}$$

$$\frac{20}{100} \times 80 = 16 \text{ Select Resp} \quad 8$$

$$\frac{40}{100} \times 80 = 32 \text{ Short} \quad \frac{16}{40}$$

Suggested Question Paper Design
Economics (Code No. 030)
Class XI (2023-24)
March 2024 Examination

Duration: 3 hrs.

Marks: 80

S.N.	Typology of Questions	Marks	Percentage
1.	<p>Remembering and Understanding: Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas</p>	44	55%
2.	<p>Applying: Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.</p>	18	22.5%
3.	<p>Analysing, Evaluating and Creating: Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations. Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.</p>	18	22.5%
	Total	80	100%

Class XI -XII		
Particulars	Academic Session 2022-23	Academic Session 2023-24
Composition of question paper year-end examination/ Board Examination (Theory)	<p>(a) Competency Based Questions are 30% in the form of Multiple-Choice Question, Case Based Questions, Source Based Integrated Questions or any other type.</p> <p>(b) Objective Question are 20%</p> <p>(c) Remaining 50% Questions are Short Answer/Long Answer Questions</p>	<p>(a) Competency Focused Questions in the form of MCQs/Case based Question Source-based Integrated Questions or any other type = 40%</p> <p>(b) Select response type questions (MCQ) = 20%</p> <p>(c) Constructed response question (Short Answer Questions/Long Answer type Questions, as per existing pattern) = 40%.</p>

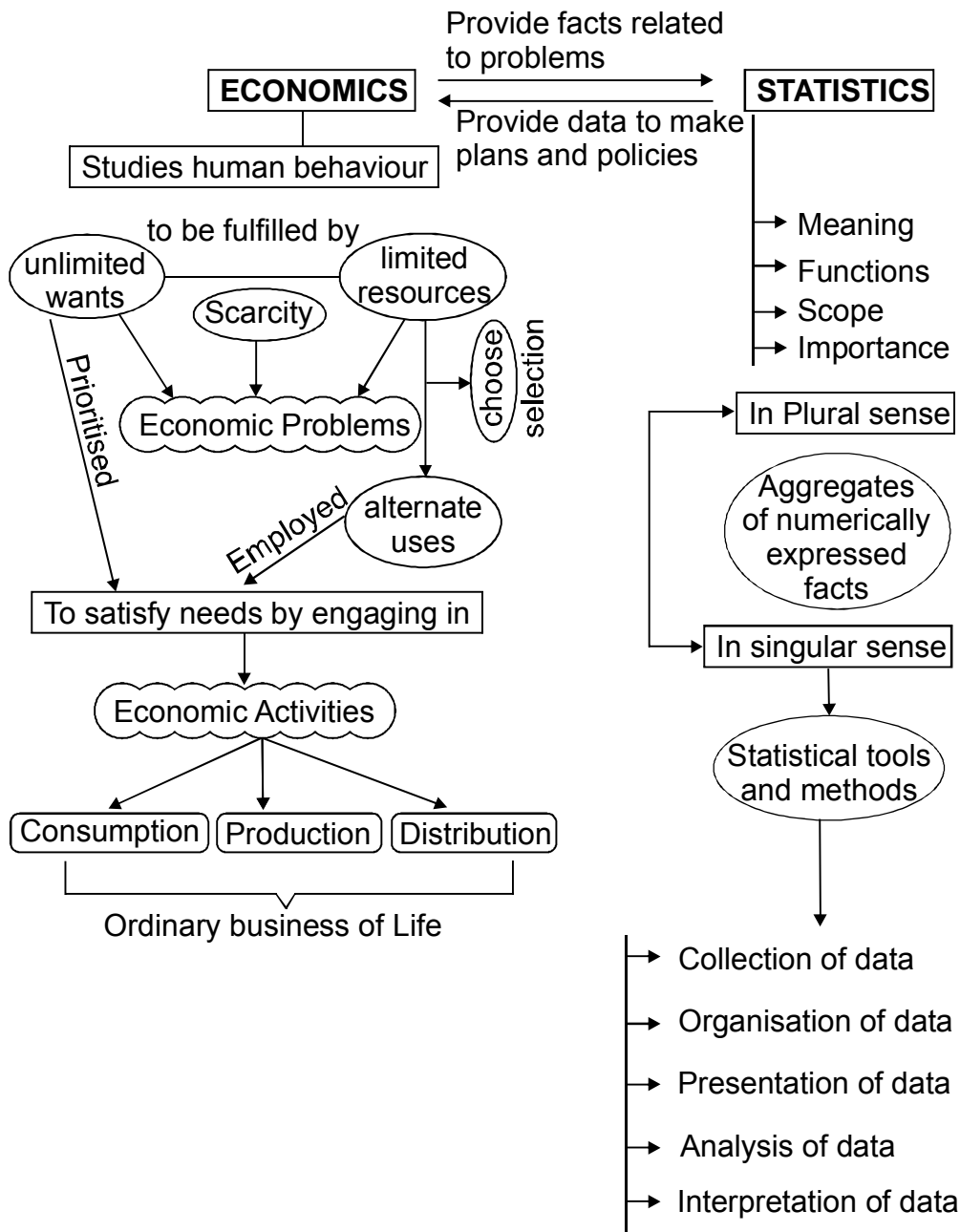
Further, Curriculum document released by the Board for the Academic Session 2023-24 and the Sample Question Papers may also be referred to for details of the QP Design of individual subject. Learning framework for various subjects for classes IX-XII is also available at the <https://cbseacademic.nic.in> for reference.

Content

S.No.	Units	Page
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STATISTICS FOR ECONOMICS		
1.	Introduction	1
2.	A : Collection of Data	13
3.	B : Organisation of Data	28
4.	C : Presentation of Data	40
PART - B		
INTRODUCTORY MICROECONOMICS		
1.	Introduction	100
2.	Consumer's Equilibrium & Demand	120
3.	Producer Behaviour & Supply	159
4.	Forms of market & Price Determination	208
5.	Practice Paper	229

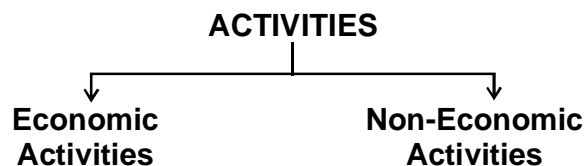
PART-A : STATISTICS FOR ECONOMICS-2023-24

**Unit - 1
INTRODUCTION**



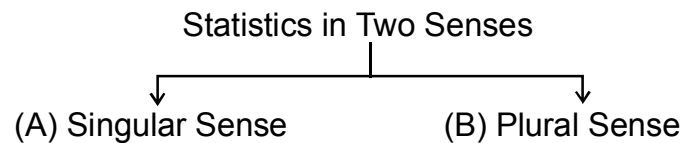
“Economics is the study of how people and society choose to employ scarce resources that could have alternative uses in order to produce various commodities and services that satisfy their wants and to distribute them for consumption among various person and groups in society.”

- **Consumer** : A consumer is one who buys goods and services for the satisfaction of his wants.
- **Producer** : A producer is one who produces goods and services for the generation of income.
- **Seller** : A seller is a person who sells goods.
- **Service Provider** : A service provider is a person who provides some kind of service to other for a payment, e.g. A doctor working in his own clinic.
- **Service Holder** : A service holder is a person who works for some other person and get paid for it in the form of wages or salary, e.g. A doctor doing job in a hospital.
- **Activities** :- There are two types of Activities



- **Economic Activities** – Those activities which increase the flow of income in the economy are called economic activities. Example- Production, consumption and capital formation.
- **Non Economic Activities** :- Those activities which do not increase the flow of income in the economy are called non-economic activities. Example- A doctor treating his child at home.
- **Scarcity** :- It refers to a situation in which supply of any good, service or resource is limited in relation to its demand. Scarcity is the root cause of all economic problems.
- **Economic Problems:**
 - Unlimited wants
 - Limited resources which satisfy wants
 - Resources may have alternative uses.

- **Statistics :-** Statistics may be defined in two main senses.



- **Statistics in singular sense :-** In singular sense statistics may be defined as the collection, organisation, presentation, analysis and interpretation of numerical data.
- **Statistics in plural sense :-** In plural sense statistics means aggregate of Numerical facts, which can be placed in relation to one another and which may be affected by multiplicity of causes.
- Statistics in plural sense must possess the following characteristics:
 1. Aggregate of facts
 2. Numerically Expressed
 3. Collected in a systematic manner
 4. Collected for a pre-determined purpose
 5. Collected with reasonable standard of accuracy
 6. Should be placed in relation to each other for comparison
 7. Affected by multiplicity of causes
- **Functions of Statistics :-**
 1. To simplify complex facts
 2. To present facts in definite form
 3. To facilitate policy formulation
 4. To help in forecasting
 5. To make comparison of facts and to find the relationship between them.
 6. To enlarge individual knowledge and experience
- **Importance of Statistics in Economics :-**
 1. Every branch of economics takes support from statistics in order to prove various economic theories in it.
 2. Helps in understanding and solving various economic problem.
 3. Helps in studies of market structure.

4. Helps in establishing mathematical relation.
 5. Useful to study of different economic concepts.
 6. Useful to evaluate the effect of economic policies.
- **Scope of Statistics :-**
 Today the importance of statistics is increasing day by day. Not a single area is visible where statistics is not in use.
 In all fields statistics is required whether it is business, politics, banking, economic research etc. For the efficient governance and policy formation data are required to govt. also.
 - **Limitations of Statistics :-**
 1. Statistics deals only with quantified facts.
 2. Statistics deals with aggregate of facts and not with individual facts.
 3. Statistical results are true on an average.
 4. Only experts can make the best possible use of statistics.
 5. Data should be uniform and homogeneous.
 6. Statistics can be misused.

QUESTION BANK

COMPETENCY BASED QUESTIONS (1 MARK)

1. Define Economics.
2. What are economic activities.
3. Define non-economic activity.
4. Give examples each of economic activity and non economic activity.
5. What is scarcity?
6. What is consumption?
7. Define Production.
8. What is Distribution?

SELECT RESPONSE TYPE QUESTION (1 MARK)

9. **The root cause of all economic problems is -**

(a) Poverty	(b) population
(c) Unemployment	(d) scarcity

10. Economics is best defined as the study of how people

- (a) use their infinite resources
- (b) attain wealth
- (c) employ scarce resources
- (d) attain education from best school

11. Today's activities of my friend Atul who is a singer, given below:

1. In the morning He perform stage show for singing and get ₹ 10000 as a fee.
2. In the evening he celebrate his 4 years daughter's birthday at home and he sang a song for her

From above information which statement is true-

- (a) activity 1 is economic activity and 2 is non economic activity
- (b) activity 1 is non-economic and 2 is economic activity
- (c) Atul is a service provider
- (d) (a) and (c) both are true

12. Economic problem implies

- (i) Unlimited wants
- (ii) Limited resources
- (iii) Alternative uses of resources
- (iv) All of the above

13. Which of the Following is not a non-economic activity

- (a) Blood donation for a noble cause
- (b) household work done by a mother
- (c) care of children by father
- (d) service provided by doctor in hospital

14. Which of the following statement is not true:

- (i) Statistics solve economic problems
- (ii) Statistics helps to analyse economic problems
- (iii) Statistics helps in formulating policies
- (iv) Statistical methods are no substitute for common sense

Q.15. 'COVID-19 cases are on rise'. This is a _____

- (a) Qualitative fact

- (b) Qualitative data
 - (c) Quantitative fact
 - (d) Statistical data
- 16. Which of the following activities does not constitute the ordinary business of life?**
- (a) Producing goods and services
 - (b) Selling goods and services
 - (c) Buying goods and services
 - (d) Storing goods and services
- 17. Identify a service provider**
- (a) A waiter working in a restaurant
 - (b) A labour working on a construction site
 - (c) A cobbler sitting roadside
 - (d) A manager of a firm
- 18. Which is not an economic activity**
- (a) Saving as much as we can
 - (b) production of goods and services
 - (c) consumption of goods and services
 - (d) selling goods and services
- 19. Statistics deals with-**
- (a) Only one number
 - (b) Only qualitative data
 - (c) Facts which can be numerically expressed
 - (d) None of the above
- 20. Choose the correct sequence of stages of a statistical study**
- (a) Collection of data, organisation of data, presentation of data, analysis of data, interpretation of data
 - (b) Organisation of data, presentation of data, collection of data, interpretation of data, analysis of data
 - (c) Collection of data, analysis of data, presentation of data, organisation of data, interpretation of data
 - (d) Collection of data, analysis of data, organisation of data, presentation of data, interpretation of data.

Competency Focused Questions

Assertion (A) and Reason (R) Question

DIRECTIONS for the questions 21 and 22

In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

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

21. Assertion (A) : Statistics helps in condensing the mass of data in a representative value.

Reason (R) : Numerical measures such as Mean, Median etc. summarise the data.

22. Assertion (A) : When economic facts are expressed in Statistical terms, they become exact.

Reason (R) : Exact facts are more convincing than vague statement.

Case-based Questions

Climate change is also a global problem just like Corona and the whole world has to deal with it. In the next 20 years, global temperatures will cross the 1.5 degree Celsius threshold. The last decade was much warmer than the previous 1.25 million years, recording 1.09 degrees Celsius between 2011 and 2020 compared to between 1850 and 1900. If greenhouse gas emissions continue as they are currently, global temperatures will cross the 2°C threshold in the middle of the 21st century itself. Every 1 degree Celsius increase in temperature will increase the intensity of heavy to heavy rain events by 7 percent. Concentration of carbon dioxide is the highest in 20 million years. The data given in the above report will be helpful in policy formulation on climate reflection as statistics.

23. Economic facts definitely proves helpful in _____ the problem

- (a) analysing
- (b) finding measures to solve
- (c) evaluation of impact of
- (d) all of the above

24. Statistical methods can not _____ the problem

- (a) solve (b) predict
(c) assess (d) all of the above

25. The relationship between greenhouse gas emissions and global temperatures can be _____

- (a) Known (b) Verified
(c) Forecast (d) All of the above

CONSTRUCTIVE RESPONSE QUESTIONS (3-4 MARKS)

1. Describe the importance of statistics in economics.
2. Explain any three characteristics of statistics
3. Explain the scope of statistics.
4. State any three limitations of statistics.
5. State any three function of statistics.
6. Consumption, Production and distribution are economic activities, and were considered as ordinary business of life by Alfred Marshall. Explain.

ANSWER OF ONE (1) MARK QUESTIONS

1. Economics is that science which deals with the use of scarce resources that have alternative uses to fulfill unlimited wants.
2. Those activities which increase the flow of income in the economy. Example : Production, consumption, capital formation etc.
3. Those activities which do not increase the flow of income in the economy. Example : A teacher teaching his own child.
4. Example of economic activity:
 - A producer producing goods and services for the generation of income.
 - Example of non- economic activity: A teacher teaching his own child.
5. It refers to shortage of resources in relation to their demand.

6. It is process in which people uses goods and services in order to satisfy their wants.
7. It is a process in which producer produce goods and services for the generation of income.
8. Distribution of National income which is generated due to production of goods and services among factors of production and society.
9. (d)
10. (d)
11. (d)
12. (d)
13. (d)
14. (a)
15. (c)
16. (d)
17. (c)
18. (a)
19. (c)
20. (a)
21. (a)
22. (b)
23. (a)
24. (a)
25. (d)

Constructed Response Questions Exam Oriented Questions with Answer

Q.1. What is the importance of statistics in economics ?

Ans. A number of economic problems can easily be understood by the use of statistics. It helps in formulation of economic policies e.g., basic economic activities like production, consumption etc. The importance of statistics in various parts of economics as follows:

- a) **Statistics in consumption** : Statistics helps in understanding how different groups of people spend their income on various goods and services. The data of consumption are useful and helpful in planning their budget and improve their standard of living. It helps producer to analyse consumption pattern, understanding of standard of living of particular region.
- b) **Statistics in production** : The comparative study of the production process is done with the help of statistics. The statistics of production are very useful and helpful for adjustment of demand and supply and determining quantity of production of the commodity.
- (c) **Statistics in distribution** : Statistical methods are used in solving the problem of distribution of national income among various factors of production i.e, land, labour, capital and entrepreneur.

Q.2. Explain functions of statistics.

Ans. Statistics performs very important functions, these are :

1. **Helps in Understanding Economic problem** : Statistics is an indispensable tool for an economics that helps to understand an economic problem. Using its various methods, effort is made to find the causes behind it with the help of the quantitative facts of the Economic problem.
2. **Presentation of facts in definite form** : Statistics enables an economist to present economic facts in a precise and definite form that helps in proper comprehension of what is stated. When economic facts are expressed in statistical terms, they become exact.

3. **Statistics helps in condensing mass data in to few numerical figures**, which can be easily summarised : For example, it would be impossible for us to remember the income of all the people of a group if the number of people is very large. Yet, one can remember easily a summary figure like the average income. In this way statistics summarises and presents meaningful overall information about a mass of data.
4. **Establishes relation between various factors** : Statistics is used in finding relationships between different economics factors. An economist may be interested in finding out, what happens to the demand for a commodity when its price increases or decreases ? By applying statistical method, one can answer whether any relationships exist or not.
5. **Helps in formulation of plans and policies** : Statistical methods, help in formulating appropriate economic policies and plans to solve various economic problems.

Q.3. Explain limitations of statistics.

Ans. Statistics has some limitations, these are

1. **Statistics does not study an individual fact** : Study of an individual is not a part of subject matter of statistics. Statistics studies the aggregate of facts only.
2. **Statistics deals with quantitative facts only** : Statistics are numerically expressed. Statistics does not study qualitative aspects. It can be used to measure quantitative data only.
3. **Statistical results are only on an average** : Unlike the laws of natural sciences, statistical observations are not error free. These are not always valid under all conditions.
4. **Only experts can make the best possible use of Statistics** : Statistics can be used by experts only. It requires special knowledge to use statistical tools otherwise results may be wrong.
5. **Uniformity and Homogeneity of Data** : It is essential that data must have the quality of uniformity and homogeneity to make data comparable.

Q.4. “You have unlimited wants and limited resources to satisfy them”. Explain this statement by giving an example. How do you choose the wants to be satisfied?

Ans. Our wants are unlimited but the resources to satisfy them are limited and have alternative uses.

If a student have ₹ 500. He wants to buy books and a new dress. But he can't purchase both in ₹ 500 as the total cost is ₹ 800. So, he will choose that which is most urgently required.

A person choose wants to be satisfied first according to the priority of needs, satisfaction attached and availability of resources to satisfy that want.

Q.5. ‘Statistical methods are no substitute of common sense!’ Support this statement with the help of a suitable example.

‘or’

‘Statistics can be misused’. Give example.

‘or’

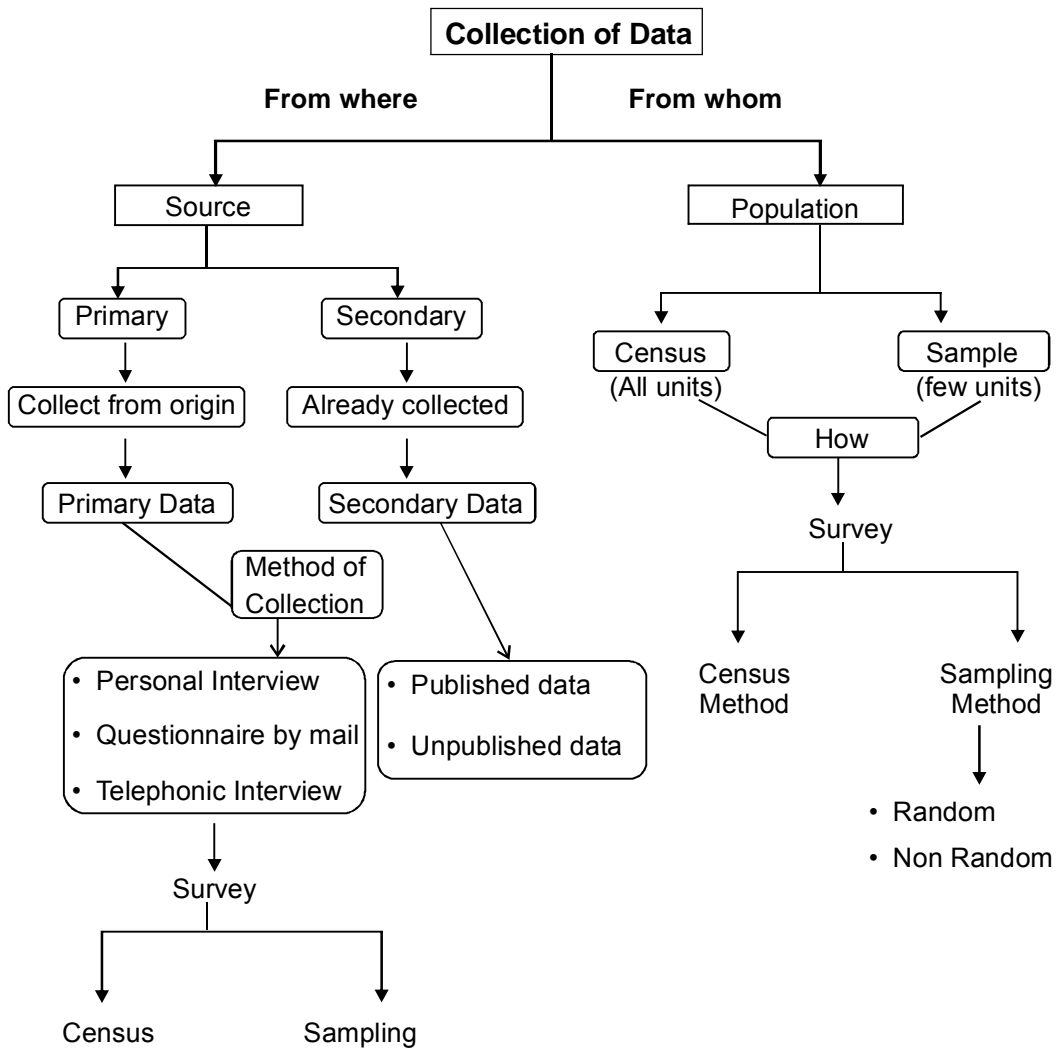
‘Statistics can lead to mistrust’ support this with an example.

Ans. The above statement can be supported with the following example:

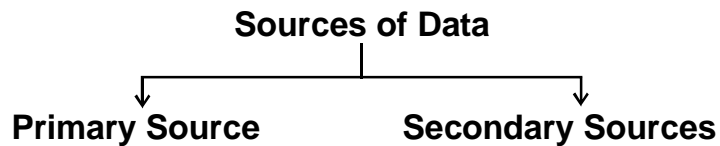
Once a pandemic broke out in various cities of a region. The authorities of a city decided to contain infection by increasing testing to identify infected persons. The more testing reduces the chance of missing the infected especially asymptomatic or mildly symptomatic person who otherwise would have been moving within society and spread infection. This testing drive led to report high rise in positive cases. Few person concluded that more testing leads to more infected persons, & so, the cities which are not testing asymptomatic or mild symptomatic persons are having less spread of infection.

In fact, this was not true. Therefore, we can say that statistics are no substitute of common sense.

Unit - 2
COLLECTION, ORGANISATION AND PRESENTATION OF DATA
A : COLLECTION OF DATA



- Data is a tool, which helps in understanding problems by providing information.
- **The data are comparative numerical facts and information. The data are tools which help in reaching a sound conclusion by providing information therefore for statistical investigation, collection of data is the first and foremost.**



- **Primary Data** – The data originally collected in the process of investigation is known as primary data. It is first hand data.
 - **Methods of collecting primary data :-**
 - i) Personal Interviews
 - ii) Mailing (Questionnaire) Surveys
 - iii) Telephone Interviews
1. **Personal Interviews**
This method is used when the researcher has access to all the members. The researcher (of investigator) conducts face-to-face interviews with the respondents.
 2. **Mailing Questionnaire**
When the data in a survey are collected by mail, the questionnaire is sent to each individual by mail with a request to complete and return it by a given data
 3. **Telephone Interviews**
In a telephone interview, the investigator asks questions over the telephone.

Advantages of Personal Interview

- Highest Response Rate
- Allows use of all type of questions
- Better of using open-ended questions
- Allows clarification of ambiguous questions.

Disadvantages of Personal interview

- Most expensive

- Possibility of influencing respondents
- More time taking

Advantages Mailed interviews

- Least expensive
- Only method to reach remote areas
- No influence on respondents
- Maintains anonymity of respondents
- Best for sensitive questions

Disadvantages

- Cannot be used by illiterates
- Long response time
- Does not allow explanation of unambiguous question
- Reactions cannot be watched

Telephonic Interviews

Advantages

- Relatively low cost
- Relatively less influence on respondents
- Relatively high response rate

Disadvantages

- Limited use
- Reactions cannot be watched
- Possibility of influencing respondents.
- **Secondary Data** :- The data which have been collected for some other purposes by some other agencies and is obtained by a person for a new purpose are called secondary data.
- **Published sources** such as government reports, documents, newspapers, research papers, books written by scholars, International Publication, websites etc.
- **Unpublished source** work of a scholar which is not published, reports of an institution.
- **Sources of Secondary Data** :-
 - 1) Published sources
 - 2) Unpublished sources
 - 3) Other sources – Web site
- **The most common type of instrument used in surveys:**
- **Questionnaire/interview schedule.**
- **Questionnaire:** It is a set of Questions relating to the problem of investigation answered by the respondent himself in his own writing.

The questionnaire is either self administered by the respondent or administered by the researcher (enumerator) or trained investigator.

- **Schedule** : Answers to the questions are obtained in a form which is filled by the enumerators on the basis of the answers given by the respondents.
- **Investigator**: The person who conducts statistical investigation/enquiry.
- **Enumerator**: Person engaged by the investigator to collect the data.
- **Respondent** : The person from whom the statistical information is collected.
- **Pilot survey** : It is a try out of the Questionnaire with a small group which is known as Pilot Survey or Pre-testing of the questionnaire. It helps to know the shortcomings and drawbacks of the questions, assessing the suitability of questions, clarity of instructions, performance of enumerators and the cost and time involved in the actual survey.

Merits or importance of pilot survey

1. The pilot survey helps in providing a preliminary idea about the survey.
2. It help in pre-testing of the questionnaire, so as to know the short comings and drawbacks of the questions.
3. Pilot survey also helps in assessing the suitability of questions.
4. Clarity of instructions performance of enumerators and the cost and time involved in the actual survey.

Exit Polls

You must have seen that the when an election takes place, the television networks provide election coverage. They also try to predict the results. This is done through exit polls, where in a random sample of voters who exit the polling booths are asked whom they voted for. From the data of the sample of voters, the prediction is made.

- **Important points to be kept in mind while drafting a questionnaire.**
 - 1) Introduction and purpose of investigation.
 - 2) Reasonable number of questions.

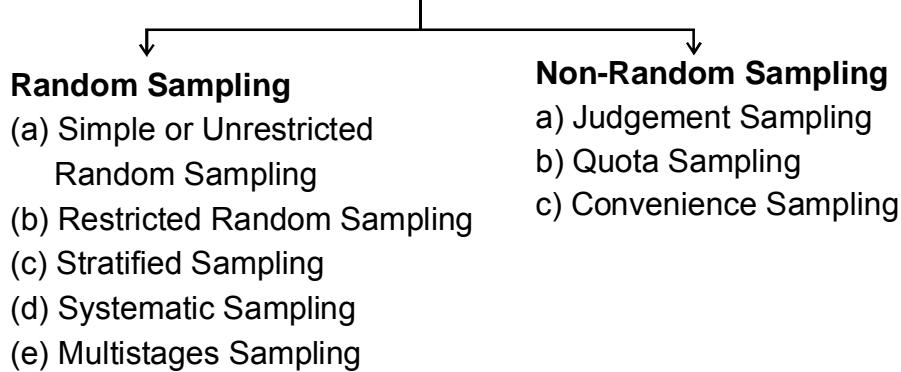
- 3) Questions should be arranged logically.
 - 4) Questions should be small and clear.
 - 5) Questions should be relevant to the investigation.
 - 6) Personal questions should be avoided.
 - 7) Avoid questions. which require calculations.
- **Population or the Universe:** In statistics, it means totality of the items under study to which the results of the study are intended to apply. A population possess certain characteristics (or a set of characteristics), according to the purpose of the survey Population representing the characteristics of whole population from which information is to be obtained.
 - **Advantage of a sample:** It is capable of providing reasonably accurate information about the population at a much lower cost.
 - **Types of Sampling:** Random sampling and Non- Random sampling
 - **Random sampling:** Sample is selected at random from the population. Every unit of population has an equal chance to be selected as sampling unit.
 - **There are two types of random sampling**
 - a) Simple or unrestricted random sampling
 - b) Restricted random sampling

a) Simple or unrestricted random sampling:
A simple random sampling is one in which every item of the population has an equal chance of being selected.

Two ways of simple (unrestricted) random sampling:

 - (1) **Lottery method:** A separate slip of all items names/numbers is made and selected in an unbiased way. Nowadays computer programmes are used to select random samples.
 - (2) **Tables of random numbers:** To select sample from a large size of population, some scholars have made Random numbers tables. These tables contain random numbers arranged in rows and columns. The most popular table or random numbers is Tippett's Random number table.

Methods of Sampling



- **Non-Random sampling** : All the unit of a population do not have equal chance of being selected as sampling unit. It depends on the judgement, or convenience of the investigator.
 - (1) **Judgement sampling** : Under this method, the choice of sample items depends exclusively on the judgement of the investigator.
 - (2) **Quota sampling** : Under this method, the items of the population are subdivided into various groups and then a quota (number of items to be selected from each sub-group) is fixed.
 - (3) **Convenience sampling** : Under this method, while selecting the sample units, the investigator prefers his convenience.
- **Survey** : It is the way to collect data. It is a method of gathering information from individuals.
- **Statistical investigation/enquiry**: It means search for information conducted by using statistical methods and instruments.
- **Census Survey** : In this method every element of population is included in investigation.
- **Sample Survey** : In this method a group of units representing all the units of population are investigated.
- **There are some agencies both at the national and state level to collect, process and tabulate the statistical data.**

Some of the agencies at the national level are

 - (1) Census of India,

- (2) National Sample Survey Organisation (NSSO)
- (3) Central Statistics Office (CSO)
- (4) Registrar General of India (RGI)
- (5) Directorate General of Commercial Intelligence and statistics (DGCIS)
- (6) Labour Bureau, etc.

Census of India and National Sample Survey Office (NSSO)

- The census of India provides the most complete and continuous demographic record of population.
- The NSSO was established by the Govt. of India to conduct nation wide survey on socio -economic issues like employment literacy, maternity, child care, utilisation of public distribution system etc.
- The data collected by NSSO survey are released through reports and its quarterly journal 'Sarvekshana'.

QUESTION BANK

Competency Focussed Questions (1 MARK)

- 1) What is data?
- 2) What are the two main types of data?
- 3) Give the meaning of primary data.
- 4) What is secondary data?
- 5) Write the meaning of population in statistics.
- 6) Define sample.
- 7) What is direct personal investigation?
- 8) What is random sampling?
- 9) State any two sources of secondary data.
- 10) What is NSSO stands for?
- 11) What is census method
- 12) What is a pilot survey?

Select Response Type Questions (1MARK)

- 13) Main demerit of mailing questionnaire is that the respondents.
(a) do not answer the questions.

- (b) do not read them carefully.
 - (c) do not send it back.
 - (d) All the above.
- 14) What type of questions should not be included in a questionnaire?
- (a) Two-way
 - (b) Multiple choice
 - (c) Open-ended
 - (d) Leading (giving a clue)
- 15) 'Census of India' collect data related to :
- (a) Industry
 - (b) National Income
 - (c) Agriculture
 - (d) Demography
- 16) Which is the most expensive method of data collection in term of time, money and efforts involved?
- (a) Telephone Interviews
 - (b) direct personal investigation
 - (c) information through questionnaires
 - (d) information from local sources
- 17) Which one of these is not a method of secondary data collection.
- (a) Questionnaires
 - (b) Interviews
 - (c) Observations
 - (d) All of the above
- 18) Secondary data may include which of the following?
- (a) Official documents
 - (b) Personal documents
 - (c) Archived research data
 - (d) All of the above
- 19) Which one of the following is not a mode of collection of primary data :
- (a) Questionnaires
 - (b) Personal Interviews
 - (c) Telephone interviews
 - (d) Published source
- 20) Primary data can be collected from-
- (a) its source of origin
 - (b) an agency
 - (c) a website
 - (d) NSSO

- 21) Data collected from NSSO (National Sample Survey Organisation) are called-
- (a) Primary data
 - (b) secondary data
 - (c) primary and secondary data both
 - (d) none of the above
- 22) Which one is not a mode of collecting primary data-
- (a) Direct Personal investigation
 - (b) data obtained from Census of India reports
 - (c) information through questionnaire
 - (d) indirect oral investigation
- 23) Personal investigation method is not suitable for
- (a) If field of Investigation is very large
 - (b) if field of Investigation is Limited
 - (c) if greater degree of originality of data is required
 - (d) if information is to be kept secret
- 24) Which is not a feature of a good questionnaire
- (a) Undesirable questions
 - (b) limited number of questions
 - (c) proper order of questions
 - (d) simple and short questions
- 25) Which one is a merit of census method-
- (a) Costly
 - (b) It require huge manpower
 - (c) not suitable for large area
 - (d) investigation is reliable and accurate

Competency Based Questions (1 MARK)

- 26) Data originally collected in the process of Investigation method are known as (primary data/ secondary data)
- 27) are costlier in term of time, money and efforts than the (secondary

data/ primary data)

- 28) Is a person who collects data for the investigator (enumerator/respondent)
- 29) Is a group of items from universe which represents characteristics of the universe. (investigators/ sample)
- 30) in mailing method questionnaires are filled by (Investigator/informant)
- 31) "Collection of primary data is more economic than secondary data". (true /false)
- 32) Census method is suitable when area of Investigation is very large (true /false)
- 33) Oxford. Astrazencea vaccine recommended for conditional approval. Before recommendation and approval, the efficacy of vaccine must have been ascertained on _____ of people for investigation on various age groups (sample/universe)
- 34) 60% turnout over 5 days of vaccination. The city recorded a turn out of 86% at its centres, the highest for a single day.
H.T January 25, 2021
This is a _____ data. (Published/unpublished)
- 35) Mr. X says that according to his observation, 10 people are infected from COVID-19 in his locality. This is a _____ source of data.

(Primary/Secondary)

Assertion (A) and Reason ® Question

DIRECTIONS for the questions 36 and 37

In each of the questions given below, there are two statements marked as Assertion (A) and Reason ®. Mark your answer as per the codes provided below:

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

(d) Both A and R are false

(e) Both A and R are false.

36) **Assertion (A)** : Random sampling is one where the individual units from the population are selected at random.

Reason (R) : In random sampling, every individual has an equal chance of being selected.

37) **Assertion (A)** : Closed-ended questions are easy to use, score and to codify for analysis.

Reason (R) : They tend to restrict the answers by providing alternatives

Case-Based Questions-I

An investigator collects data in very few days regarding the percentage expenditure on fast food by households in a locality. The total households are 1,000 and investigator himself collects the data. It surveyed 100 households.

Answer the following questions on the basis of above information:

38) The _____ survey conducted by investigator.
(Census/Sample)

39) The data collected is _____ in nature.
(primary/secondary)

40) The data is collected by _____ investigation.
(Direct personal/indirect oral)

Sample, Primary, Direct personal

Case-Based Questions-II

A researcher wants to collect data from people on the understanding of climate change. These days online surveys or surveys through Google forms are popular and researcher collected the data by sending a Google form to his friends and family making a request to forward it.

41) The data collected will be

- a) reasonably reliable
- b) accurate information at a lower cost
- c) shorter time
- d) all of the above

- 42) Requirement of enumerators is
- a) Very large
 - b) Large
 - c) Small
 - d) No requirement
- 43) The data from Google form may cover population of
- a) Wide area
 - b) only educated people
 - c) only having internet facility
 - d) all of the above
44. State whether the following statements are True or False.
- (i) There are many sources of data.
 - (ii) Telephone survey is the most suitable method of collecting data. When the population is literate and spread over a large area.
 - (iii) Data collected by investigator is called the secondary data.
 - (iv) There is a certain bias involved in the non-random selection of samples.

Constructed Response Type Questions (3 - 4 MARKS)

- 1) Differentiate between primary data and secondary data
- 2) Differentiate between Personal Interviews and Telephone Interviews.
- 3) What is the difference between a questionnaire and a schedule?
- 4) Explain the importance of pilot surveys.
- 5) What are the main sources of secondary data? Explain.
- 6) What precautions are necessary while using secondary data?
- 7) Write the precautions to be taken while taking data from a website.
- 8) What type of information does the reports and publications of NSSO contain?
- 9) Differentiate between census and sample.

- 10) Write two merits and two demerits of Census method.
- 11) Mention four demerits of sample method.
- 12) What do you mean by random sampling? Explain it's Lottery method.
- 13) Discuss the stratified sampling with an example.
- 14) What are the essentials of a sample ?
- 15) "Sampling is a necessity under certain conditions". Explain.

Constructed Response Type Questions (6 MARKS)

- 1) "The choice of source of data and mode of collection depends on the objective of the study"
- 2) Explain personal Interview method of collection of data. Write its merits and demerits.
- 3) Write a short note on census survey.
- 4) What is a questionnaire? Write the qualities of a good questionnaire.
- 5) Explain, why a sample survey is usually preferred over a census survey.
- 6) Explain the procedure for selecting a random sample of 3 students out of 10 in your class by using random number tables.

ANSWERS OF ONE MARK QUESTIONS

- 1) The data are tools which help in reaching a sound conclusion by providing information.
- 2) (i) Primary data (ii) Secondary data
- 3) The primary data are original data which are collected for the first time by an investigator.
- 4) The data which have been collected for some other purposes by some other agencies are called secondary data.
- 5) In statistics population or universe simply refers to an aggregate of items to be studied for an investigation.

- 6) A group of items taken from the population for investigation and representative of all the items.
- 7) It is method of investigation in which data are collected personally by the investigator by asking questions.
- 8) A method in which each item of the universe has equal chance of being selected in the sample.
- 9) (i) Published sources (ii) Unpublished sources
- 10) NSSO is the largest organisation which conducts regular socio economic survey.
- 11) The sampling error is the difference between the result of studying a sample and the result of the census of the whole population.
- 12) The errors that occur in acquiring, recording or tabulating statistical data.
- 13) (d) 14) (c) 15) (d)
- 16) (b) 17) (d) 18) (d)
- 19) (d) 20) (a) 21) (b)
- 22) (b) 23) (a) 24) (a)
- 25) (d)
- 26) Primary data
- 27) Primary data; Secondary data
- 28) Enumerators
- 29) Sample 30) Informant
- 31) False 32) False
- 33) Sample 34) Published
- 35) Primary 36) B
- 37) A 38) Sample
- 39) Primary 40) Personal Interview
- 41) D 42) D
- 43) D 44) (i) False
(ii) False
(iii) False
(iv) True

Constructed Response Questions with Answers

Q.1. Explain difference between the primary and secondary data.

Ans. 1) The data collected by the investigator for his own purpose for the first time are called primary data.
2) These are original as these are collected from the source of origin.
3) These are costlier in terms of time, money and efforts involved.
4) Example : Investigator makes a list of marks obtained by students in economics of class XI by interrogating them.

- **Secondary Data**

- 1) Data which are already in existence and which have been collected for some other purposes are called secondary data.
- 2) These are not original as these are already in existence. These can be obtained from published or from any other sources.
- 3) These are less costlier in terms of time, money and efforts involved.
- 4) Example : Investigator collects the marks obtained by class teacher in economics of class XI from his school records like award list, result register etc.

Q.2. What are personal interviews? Write the merits and demerits of personal interviews.

Ans. Personal Interviews : This method is used when the researcher has access to all the members. The researcher conducts face to face interviews with the respondents. The interviewer has the opportunity of explaining the study and answering any query of respondents.

Merits :

- 1) Get the highest response rate by this method.
- 2) The Misinterpretation and the misunderstanding can be avoided.
- 3) Watching the reactions of respondents can provide supplementary information.

4) Allows clarification of ambiguous questions.

Demerits :

- 1) It is expensive.
- 2) It requires trained interviewer.
- 3) It takes longer time to complete the survey.
- 4) Presence of the researcher may inhibit respondents from saying what they really think.

Q.3. Differentiate between the census method and the sample method.

Ans. Census Method :

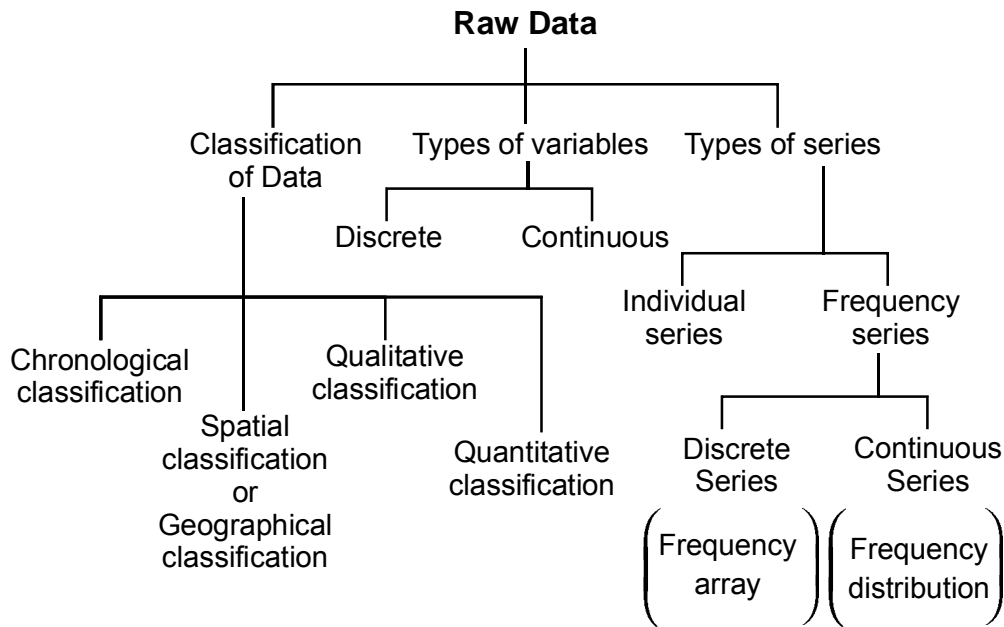
- 1) The Census covers every individual/unit belonging to the population.
- 2) Since all items are studied under census method, highest degree of accuracy is possible.
- 3) As all items are studied under census method, this method is very expensive and involves a lot of money and efforts.
- 4) The Census method is very time consuming as all items are studied.
- 5) The Census method is suitable when items in the universe have diverse characteristics.
- 6) This method is suitable when the area under investigation is relatively small.

Sample Method :

- 1) The Sample is a smaller group selected from the population from which the relevant information would be sought.
- 2) Since only representative units are studied under sample method. It is less accurate. However errors can be easily detected and removed.
- 3) As only few units are studied under sample method, this method is comparatively less expensive.
- 4) The Sample method is less time consuming as only sample units are studied.
- 5) The Sample method is suitable when items in the universe are homogeneous.
- 6) This method is suitable when the area under investigation is large.

Unit - 2

B : ORGANISATION OF DATA



- **Raw Data** : Investigator collect data which is complex and unorganised mass of figures is called raw data or pure data. To make them comprehensible, analyse and draw inferences, these are classified and tabulated.
- **Organisation of data** refers to the systematic editing, arrangement and classification of facts and figures (raw data) in such a form that comparison of masses of similar data may be facilitated and further analysis may be possible.
- **Classification is the process** of arranging data into sequences and groups according to their common characteristics of separating them into different but related parts.
- **Characteristics of classification :-**
 - 1) Homogeneity
 - 2) Clarity
 - 3) Flexibility
 - 4) Diversification
 - 5) Suitability

- **Basis of classification :**

- 1) **Chronological classifications** :- The data are classified either in ascending or in descending order with reference to time such as years, quarters, months, weeks etc.
- 2) **Spatial classification** :- The data are classified with reference of geographical location such as countries, states, cities, districts etc.
- 3) **Qualitative classification** :- The data are classified with reference to descriptive characteristics like sex, caste, religion, literacy etc.
- 4) **Quantitative classification** :- The data are classified on the basis of some measurable characteristics such as height, age, weight, income, marks of students etc.

Statistical series : Is one in which the data are arranged in proper and systematic manner.

Attributes : The characteristics which cannot be expressed quantitatively are called Attributes or Qualities. For example: Nationality, literacy, religion, gender, marital status etc. These can be classified on the basis of the presence or the absence of a qualitative characteristic.

Variable :- Variable is a characteristic which is capable of being measured and capable of change in its value from time to time. There are two types of variables.

- a) **Discrete variables** :- Those variables that increase in jumps and can't take any value between two adjacent number. For example number of students, number of workers.
- b) **Continuous Variables** :- Those variables which can take all the possible values (integral as well as fractional in a given specific range. For example height, weight etc.

These are two type: Individual series and frequency series (Frequency distribution).

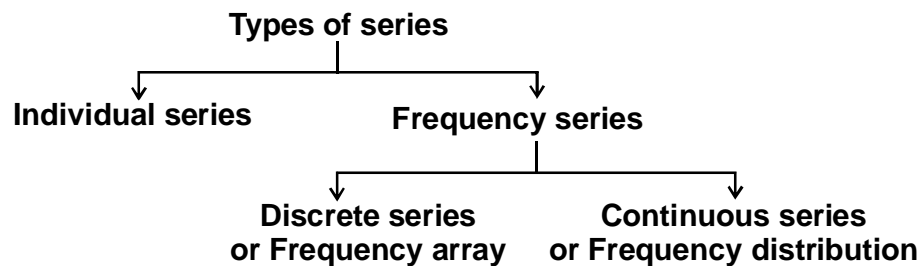
Individual series : All items are listed individually, i.e., each item is given a separate value.

For example:	Value	Frequency
	10	2
	15	5

Frequency Array: The classification of a data of discrete variable is known as Frequency array. It is ungrouped data known as Discrete series.

- **Frequency distribution** :- It is the series in which items assume a range of values and are placed within the range or limit. It is also known as continuous series. It is grouped data.
- **Class Limits** :- Class limits are the two ends of a class. The lowest value of a class is called lower class limit and the highest value of a class is called upper class limit.
- **Class interval** :- The magnitude spreads between the lower and upper class limits is called interval. for example 10-20, 10 is the lower limit and 20 is the upper limit.
- **Class frequency** :- The number of observations lies in a particular class interval is known as its class frequency.
- **Class Mid-point or class mark** :- The mid-value which lies half way between the lower and upper class limits is known as mid-point, or it is the central point of a class interval. For example: Mid point of

$$\text{Class } 10 - 20 = (10+20)/2 = 15 \text{ (Mid Point)}$$



- **Univariate Frequency Distribution:-** The frequency distribution based on a single variable or characteristics is called a univariate distribution.

Example: Marks of a student.

- **Bivariate Frequency Distribution:-** A bivariate frequency distribution is the frequency distribution which is based on two variables or characteristics.

Example: The tables shows the sales and advertisement expenditure of the firm.

- **Exclusive Method:-** Under this method upper limits are excluded. The upper limit of class interval is the lower limit of the next class interval. For example, if the marks obtained by students are grouped as 5–10, 10–15, 15–20, 20–25 etc. If the marks of a student is 15 then it will be included in 15–20, not in 10–15.
- **Inclusive Method:-** Under this method upper limits are included in respective classes. For example if the marks obtained by students are grouped as 5–9, 10–14, 15–19, 20–24 etc. If the marks of a student is 9 then it will be included in the class 5–9.
- **Loss of Information :** The classification of data as a frequency distribution has an inherent short coming. While it summarises the raw data making it concise and comprehensible. But it does not show the details of individual units that are found in raw data. So there is a loss of information in classifying raw data.

It include only number of information not the original value of observations. All observations are assumed to have equal value i.e. middle value. Or by the use of class marks instead of the actual value of the observations it is known as loss of information.

- **Individual series :-** The Individual series are those series in which items are listed singly. For example :-

Roll No.	Marks
1	18
2	95
3	82
4	59
5	92

- **Discrete series (Frequency array) :-** That series in which data are prescribed in array that clearly shows the number of times a value appears in a series Or we can say Discrete (series) variable take whole value not intermediate fractional value between two integral values in know as frequency array.

For example :-

Size of household	No. of household
1	15
2	10
3	20
4	30
5	15
6	10

- **Continuous series Frequency Distribution** :- It is that series in which items can take any numerical values. The items assume a range of values and are placed within the range of limits (Equal or greater than lower limit and Less than upper limit).
- For example :-

Marks	Frequency
0-10	5
10-20	7
20-30	10
30-40	8

QUESTION BANK

Competency Focused Questions (1 MARK)

- 1) State the meaning of classification.
- 2) State the meaning of qualitative classification.
- 3) What is a variable ?
- 4) Give the meaning of mid-value.
- 5) Define discrete series or frequency array.
- 6) Define class-interval.
- 7) Give the meaning of exclusive series.
- 8) What is meant by frequency ?
- 9) What do you mean by continuous variable ?

Select Response Type Questions (1 MARK)

- 10) **Choose the correct one about inclusive series;**
 - (a) Value of upper limit is included in the same class interval.
 - (b) Value of lower limit is included in the previous class interval

- (c) Value of upper limit of one class interval is the lower limit of next class interval.
- (d) It is also known as open end series

11) **Choose the correct match:**

- (a) Frequency Distribution \Rightarrow Individual series
- (b) Frequency Array \Rightarrow Discrete series
- (c) Mid Value \Rightarrow $\frac{\text{Upper limit} - \text{lower limit}}{2}$
- (d) Class Interval \Rightarrow $\frac{\text{lower limit} + \text{upper limit}}{2}$

12) The number of times an item repeat itself in a class interval is known as _____.

13) **Choose the correct one:**

An open end series in that series in which:

- (a) Lower limit of the first class interval is not given
- (b) Upper limit of the last class interval is not given
- (c) In which frequency of the last class interval is missing
- (d) Either (a) or (b) or both (a) and (b)

14) **Class intervals maybe classified as**

- (a) Equal class intervals and unequal class intervals
- (b) Inclusive class intervals and exclusive class intervals
- (c) (a) and (b) both
- (d) Only (b)

15) **Exclusive class intervals may exclude**

- (a) Lower limit of the class
- (b) upper limit of the class
- (c) Either lower limit or upper limit of the class
- (d) exclude both the limits

Which of the following alternative is true?

16) The class midpoint is equal to:

- (a) The average of the upper class limit and the lower class limit
- (b) The product of upper class limit and the lower class limit
- (c) The ratio of the upper class limit and the lower class limit
- (d) None of the above.

17) The frequency distribution of two variables is known as

- (a) Univariate distribution
- (b) Bivariate distribution
- (c) Multivariate distribution
- (d) None of the above

18) Statistical calculation in classified data are based on

- (a) The actual values of observations
- (b) The upper class limits
- (c) The lower class limits
- (d) The class midpoints

Competency Focussed Questions

19) Calculate class size and mid value of class interval “20–40”.

20) **From the following frequency distribution.**

Calculate no. of student, who got marks between 70 – 75.

Marks (less than)	65	70	75	80
No. of students	0	2	17	32

21) Those series in which items are listed singly, is known as _____.

22) _____ is the difference between the largest and smallest observation.

23) **Choose the correct match.**

- (a) Classification of data on the basis of time period
⇒ Geographical classification
- (b) Difference between upper limit and lower limit of class
⇒ Class mark
- (c) No. of students in a class ⇒ continuous variable
- (d) Words “Less than & More than related to
⇒ Cumulative frequency series

24) **Choose the correct statement:**

- (a) Discrete variable data are normally expressed in fractions.
- (b) Cumulative frequency is the frequency of a class.
- (c) A frequency distribution should not have more than 5 classes.
- (d) Statistical calculations in classified data are based on the class mid–points.

25) The frequency distribution based on two variables is known as _____.

26) A characteristic which is capable of being measured and changes its value overtime is called _____.

Assertion (A) and Reason (R) Question

DIRECTIONS for the questions 27 - 29.

In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R) Mark your answer as per the codes provided below:

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

27) **Assertion (A) :** Classification of objects or things saves our valuable time and effort

Reason (R) : Classification is arranging or organising things into groups or classes based on some criteria.

- 28) **Assertion (A)** : A discrete variable takes only certain values which changes only by a finite 'jumps' and not intermediate fractional values between two integral values

Reason (R) : The case of discrete variables, both exclusive and inclusive class intervals can be used.

- 29) **Assertion (A)** : The classes 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.

Reason (R) : Use of class mark instead of the actual values of the observations in statistical methods involves considerable loss of information

Constructed Response Type Questions (3 - 4 Marks)

- 1) State the objectives of classification.
- 2) Write the characteristics of a good classification.
- 3) Difference between discrete and continuous variables.
- 4) Write three advantages of classification.
- 5) By using exclusive method and inclusive method make a frequency distribution from following data :-
33, 10, 17, 15, 20, 12, 18, 16, 20, 22, 29, 29, 23, 24, 16, 11, 16, 19, 24, 30, 29, 18, 42, 26, 32, 14, 40, 20, 23, 27, 30, 12, 15, 18, 24, 36, 18, 48, 21, 28
- 6) What is a variable? Distinguish between a discrete and a continuous variable.
- 7) Explain the 'exclusive' and 'inclusive' methods used in classification of data.
- 8) Distinguish between Univariate and bivariate frequency distribution.

Constructed Response Type Questions (6 Marks)

- 1) Explain the types of classification of data.
- 2) Define statistical series. How many types of these are ?
- 3) Do you agree that classified data is better than raw data ? why ?
- 4) "The quick brown fox jumps over the lazy dog" Examine the above sentence carefully and note the numbers of letters in each word. Treating the number of letters as a variable, prepare a frequency array for this data.

ANSWER OF ONE (1) MARK QUESTIONS

- 1) Classification is the grouping of related facts into different classes.
- 2) The classification according to qualities or attributes of the data are called qualitative classification.
- 3) Variable is a characteristic which is capable of being measured and capable of changing in its value from time to time.
- 4) It lies halfway between the lower class limit and the upper class limit of a class.
- 5) A discrete series or frequency array is that series in which data are presented in a way that exactly measure the number of items a value appears in a series.
- 6) The magnitude spreads between the lower and upper class limit is called class interval.
- 7) When the class intervals are so fixed that the upper limit of one class interval is the lower limit of the next class interval it is called an exclusive series.
- 8) Frequency is number of times an item repeats itself in the series.
- 9) Those variables which can take all the possible values (integral as well as fractional) in a given specified range.
- 10) (a)
- 11) (b)

- 12) Class Frequency
- 13) (d)
- 14) (b)
- 15) (b)
- 16) (a)
- 17) (b)
- 18) (d)
- 19) Class Size = 20
Mid Value = 30
- 20) 15
- 21) Individual Series
- 22) Range
- 23) (d)
- 24) (d)
- 25) Bivariate frequency distribution
- 26) Variable

Constructed Response Type Questions with Answers

Q.1. Discuss the different methods of classification of data.

Ans. The raw data is classified in various ways depending on the purpose.

- 1) **Chronological Classification** :- In such a classification data are classified either in ascending or in descending order with reference to time such as years, quarters, months, weeks etc.
- 2) **Spatial Classification** :- The data are classified with reference to geographical locations such as countries, states, cities, districts etc.
- 3) **Qualitative classifications** Characteristics like nationality, literacy, religion, gender, marital status etc. are called qualities or attributes. They can not be measured. Yet these attributes can be classified on the basis of either the presence or the absence of a qualitative classification.
- 4) **Quantitative classification** :- Characteristics like height, weight, age, income, marks of students etc, are quantitative in nature. When the collected data of such characteristics are grouped into classes. It becomes a quantitative classification.

Q.2. Explain characteristics of classification.

Ans. The main characteristics of classification are :

- 1) **Homogeneity** : The data classified in one group or class should be homogeneous. All items in a group must be similar to each other.
- 2) **Clarity** : Classification should be done in such a way that meaningful conclusion is possible. Each item of the data should belong to one particular class only. There should be no confusion about the group or class of a given item.
- 3) **Flexibility** : Classification should be flexible and should be able to adapt to new condition of the given enquiry. Some of the classes may have to be abandoned and new classes need to be added.
- 4) **Diversification** : Classification should be done in such a way that every items of study can be classified into class. If all items are not included in the classes arrangement of data will not be correct.

- 5) **Suitable to objectives of study** : The basis selected for classification should be in accordance with the objectives of the statistical study. If basis selected for classification do not match the requirement, the entire exercise of investigation will be meaningless.

Q.3. Construct a discrete frequency series the help of following data by arranging in ascending order.

Marks

6 6 5 7 9 8 7 4 8 4
6 5 7 5 9 7 8 5 6 5

Ans.	Marks	Tally-bars	Frequency
	4	II	2
	5	IIII	5
	6	IIII	4
	7	IIII	4
	8	III	3
	9	II	2
	Total —		20

Q.4. Prepare a frequency distribution by inclusive method taking class interval of 7 from the following data :

28 17 15 22 29 21 23 27 18 12 7 2 9 4 6 1 8 3 10 5
20 16 12 8 4 33 27 21 15 9 3 36 27 18 9 2 4 6 32 31
29 18 14 13 15 11 9 7 1 5 37 32 28 26 24 20 19 25 19 20

Ans	Class Interval	Tally-bars	Frequency
	1-7	IIII IIII IIII	15
	8-14	IIII IIII II	12
	15-21	IIII IIII IIII	15
	22-28	IIII IIII	10
	29-35	IIII I	06
	36-42	II	02
	Total —		60

Q.5. What is 'loss of information' in classified data?

Ans. The frequency distribution summarises the raw data by making it concise and comprehensible. However, it does not show the details that are found in raw data and leads to loss of information. When the raw data is grouped into classes, an individual observation has no significance in further statistical calculations.

For example, the class 20-30 contains 5 observations : 22, 25, 23, 28, 27. So, when these data are grouped as a class 20-30, then individual values have no significance and only frequency i.e., 5 is recorded and not their actual values. All values in this class are assumed to be equal to the middle value of the class interval. Statistical calculations are based on the values of class mark instead of the actual values. As a result, it leads to considerable loss of information.

Q.6. Is classified data better than Raw data?

Ans. The unclassified data or raw data are highly Unorganised. They are often very large and cumbersome to handle. To draw meaningful conclusions from them is a tedious task. While, classified data is easy to understand and concise in nature. It is easier to draw meaningful conclusions from them.

Therefore, proper organisation and classified data is better than Raw data.

Q.7. What is inclusive method of classification? Why and how the adjustment in class interval is done to make it an exclusive series. Explain with the help of a numerical example.

Ans. In inclusive method, class limits are so determined that the class limits are included in the class itself. Upper limit of a class is not the same as the lower limit of the next class.

Example 10-19, 20-29

To make the continuity between the upper limit of a class and the lower limit of the next class the adjustment in class interval is done. After adjustment the values of a variable falling within upper limit of previous class and lower limit of next class can also be included in the series. For adjustment the difference of lower limit of next class and upper limit of pervious class is calculated. For 10-19, 19-29, the difference will be $20-19 = 1$.

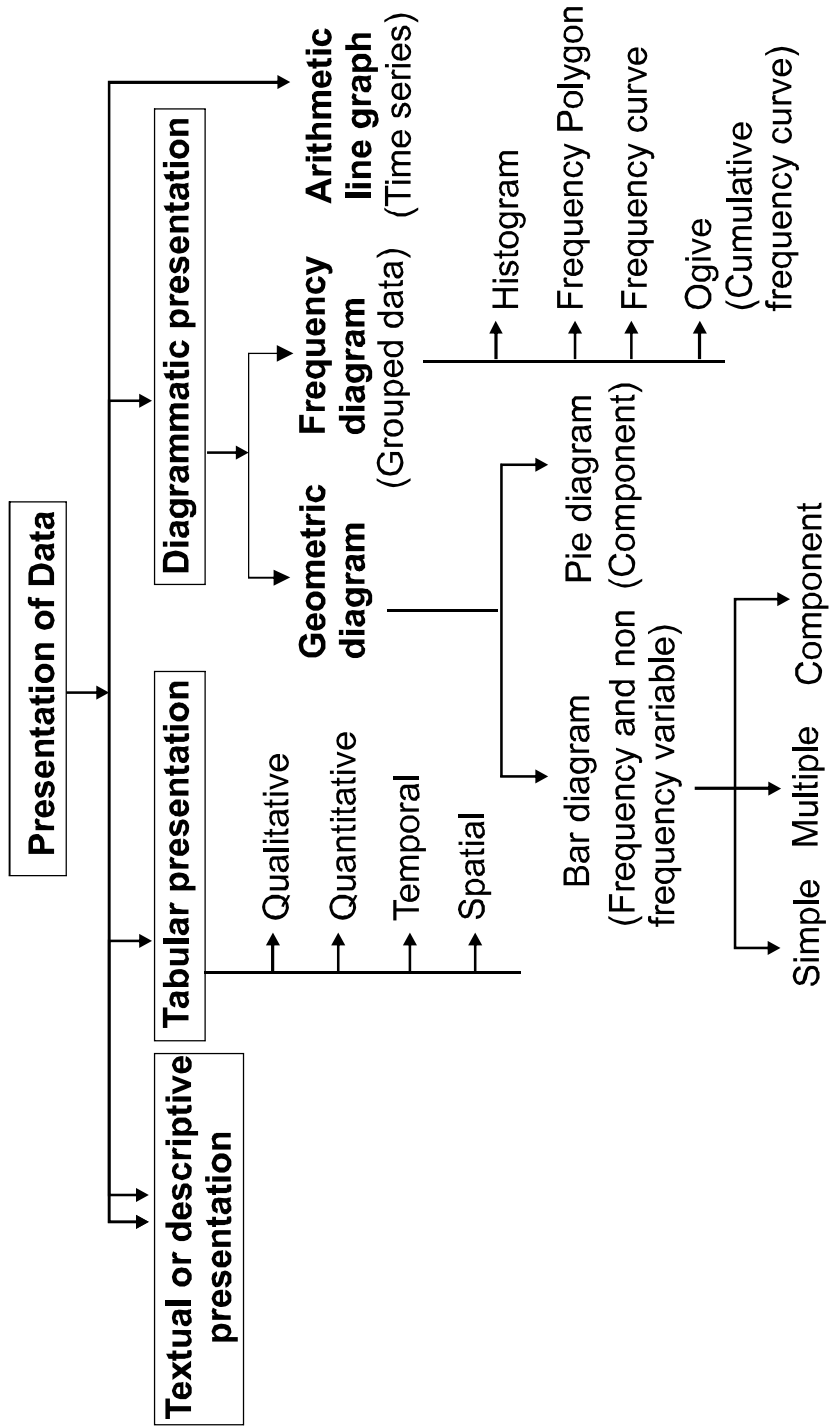
Divide the difference by two i.e. $1/2 = 0.5$.

Subtract the value obtained from lower limits of all classes $10-0.5 = 9.5$, $20-0.5 = 19.5$

Add the value of difference in upper limits of all classes. $19 + 0.5 = 19.5$, $29 + 0.5 = 29.5$.

Now the inclusive series is adjusted as exclusive series. $9.5 - 19.5$, $19.5 - 29.5$.

Unit - 2 (continued)
C : PRESENTATION OF DATA



The data are generally voluminous; they need to be put in a compact and presentable form. There are generally three forms of presentation of data:

- 1. Textual Presentation of Data**
- 2. Tabular Presentation of Data**
- 3. Diagrammatic Presentation of Data**

Textual Presentation of Data

Data is described within the text. When the quantity of data is not too large, this form of presentation is more suitable.

Merit: It enables one to emphasise certain points of the presentation.

Demerit: One has to go through the complete text of presentation for comprehension.

Example: Delhi has an estimated 300000 health care workers of which 2,40,000 have registered for vaccination. 25,762 of them out of targeted 42,578 had been vaccinated in five days, reflecting an overall turnout rate of 60.5%.

2. Tabular Presentation of Data :-

In a tabular presentation, data are presented systematically in rows (horizontally) and columns (vertically). The most important advantage of tabulation is that it organises data for further statistical treatment and decision-making.

Classification used in tabulation is of four kinds:

- Qualitative
- Quantitative
- Temporal and
- Spatial

Qualitative classification

When classification is done according to attributes such as social status, physical status, nationality etc. it is called qualitative classification. For example, if in a table the attributes for classification are sex and location, which are qualitative in nature.

Quantitative classification

In quantitative classification, the data are classified on the basis of characteristics which are quantitative in nature. In other words, these characteristics can be measured quantitatively, for example age, height, production, income etc.

Temporal classification

In this classification time becomes the classifying variable and data are categorised according to time . Time maybe in hours , days , weeks , months , years , etc . For example sales in a year.

Spatial classification

When classification is done on the basis of place it is called spatial classification. The place maybe a village , town , block , district , state , country etc . For example export from India to USA was 12.5 % and to Germany 2.4% in 2013 -14 as share of total export etc.

Statistical Table : It is a systematic organisation data in columns and rows.

In a tabular presentation, data are presented in rows (horizontally) and columns (vertically). The most important advantage of tabulation is that it organises data for further statistical treatment and decision making.

To construct a table it is important to learn first what the parts of a good statistical table are. When put together in a systematically ordered manner these parts form a table. The simplest way of conceptualising a table may be data presented in rows and columns along with some explanatory notes.

Tabulation : It is the process of presenting the data in the form of a statistical table. Or we can say a table is to present the data in rows and columns along with some explanatory notes.

Tabulation can be done using one-way, two-way or three-way classification depending upon the number of characteristics involved. A good table should essentially has the following:

- i. Table Number
- ii. Title
- iii. Captions or Column Headings
- iv. Stubs or Row Headings
- v. Body of the Table
- vi. Unit of Measurement

Table No.
Title
(Head Note)

Stub	Caption		Total (Rows)
	Sub-Head	Sub Head	
	BODY		
Total (column)			

Source note

Foot note

vii. Source Note

viii. Footnote

Essential guidelines for construction of a good table:

1. Ideal manageable size
2. Appropriate size of columns and rows
3. Systematic presentation without overlapping
4. Approximation of large numbers
5. Self-explanatory
6. Facilitates comparison
7. Should have all parts of a table

Tabulation depending upon the number of characteristics involved: One-way, two-way or three-way classification

One-way table: These tables are constructed on the basis of only one characteristic of population. For example, Distribution of students on the basis of age.

Two-way table : These tables are constructed on the basis of two characteristics of population. For example, Distribution of students on the basis of age and sex.

Three-way table : These tables are constructed on the basis of three characteristics of population. For example, Distribution of students on the basis of age, sex and class.

Merits of Tabular Presentation

1. Simple and Brief Presentation
2. Easy Analysis
3. Facilitates Comparison
4. Economical
5. Highlights Characteristics of Data

Demerits of a Tabular presentation:

1. Preparation of tables require proper understanding of characteristics of data.
2. They are not enable for quicker comprehension of the facts presentation as diagrams.

Diagrammatic Presentation of Data :-

This method provides the quickest understanding of the actual situation

to be explained by data in comparison to tabular or textual presentations. Diagrammatic presentation of data translates quite effectively the highly abstract ideas contained in numbers into more concrete and easily comprehensible form.

Merits of Diagrammatic Presentation:

- Provides the quickest understanding.
- Translates data into more concrete and easily comprehensible form.
- Much more effective.
- Attractive and interesting

Demerits of a Diagrammatic presentation:

- Suitable only for comparison
- Misinterpreted easily
- Limited information
- Not suitable for further analysis

Diagrams may be more or less accurate but are much more effective than tables in presenting the data. There are various kinds of diagrams in common use. Amongst them the important ones are the following:

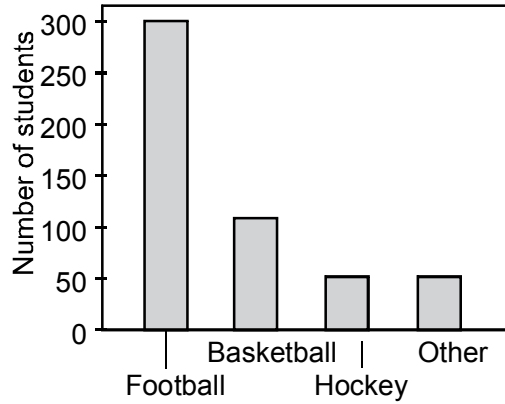
- (I) Geometric diagram
- (ii) Frequency diagram
- (iii) Arithmetic line graph

Geometric Diagram

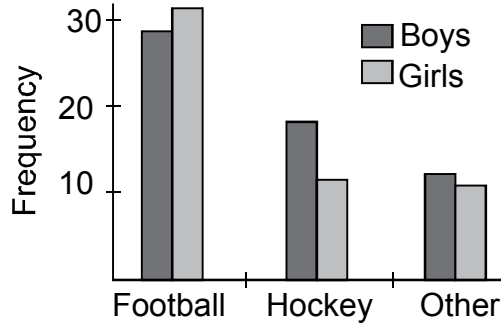
In this category two types of diagrams:-

1. Bar Diagram
 2. Pie Diagram
1. **Bar diagram:** Bar diagram comprises a group of rectangular bars for each category of data. Height or length of the bar reads the magnitude of data. Bars of a bar diagram can be visually compared by their relative height and accordingly data are comprehended quickly. These are suitable both for frequency type and non-frequency type variable and attributes.

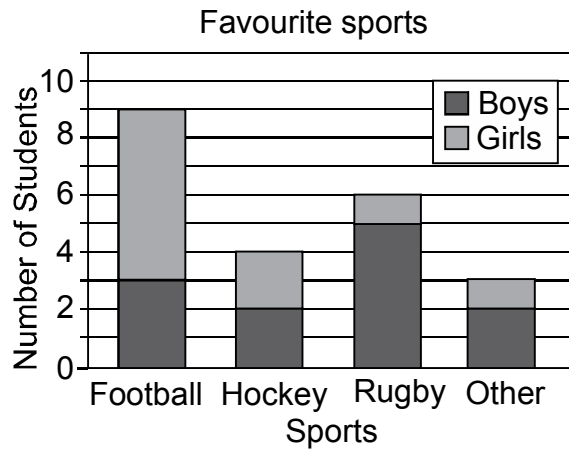
**Simple Bar Diagram
(Shows only one variable)**



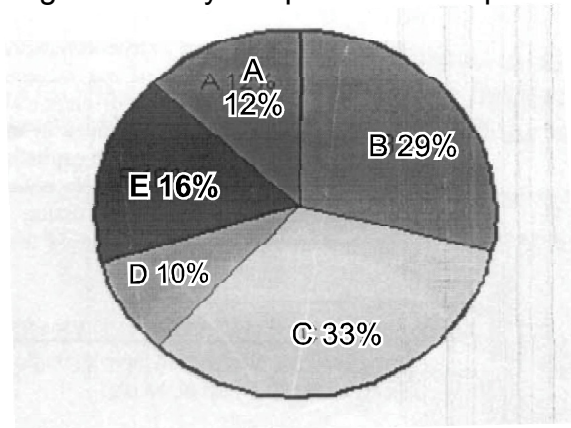
**Multiple Bar Diagram
(Shows two or more than two variables)**



**Component Sub Divided Bar Diagram
(Shows various sub divisions of a variable)**



2. **Pie Diagram:** A pie diagram is a component diagram. It represents a circle whose area is proportionally divided among the components. It is called a pie chart. Also called Angular Diagram circle diagram, circle graph, pizza chart, or sector graph. The circle is divided into as many parts as there are components by drawing straight lines from the center to the circumference.
1. Pie charts usually are not drawn with absolute values of a category. The values of each category are first expressed as percentage of the total value of all the categories.
 2. A circle in a pie chart, irrespective of its value of radius, is thought of having 100 equal parts of 3.6° ($360^\circ/100$) each. To find out the angle, the component shall subtend at the center of the circle, each percentage figure of every component is multiplied by 3.6° .



Pie Diagram

Angular Part of a component in Circle

$$= \frac{\text{Value of Component}}{\text{Total Value}} \times 360^\circ$$

$$\text{i.e. } A^\circ = \frac{C}{T} \times 360^\circ$$

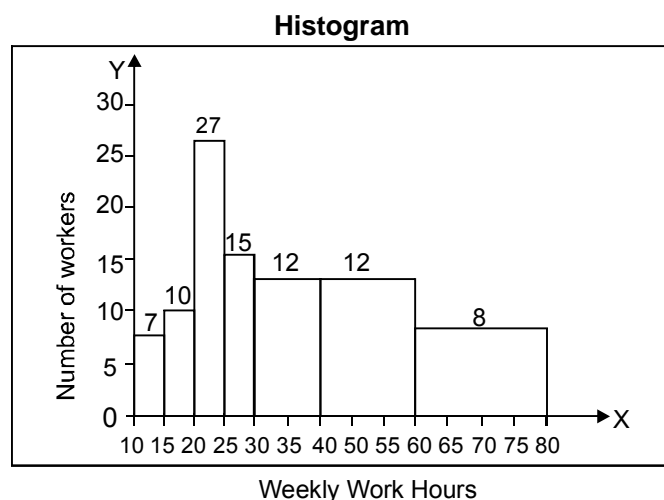
Graphic Presentation of Data : The Graphical presentations are two types i.e. Frequency diagram and Arithmetic Graph.

Frequency Diagram : The data in the form of grouped frequency distributions are generally represented by frequency diagrams like histogram, frequency polygon, Frequency curve and ogive.

1. **Histogram** : A histogram is a two dimensional diagram. It is a set of rectangles with bases as the intervals between class interval (along X-axis) and with areas proportional to the class frequency.
 - For graphical representation of such data, height for area of a rectangle is the quotient of height (here frequency) and base (here width of the class interval).
 - A histogram is never drawn for a discrete variable/data
 - If the classes are not continuous they are first converted into continuous classes.

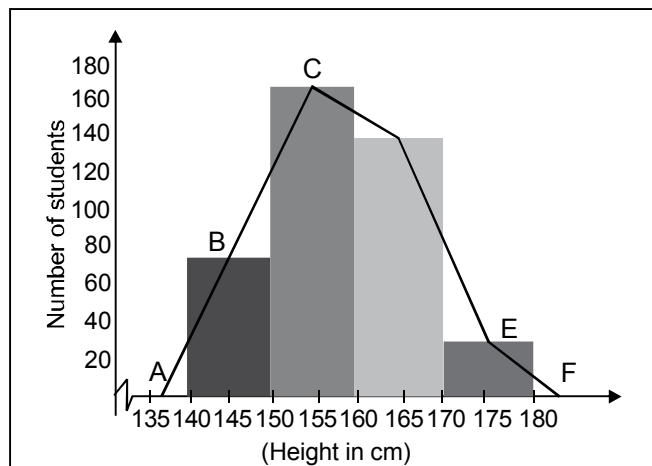
Comparison of Bar diagram and Histogram

- A histogram looks similar to a bar diagram. But there are more differences than similarities between the two that may appear at the first impression.
- Moreover, in histogram no space is left in between two rectangles, but in a bar diagram some space must be left between consecutive rectangles.
- Although the bars have the same width, the width of a bar is unimportant for the purpose of comparison. The width in a histogram is as important as its height.
- We can have a bar diagram both for discrete and continuous variables, but histogram is drawn only for a continuous variable. Histogram also gives value of mode of the frequency distribution graphically.



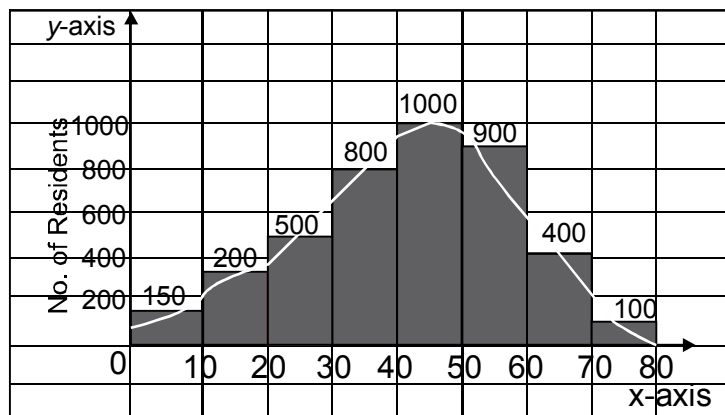
2. **Frequency Polygon** : A frequency polygon is a plane bounded by straight lines, usually four or more lines. Frequency polygon is an alternative to histogram and is also derived from histogram itself. A frequency polygon can be fitted to a histogram for studying the shape of the curve. The simplest method of drawing a frequency polygon is to join the midpoints of the topside of the consecutive rectangles of the histogram.

Frequency Polygon



Polygon

3. **Frequency Curve** : It is the free hand curve passing through the mid-points of the tops of rectangle of a histogram. It is also known as smoothed frequency curve.

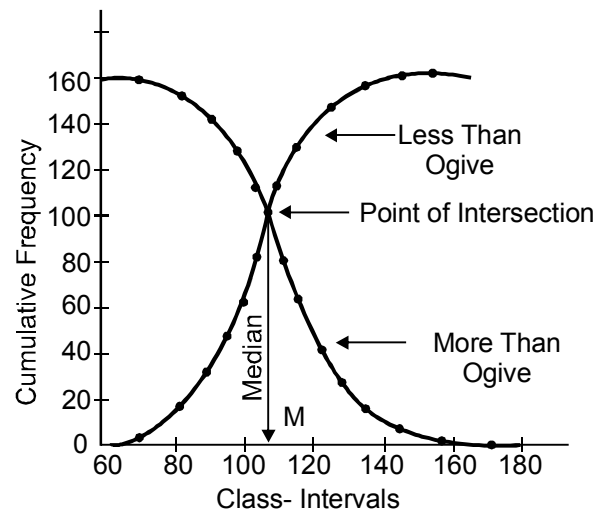


Frequency curve

As a generated rule, the curve should start and end at the base line.

4. **Ogive : Ogive is also called cumulative frequency curve.**

- There are two types of cumulative frequencies, for example less than type and more than type, accordingly there are two ogives for any grouped frequency distribution data.
- Cumulative frequencies are plotted along Y-axis against class limits of the frequency distribution.
- For less than ogive the cumulative frequencies are plotted against the respective upper limits of the class intervals.
- Whereas for more than ogives the cumulative frequencies are plotted against the respective lower limits of the class interval.
- We can locate median graphically by putting a perpendicular on x-axis from the point of intersection of both ogives.



• **Arithmetic Line Graph**

An arithmetic line graph is also called time series graph and is a method of diagrammatic presentation of data. In it, time (hour, day/date, week, month, year, etc.) is plotted along x-axis and the value of the variable (time series data) along y-axis. A line graph by joining these plotted points, thus, obtained is called arithmetic' line graph (time series graph). It help in understanding the trend, periodicity, etc. in a long term time series data.

Two types of Graphs :-

- (i) One variable graphs
- (ii) Two or more variable graphs

General Rules for Constructing Diagram and Graphs :-

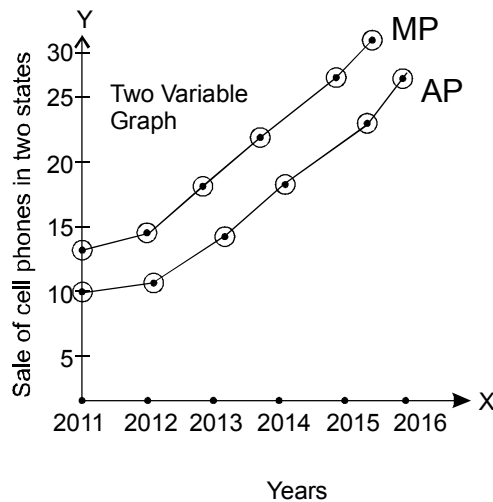
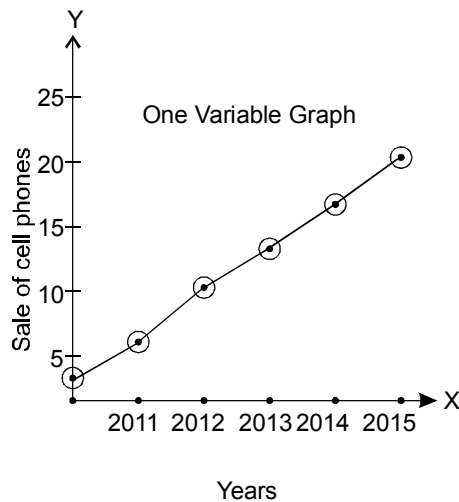
- (i) Proper size
- (ii) Proper heading
- (iii) Proper scale
- (iv) Use of signs and colours only
- (v) Less use of words.
- (vi) Simple
- (vii) From left to right or bottom to top
- (viii) Drawing the border
- (ix) Proper labelling
- (x) Use of false base line whenever required

Advantages of Graphic Presentation of Data

- (i) Simplify complex data
- (ii) Helpful in Forecasting
- (iii) Easy study of trends and variations
- (iv) Helpful in location of statistical positional averages.
- (v) Useful in quick comparison

Limitations of Graphic Presentation of Data

- (i) Precise values are not shown
- (ii) Limit to only two characteristics
- (iii) Limited information is presented



QUESTION BANK

Competency Based Questions (1 Mark)

1. What is meant by Tabulation?
2. Define caption as a part of Table.
3. What is meant by manifold table ?
4. Define the Bar diagrams.
5. Give the meaning of the sub-divided bar diagrams.
6. Define Pie-diagram.
7. What is meant by Histogram ?
8. Give the meaning of frequency curve.
9. Write the name of the curve which is formed by joining mid point of the top of all rectangles in histogram in straight lines.
10. Define the ogive curve.
11. Give the meaning of false base line.
12. A systematic presentation of data in columns and rows is known as
13. A graph that represent the class frequencies in a frequency distribution by vertical rectangles is called
14. Width of a bars in a bar diagram need not to be equal (True /False).
15. Width of a rectangles in a histogram should essentially be equal (True /False) .
16. Histogram can only be formed with continuous classification of data (True /False).
17. Histogram and column diagram are the same method of presentation of data (True /False).
18. Mode of frequency distribution can be known graphically with the help of histogram.(True /False).
19. Median of a frequency distribution can not be known from the ogives.(True /False)

Select Response Type Questions (1 Mark)

20. For presenting the 12th class exam results of different faculty (Science, Commerce and Arts) of a school pertaining the last 3 years in an impressive way, which of the following digrams will be suitable:
- (a) Simple bar diagram
 - (b) Multiple bar diagram
 - (c) Sub-divided bar diagram
 - (d) Both (b) and (c)
21. Which of the following information can be derived with the help of Histogram?
- (a) Mean
 - (b) Median
 - (c) Mode
 - (d) Correlation
22. Choose the correct match:
- (a) Diagram formed by joining \Rightarrow Ogive
mid points of the tops of all
rectangles in a Histogram
 - (b) Diagram which show total \Rightarrow Sub-divided bar diagram
value as well as part values of
a set of data simultaneously
 - (c) One dimensional diagram \Rightarrow Frequency polygon
23. Bar diagram, in which height of all bars are equal is known as _____.
24. The title given to the vertical columns of a table is called:
- (a) Title
 - (b) Stubs
 - (c) Caption
 - (d) Both (b) and ©
25. In Arithmetic line graphs, which of the following is shown on X axis:
- (a) Income
 - (b) Expenditure
 - (c) Time
 - (d) All (a), (b) and (c)

26. **If a family spends 30% of their income on food, then to present it in pie diagram, how many degrees of angle is formed:**
- (a) 96° (b) 108°
(c) 120° (d) 132°
27. **Which of the following can be located through "Ogive"**
- (a) Mean (b) Median
(c) Mode (d) correlation
28. **A table which shows the data like Average, Percentage, Ratio etc is based on:**
- (a) Qualitative Classification
(b) Quantitative Classification
(c) Temporal Classification
(d) Spatial Classification
29. **Choose the correct statement:**
- (a) Mode can be find out through ogive.
(b) The breadth of bars in Bar Diagram should be equal.
(c) The breadth of rectangles in Histogram must be equal.
(d) Histograms are drawn for frequency array.

Competency Based Questions (1 Mark)

Assertion (A) and Reason (R) Question

DIRECTIONS for the questions 30 to 32.

In each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

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

30. **Assertion (A)** : The lower end of the bar touches the base line such that the height of a bar starts from the zero unit.

Reason (R) : Bars of a bar diagram are visually compared by their relative height

31. **Assertion (A)** : In a Histogram, there is no open space between two consecutive rectangles

Reason (R) : Histogram is drawn only for a continuous variable.

32. **Assertion (A)** : “less than” ogive is never decreasing

Reason (R) : For “less than” ogive the cumulative frequencies are plotted against the respective upper limits of the class intervals.

Constructed Response Questions (3-4 Marks)

1. State three features of a good table.
2. State the merits of tabular presentation.
3. Define pie-diagram. Write the steps of construction of a pie-diagram.
4. State any three importance of diagrammatic presentation.
5. Present the following data by multiple bar diagram. Number of students in respective classes/sections (year wise) give below:

Year	XI A	XI B	XI C
2011-12	500	300	200
2012-13	600	250	300
2013-14	700	350	400

6. Present the following data of final consumption expenditure of family with the help of a pie-diagram.

Items	% of Income Spent
Clothing	15
Food	60
Education	10
Electricity	5
Misc.	10

7. Make a pie diagram from following data :

Marks	No. of students
0-9	4
10-19	17
20-29	25
30-39	32
40-49	13
50-59	9

8. Present the following data in a pie-diagram.

Items	% expenditure
Labour	27.2%
Bricks	12.9%
Steel	15.4%
Cement	15.9%
Timber	12.5%
Supervision	16.1%

Constructed Response Questions (6 Marks)

1. Explain the main parts of a table.
2. Differentiate between Bar diagram and Histogram.
3. Draw less than and more than ogive curves with the help of following data .

Marks	No. of students
0-10	7
10-20	12
20-30	15
30-40	30
40-50	22
50-60	14

4. Make a frequency polygon and a frequency curve for the following data.

Marks	No. of students
30-35	10
35-40	12
40-45	20
40-45	26
45-50	20
50-55	38
55-60	28
60-65	18
65-70	12

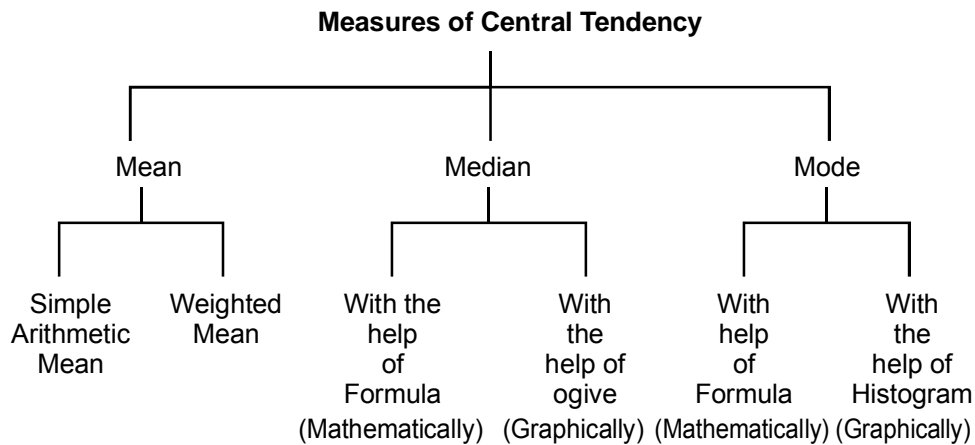
ANSWER OF ONE (1) MARK QUESTIONS

1. The method of arranging data orderly in form of rows and columns is known as tabulation.
2. The Caption is the title given to the columns of a table. It indicates information contained in the columns.
3. The Manifold table shows more than three characteristics of the data.
4. The Bar diagrams are those diagrams in which data are presented in the form of bars and rectangles.
5. The Sub divided bar diagrams are those diagrams which simultaneously present total values as well as part values of a set of data.
6. The Pie diagram is a circle divided into various segment showing the percent value of various components of a series.
7. The Histogram is a graphical presentation of a frequency distribution in a continuous series.
8. The Frequency curve is obtained by joining the points of a frequency polygon through freehand smoothed curves not by straight lines.
9. Frequency polygon.
10. It is the curve which is constructed by plotting cumulative frequency data on the graph paper in a form of a smooth curve.
11. If there is a large gap between zero and minimum value of a variable than to minimise this gap we use false base line.
12. Table
13. Histograms
20. (d)
21. (c)
22. (b)
23. Percentage Bar Diagram
24. (c)
25. (c)
26. (b)
27. (b)
29. (b)
29. (b)

Unit - 3

STATISTICAL TOOLS AND INTERPRETATION

MEASURES OF CENTRAL TENDENCY



- 1 **Measure of central tendency** : A central tendency is a single value that represents the whole mass of data.
2. **Mean** : Arithmetic mean is the number which is obtained by adding the values of all the items of a series and dividing the total by the number of items.
Types of mean : Means is of following two types:
 - (a) **Simple Arithmetic mean** : When all items of a series are given equal importance then it is called simple arithmetic mean.
 - (b) **Weighted Arithmetic mean** : When different items of a series are given different weight according to their relative importance is know as weighted arithmetic mean.

⇒ **Merits of mean**

- | | |
|----------------------------------|--------------------------------|
| (i) It is easy to calculate. | (ii) It is rigidly defined. |
| (iii) It is based on all values. | (iv) It is easy in comparison. |

⇒ **Demerits of mean**

- (i) It is affected by the extreme values.
- (ii) Mean value may not exist in the series.
- (iii) It may lead to misleading conclusion.
- (iv) It cannot be located on graph.

3. Median – The Median is the middle value of the series which divides it into two equal parts.

⇒ **Merits of Median**

- (i) It is easy to calculate.
- (ii) It is not affected by the extreme values.
- (iii) It can be located on graph.
- (iv) It can be calculated even when data is incomplete.

⇒ **Demerits of Median**

- (i) It requires organization of data.
- (ii) It is not based on all the items.
- (iii) Not suitable for algebraic treatment.
- (iv) Affected by fluctuations of items.

4. Mode - Mode is the value which occurs most frequently in the series.

⇒ **Merits of Mode**

- (i) It is easy to calculate.
- (ii) It is not affected by the extreme values.
- (iii) It can be located on graph.
- (iv) It is the most representative value in the given series.

⇒ **Demerits of Mode**

- (i) It is not based on all the values.
- (ii) It is not suitable for statistical treatment.
- (iii) Procedure of grouping is complicated.
- (iv) It is an uncertain measure.

5. Differences between Arithmetic mean, median and mode

Arithmetic Mean	Median	Mode
(I) Its value is definite.	(i) Its value is not definite.	(I) Its value is not definite.
(ii) It is based on all the values of series.	(ii) It is not based on all the values of series.	(ii) It is not based on all the values of series.
(iii) It cannot be located on graph.	(iii) It can be located on graph.	(iii) It can be located on graph.
(iv) It is not a positional average.	(iv) It is a positional average.	(iv) It is a positional average.

6. Relation between Mean, Median and Mode

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean} \quad \text{OR} \quad Z = 3M - 2\bar{X}$$

7. Formulae of calculating mean

Types of series	Direct Method	Shortcut Method	Step Deviation Method
Individual	$\bar{x} = \frac{\sum X}{N}$	$\bar{x} = A + \frac{\sum dx}{N}$ $d_x = (x - A)$	$\bar{x} = A + \frac{\sum dx}{N} \times C$
Discrete	$\bar{x} = \frac{\sum fx}{N}$ $N = \sum F$	$\bar{x} = A + \frac{\sum fdx}{N}$ $N = \sum F$	$\bar{x} = A + \frac{\sum fd'x}{N} \times C$ $N = \sum F$
Continuous	$\bar{x} = \frac{\sum fm}{N}$ $N = \sum F$ $m = \frac{l_1 + l_2}{2}$	$\bar{x} = A + \frac{\sum fdm}{N}$ $N = \sum F$ $dm = (m - A)$	$\bar{x} = A + \frac{\sum fd'm}{N} \times C$ $N = \sum F$ $d'm = dm/C$

$$\Rightarrow \text{Weighted arithmetic Mean} \quad \bar{X}_w = \frac{\sum WX}{\sum W}$$

8. Formulae of Calculating Median

(a) Individual Series:

- Arrange the given data in ascending or descending order.
- If N = Odd Number, then use formula $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th item}}$
- If N = Even Number, the use formula

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

(b) Discrete Series :

- Arrange the given data in ascending or descending order.
- Calculate cumulative frequency (C.F) of the given data with the help of frequency (F)
- Use formula, $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th item}}$
Where, $N = \sum F$

(c) Continuous Series :

- Arrange the given data in ascending or descending order.
- Calculate cumulative frequency (C.F) of the given data with the help of frequency (F)
- Determine median class by using formula, $M = \text{Size of } \left(\frac{N}{2}\right)^{\text{th item}}$

Where, $N = \sum F$

- After determining median class use following formula,

$$M = L_1 + \left[\frac{\left(\frac{N}{2}\right) - C.F}{f} \right] \times i$$

Where,

L_1 = Lower limit of the median class

CF = Cumulative frequency of the preceding class of the median class

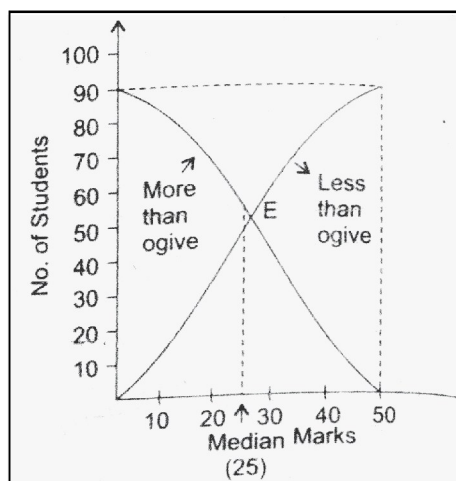
f = Frequency of the median class

i = Class interval of the median class

(d) Graphical Method to Calculate the Median

Median is calculated with the help of less than or more than ogive curve. Both intersect at point E. A perpendicular is drawn on X-axis from E, which touches at 25.

So, Median is 25.



9. Formulae of Calculating Mode (Mode can be calculated by using inspection and grouping method)

(a) Individual Series :

- Z = The observation which has highest frequency

(b) Discrete Series :

- Check which item has highest frequency in the given table.
- Z = The observation which has highest frequency.

(c) Continuous Series :

- Determine modal class by identifying the class interval which has highest frequency.
- After determining modal class use following formula:

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

Where,

L_1 = Lower limit of the modal class

f_1 = Frequency of modal class

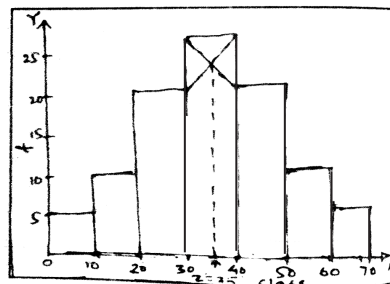
f_0 = Frequency of pre modal class

f_2 = Frequency of after modal class

i = Class interval of the modal class

(d) Graphical Method to Calculating the Median

Mode Graphically mode is calculated by drawing histogram. The rectangle with the greatest as height will be the modal class. By joining the top right point of the rectangle of the modal class with the top right point of the rectangle of the class preceding the modal class. Similarly with left point of the rectangle of modal class with the top left point of the rectangle of the class succeeding the modal class. Both line intersect each other. From intersection point draw a perpendicular on x-axis which cuts x-axis at 35. So mode is 35.



QUESTION BANK

(I) **COMPETENCY BASED QUESTIONS (1 Mark)**

1. What is meant by mean?
2. Write two types of mean.
3. Write one merit of median.
4. Find mode 10, 5, 4, 6, 4, 5, 4, 12, 4, 15, 4
5. Write one merit of mode.
6. Define mode.
7. Define median.
8. What is the relationship between mean, median and mode?
9. What is the sum of derivations taken from mean in a series?
10. Write one objective of an average.
11. Write the name of most popular statistical average.
12. Find median of 4, 9, 10, 12, 14.
13. State one disadvantage of mode.
14. Find mean- 10, 20, 40, 80, 100.
15. If mean is 40 and median is 48. Find mode.

Fill the appropriate word in the bank:

16. is based on all the items of the distribution.
(mode/mean)
17. Median can be easily located through (histogram/ogive)
18. mean gives relative importance to each item. (simple/weighted)
19. Mode is calculated graphically through (ogive/histogram)
20. The sum of the square of the deviations of the items from their arithmetic mean is (zero/minimum)
21. The sum of deviations of the observations from their arithmetic mean is always..... (zero/minimum)
22. is very much affected by the extreme values.
(Median/Mean)

II. Select Response Type Questions (1 Mark)

23. The most common used measure of central tendency is:
- (a) Median (b) Mode
(c) Arithmetic mean (d) Percentile
24. Median are the measures which divide the series into
- (a) Two equal parts (b) Three equal parts
(c) Five equal parts (d) Four equal parts
25. Which of the following is not a merit of mean?
- (a) Based on all items (b) Easy to calculate
(c) Affected by extreme items (d) None of these
26. Which of the following is a demerit of mode?
- (a) Not affected by extreme items (b) Based on all items
(c) unclued item measure (d) Both (a) and (b)
27. Which of the following represent Median?
- (a) Q1 (b) Q2
(c) Q3 (d) Q4
28. Sum of deviation about mean is
- (a) Zero (b) One
(c) Minimum (d) Maximum
29. Assign weights to various items according to their importance is called
- (a) Arithmetic mean (b) Median
(c) Mode (d) Weighted mean
30. The most suitable average for qualitative measurement is
- (a) Arithmetic mean (b) Median
(c) Mode (d) Weighted mean
31. Which average is affected most by the presence of extreme value
- (a) Arithmetic mean (b) Median
(c) Mode (d) None of these
32. Which of the following is not a measure of central tendency
- (a) Mean (b) Median
(c) Mode (d) Mean deviation

33. Which of the following is a positional average
- (a) Arithmetic mean (b) Geometric mean
(c) Median (d) Harmonic mean
34. Five students obtained 100, 200, 300, 400 and 500 marks, what would be the mean?
- (a) 300 (b) 400
(c) 250 (d) 350
35. In India, shoe size of most of the men is no. 7. Which measure of central tendency represent it?
- (a) Mean (b) Median
(c) Mode (d) Quartile
36. Find the correct option from the following:
- (a) Mode = 3 Median-2 Mean
(b) Mode=2 Median-3 Mean
(c) Median = 3 Mode-2 Mean
(d) Mean = 3 Median-2 Mode
37. The values of all items are taken into consideration in the calculation of:
- (a) Mean (b) Median
(c) Mode (d) Quartile
38. Find out the demerit of median from the following
- (a) Simplicity
(b) Ideal average
(c) Not based on all observation
(d) Graphic presentation
39. Mode can be obtained graphically from the following
- (a) Bar diagram
(b) Histogram
(c) Frequency polygon
(d) Frequency curve

40. The middle most value of a arranged series is known as:
(a) Mean (b) Median
(c) Mode (d) Quartile
41. The value of a variate that occur most often is known as:
(a) Mean (b) Median
(c) Mode (d) Quartile
42. Find median from 5,9,10,6,4,17,23,3 and 11
(a) 6 (b) 5
(c) 9 (d) 10
43. Find mode from 34, 77,18,6,8,17, 22, 6, 34, 6 and 56
(a) 77 (b) 34
(c) 56 (d) 6
44. Histogram is used to determine graphically the value of
(a) Mean (b) Median
(c) Mode (d) Quartile
45. For calculating quartie, all items of the series are arranged
(a) Ascending order
(b) Descending order
(c) Ascending order or descending order
(d) All of these
46. Mode can be calculated by:
(a) Inspection method
(b) Grouning method
(c) Both (a) and (b)
(d) None of these
47. Which measure of central tendency cannot be calculated by graphic method:
(a) Mode (b) Median
(c) Mean (d) None of these

48. For a skewed distribution, median = 30 and mode = 35. What is the value of the mean.
- (a) 35 (b) 30
(c) 32.5 (d) 27.5
49. In India, shoe-size of most of the women is no. 7. Which measure of central tendency represents it?
- (a) Mean (b) Median
(c) Mode (d) Quartile
50. Read the following statements carefully-
- Statement 1: Arithmetic mean is based on all the items of the series.
Statement 2: Mode can be determined with the help of the histogram.
Based on the given statements, choose the correct option from the following-
- (a) Statement 1 is true and statement 2 is false.
(b) Statement 1 is false and statement 2 is true.
(c) Statement 1 and 2 are true.
(d) Both the statements 1 and 2 are false.
51. Read the following statements carefully-
- Statement 1: In computing the median, all the items of the series are included.
Statement 2: Mode can be determined with the help of ogive.
Based on the given statements, choose the correct option from the following-
- (a) Statement 1 is true and statement 2 is false.
(b) Statement 1 is false and statement 2 is true.
(c) Both statement 1 and 2 are true.
(d) Both the statements 1 and 2 are false.

COMPETENCY BASED QUESTIONS

Directions for Questions 52-54

In each of the questions given below, two statements are given mark them as Assertion (A) and Reason (R).

- (a) Both (A) and (R) are true and (R) is the correct explanation of (A).
 - (b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
 - (c) (A) is true but (R) is false.
 - (d) (A) is false but (R) is true.
52. Assertion (A): Arithmetic mean is affected by extreme values.
Reason (R): All the items are considered while computing the mean.
53. Assertion (A): While computing the median in the series, the data needs to be arranged in ascending or descending order.
Reason (R): Median is that item which divides the series into two equal
54. Assertion (A): The mode of the series 8, 4, 85, 6, 2, 3, 8, 9, 2, 5, 10, 8 is 8.
Reason (R): The mode of a series is the item which divides it into two equal parts.

Study the following case study and answer the question numbers 55-57.

Measures of central tendency are used to summarize the data. It specifies a single most representative value to describe a set of data. The most commonly used average is the arithmetic mean. It is easy to calculate and all are based on observations but it is affected by extreme values. Median is better for analysing such data. Mode is commonly used to describe qualitative data. The median and mode can be easily calculated from the graph. Thus it is important to choose an appropriate average depending on the purpose of the analysis and the nature of the data.

- 55. Mean can be represented by graph (True/False)
- 56. Which average is used in case of qualitative data?
- 57. Which average is least affected by extreme values?

CONSTRUCTED RESPONSE QUESTIONS (3–4 MARKS)

- 1) Write two merits and demerits of median.
- 2) State three advantages of mode.
- 3) The average marks in statistics obtained by 30 students is 52. The average marks of top 6 students is 31. Calculate average marks of the remaining students.

Ans. 57.25

- 4) The average marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. Find the correct mean.

Ans. 39.7

- 5) Calculate Mean

Class	1-10	11-20	21-30	31-40	41-50
Freq	4	10	20	13	3

Ans. $\bar{X} = 25.7$

- 6) Find out Q_1 and Q_3 ,
6, 8, 10, 12, 18, 19, 23, 23, 24, 28, 37, 48, 49, 53, 56

Ans. $Q_1 = 12$

$Q_3 = 48$

- 7) Show that the sum of deviations of the observation from their arithmetic mean is zero with the help of suitable example.

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

- 1) If $\bar{X} = 52$, find missing frequency.

Class	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Freq.	5	3	?	7	2	6	13

5Ans. 7

- 2) Calculate mean from following information by short-cut method.

Marks	0-10	10-20	20-30	30-40	40-50
No. of 4 Students	4	6	10	20	10

Ans. $\bar{X} = 30.2$

- 3) Calculate mean by step derivation method.

Class	5-15	15-25	25-35	35-45	45-55	55-65
Freq.	8	12	6	14	7	3

Ans. $\bar{X} = 31.8$

- 4) Find out median.

Age(Yrs)	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
No. of Person	50	70	100	180	150	120	70	60

Ans. 40 Year

- 5) Calculate the Mean.

Class	0-5	5-10	10-15	15-20	20-25	25-30	35-35	35-40
Freq.	7	9	11	29	30	22	7	5

Ans. 21

- 6) Calculate Mean, Median and Mode.

Marks	10-19	20-29	30-39	40-49	50-59
No. of 4 Students	3	5	9	3	2

Ans. $\bar{X} = 37.6$, $M = 36.7$, $Z = 36$

- 7) Graphically calculate Median.

Class	0-10	10-20	20-30	30-40	40-50	50-60
Freq.	6	11	20	12	6	5

Ans. $M = 26.5$

ANSWER OF ONE (1) MARK QUESTIONS

- Mean is defined as the sum of all items divided by their numbers.
- Two types of mean are
(i) Simple mean (ii) Weighted mean
- It can be determined by graphical method.
- Mode = 4
- Easy to calculate.
- It is that items which has highest frequency in a series.

7) Median is a value which divide a series into two equal parts.

8) Mode = 3 Median –2 Mean

9) Zero

10) It summarises huge data

11) Mean

12) 10

13) Is is not based on all the value.

14) $\bar{X} = 50$

15) $Z = 3M - 2\bar{X} = 3 \times 48 - 2 \times 40$
 $= 144 - 80 = 64$

16) Mean

17) Ogive

18) Weighted

19) Histogram

20) Minimum

21) Zero

22) Mean

23) (c) 24) (d) 25) (b)

26) (a) 27) (b) 28) (a)

29) (d) 30) (c) 31) (a)

32) (d) 33) (c) 34) (a)

35) (c) 36) (a) 37) (a)

38) (c) 39) (b) 40) (b)

41) (c) 42) (c) 43) (d)

44) (c) 45) (d) 46) (c)

47) (c) 48) (d) 49) (a)

50) (c) 51) (d) 52) (a)

53) (a) 54) (c) 55) False

56) Mode 57) Median

Exam Oriented Questions With Answers

CONSTRUCTED RESPONSE QUESTIONS

1. Which average would be suitable in the following cases?

- (a) Average production in factory per shift.
- (b) Average wages in an industrial concern.
- (c) In case of open ended frequency distribution.
- (d) Average size of readymade garments.
- (e) Average intelligence of students in a class.

Ans. (a) Arithmetic Mean (b) Arithmetic mean
(b) Median (d) Mode (e) Median

2. Write merits and demerits of mean or median.

Ans. Mean	Median
Merits	Merits
(a) Definite value	(a) unaffected by extreme values
(b) Easy to calculate	(b) Expressed/determined
(c) Based on all items of a series	(c) Easy to calculate
Demerits	Demerits
(a) Can't be located graphically	(a) Arrangement of data is required
(b) Calculation not possible if single item missing	(b) Not suitable for algebraic treatment
(c) Not used in case of qualitative measurement	(c) Affected by fluctuations of items.

3. What are the requisites of an ideal averages?

Ans. (i) Easy to understand.
(ii) Easy to compute.
iii) Rigidly defined.
iv) Based on all items of series.
v) Capable of algebraic treatment
vi) Least effect of fluctuation.

4. Write main objectives and functions of averages.

Ans. The main objectives and functions of averages are following.

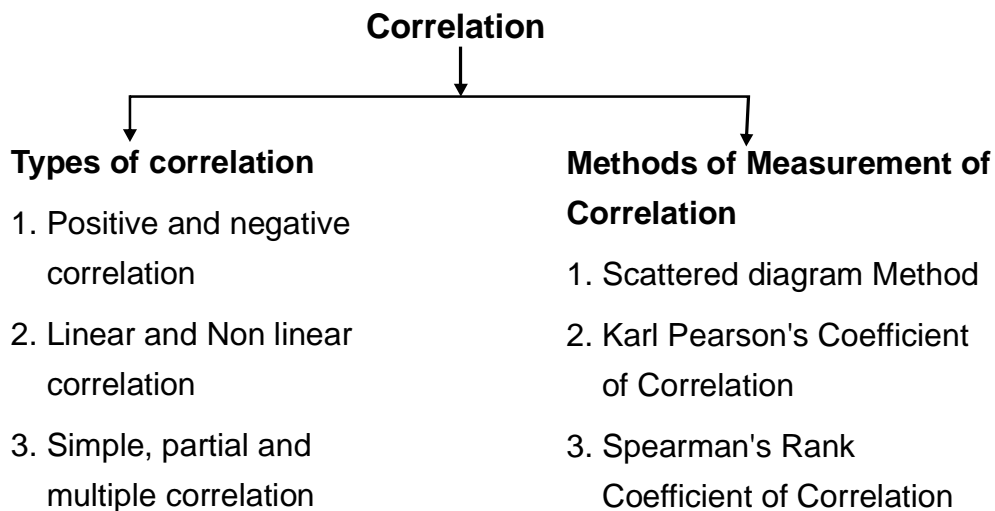
1. It establishes relationship between different groups.
2. It summarises huge data.
3. It makes comparison easier.
4. It helps in decision-making.

5. Write properties of arithmetic mean.

Ans. These are the following properties of arithmetic mean.

1. The sum of deviation of the observations from their arithmetic mean is always zero.
2. The sum of the square of the deviations of the items from their arithmetic mean is minimum.
3. If each observation of a series is increased or decreased by a constant, say K , then the arithmetic mean of the new series will also get increased or decreased by K .
4. If all the items in a series are multiplied or divided by a constant, then the mean of these observations also get multiplied or divided by it.

CORRELATION



Correlation is a statistical device or tool to measure the quantitative relationship between two variables. It measures the direction and intensity of relationship among variables. Thus, correlation measures co-variation, not causation. It does not tell us anything about cause and effect relationship.

- **Types of Correlation**

- 1) **Positive and negative correlation :**

When both the variables (say X and Y) move in the same direction then it is called positive correlation. For eg. increase in temperature and increase in sale of AC or Vice-versa.

When both the variable (say X and Y) move in the opposite direction then it is called negative correlation for eg. increase in temperature and decrease in sale of Heater.

2) **Linear and Non-linear correlation :**

When both the variables (say X and Y) change in the same proportion, it is called linear correlation. When both the variables (say X and Y) change in the different proportions, it is called non-linear correlation.

3) **Simple, Partial and Multiple Correlation :**

Study of correlation between two variables is called simple correlation. In this correlation, there are two variables one is independent and another is dependent.

Study of correlation between more than two variables is called multiple correlation. If we study correlation between two variables keeping other variables constant then it is called partial correlation.

DEGREE OR MAGNITUDE OF CORRELATION

Degree	Positive	Negative
Perfect	+1	-1
Higher	(+ 0.75) to (+ 1)	(- 0.75) to (- 1)
Medium	(+ 0.25) to (+ 0.75)	(- 0.25) to (- 0.75)
Low	0 to (+ 0.25)	(0) to (- 0.25)
Zero (Absence of correlation)	0	0

- **Methods of measurement of correlation:**

There are following methods:

1. Scattered Diagram Method
2. Karl Pearson's Coefficient of Correlation
3. Spearman's Rank Coefficient of Correlation

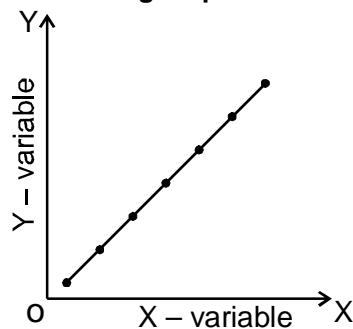
- 1) Scattered Diagram Method :

A scatter diagram is a useful technique for visually examining the form of relationship between two variable by plotting the values on a graph paper, without calculating any numerical values. It is a graphical method. In this method we use graph paper. We show X-variable on X-axis and Y-variable on the Y-axis. We plot the corresponding value of both the variable by dot (.) on the graph . Group of these dots called scatter diagram & all dots lie on a line then correlation is perfect.

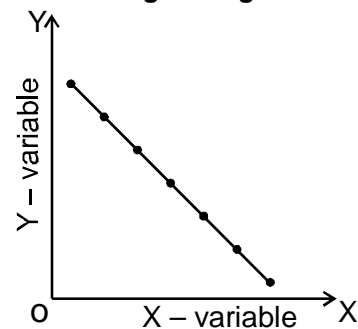
Point of quick interpretation of Scatter diagram:

- If all **the points lie on a line**, the correlation is perfect and is said to be in **unity**.

Perfect degree positive correlation

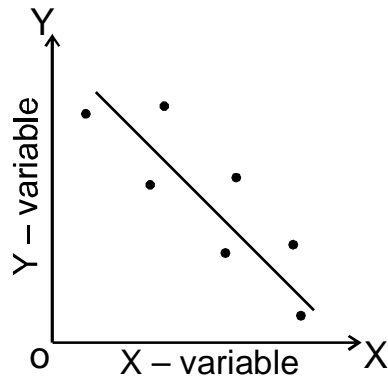
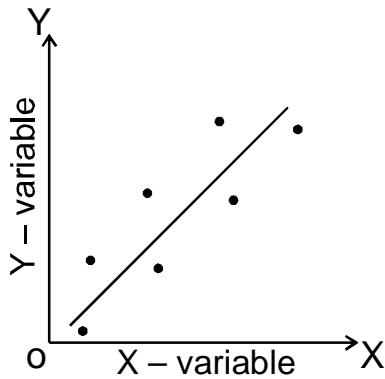


Perfect degree negative correlation



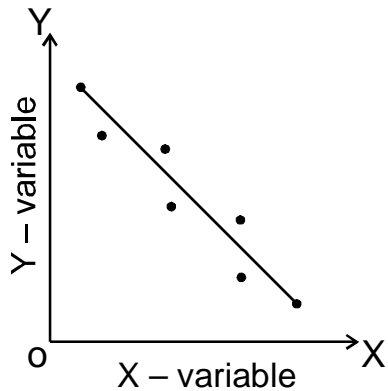
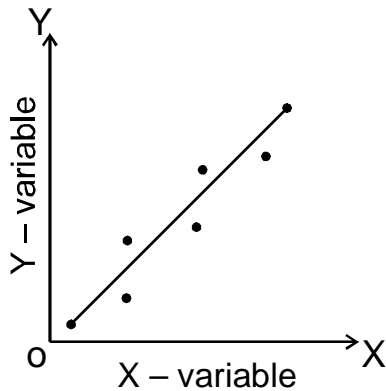
- If the scatter points are **widely dispersed** around the line, the **correlation is low**.

Lower degree positive correlation Lower degree negative correlation



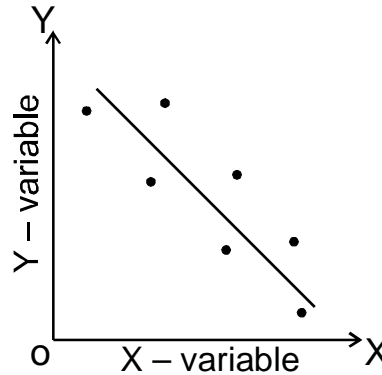
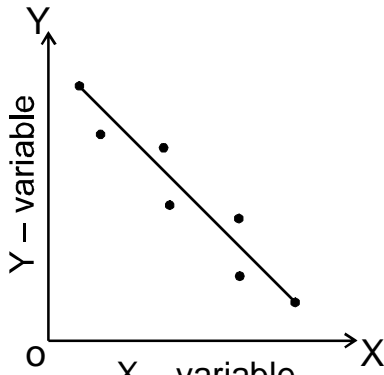
- The correlation is said to be **linear** if the scatter points lie near a line or on a line.
- Scatter points have an **upward rising line** indicating the movement of the variables in the same direction (When X rises Y will also rise/when X falls Y will also fall). This is **positive correlation**.

Higher degree positive correlation Higher degree negative correlation



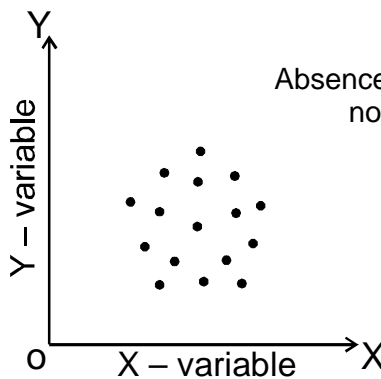
- When the points are found to be **scattered around a downward sloping line**. This time the variables move in opposite directions (When X rises Y falls and when X falls Y rises). This is **negative correlation**.

Higher degree negative correlation Lower degree negative correlation



X – variable

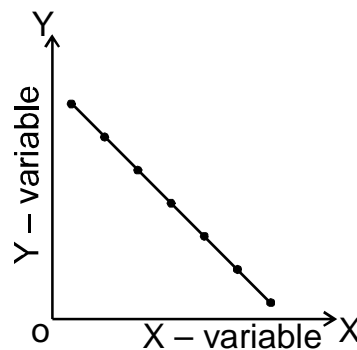
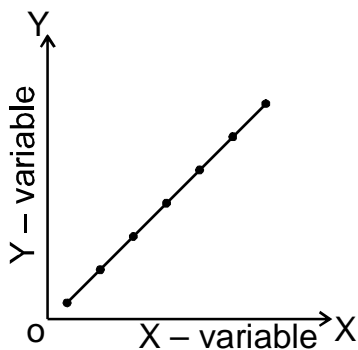
- If there is no upward rising or downward sloping line around which the points are scattered. This is an example of no correlation.



Absence of correlation or no correlation

- When the points are no longer scattered around an upward rising or downward falling line. The **points themselves are on the lines**. This is referred to as **perfect positive correlation and perfect negative correlation respectively**.

Perfect degree positive correlation Perfect degree negative correlation



2. Karl Pearson's Method

It is also called product moment method of correlation coefficient. It is denoted by r . It is based on arithmetic mean and standard deviation.

Let there are two variables X and Y .

Mean of x -series is $\bar{X} = \frac{\sum X}{N}$ and mean of y -series is $\bar{Y} = \frac{\sum Y}{N}$.

Standard deviation of x -series is $\sigma_x = \sqrt{\frac{\sum x^2}{N}}$ and standard deviation of y -series is $\sigma_y = \sqrt{\frac{\sum y^2}{N}}$. Here $x = X - \bar{X}$ and $y = Y - \bar{Y}$

Covariance of variable x and y is

$$\text{Cov. (X, Y)} = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{N} = \frac{\sum xy}{N}$$

then we find Karl Pearson's coefficient of correlation

$$r = \frac{\text{Cov. (X, Y)}}{\sigma_x \cdot \sigma_y}$$

OR

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

OR

$$\sigma_x = \sqrt{\frac{\sum x^2}{N}}$$

$$\sigma_y = \sqrt{\frac{\sum y^2}{N}}$$

$$r = \frac{\sum xy}{N \sqrt{\frac{\sum x^2}{N}} \times \sqrt{\frac{\sum y^2}{N}}}$$

$$r = \frac{\sum xy}{\sqrt{\sum x^2} \times \sqrt{\sum y^2}} = \frac{\text{OR } \sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2} \sqrt{\sum (Y - \bar{Y})^2}}$$

Therefore, the following methods are used to measure Karl Pearson's coefficient of correlation.

1) Actual Mean Method

$$r = \frac{\sum xy}{\sqrt{\sum x^2} \cdot \sqrt{\sum y^2}} \quad \text{where } x = X - \bar{X}; y = Y - \bar{Y}$$

$$\bar{X} = \frac{\sum X}{N}; \quad \bar{Y} = \frac{\sum Y}{N}$$

N = No. of observations

2) Assumed Mean Method

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

OR

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

Where $dx = X - A$; $dy = Y - A$

A = Assumed mean from X and Y series.

3) Step-deviation Method

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

OR

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

$$\text{Where } dx' = \frac{X - A}{i}; \quad dy' = \frac{Y - A}{i}$$

- Direct Method

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

OR

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

- **Properties of correlation.**

- It is independent from unit.
- Negative value of coefficient of correlation indicates negative correlation while positive value of coefficient of correlation indicates positive correlation.
- Coeff. of correlation lies between -1 and $+1$
i.e $-1 \leq r \leq +1$
- $r = 0$, means of absence of correlation.
- If higher value of r shows higher degree linear correlation and a lower value of r shows lower degree of linear correlation.
- $r = +1$, means perfect degree positive correlation between two variable and $r = -1$, means perfect degree negative correlation between two variables.
- It is independent of change of origin and change of scale of the variables. It is proved by value of r which is calculated by step deviation method.

3. Spearman's coefficient of correlation.

It is also called rank order coefficient of correlation. It is useful for qualitative observations. When values of variables are not expressed in quantitative measures then this method is used to measure correlation. For example honesty, morality, character, beautifulness, originality, leadership, quality, wisdom etc. It is more logical and scientific to determine the ranks instead of quantification of qualitative information.

It is indicated by r_k .

This method is useful in the following three situation :

1) When ranks are given :

If ranks are already given then

$$r_k = 1 - \frac{6 \sum D^2}{N^3 - N}$$

Where N = No. of observations

D = Deviation / Difference between ranks
of two variables

2) When ranks are not given.

1. First rank the all values of variables either in ascending order or in descending order. 1st rank to largest value 2nd rank to second largest value, 3rd rank to 3rd largest value and so on or vice-versa.

2. Find deviation or difference between ranks of two series denoted by D.

3. Use the following formula to find correlation

$$r_k = 1 - \frac{6 \sum D^2}{N^3 - N}$$

3. When values are repeated.

- Repeated values need correction factor
- When two or more than two observations values are equal then average rank to be given to all equal observations.
- Actual rank to next value and so on.
- Use the following formula to find correlation after adjustment of ranks.

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

Where m_1, m_2, \dots indicate number of repetition of values and $\frac{1}{12} (m_1^3 - m_1), \frac{1}{12} (m_2^3 - m_2) \dots$ indicate their corresponding correction coefficient.

- **Similarities between Karl Pearson's and Spearman's Correlation:**
 - (i) The values of both correlation lie between ± 1 .
 - (ii) When $r_R = -1$; it means perfectly disagree. In this case ranks

are such that highest ranking X goes with the lowest ranking Y and so on, we have perfect negative correlation with coefficient of -1 .

(iii) When $r_R = +1$, it means perfectly agree. If each X and its paired Y have exactly the same rank, we have perfect positive correlation with coefficient if $+1$.

- **Dissimilarities**

(i) Ranks correlation give less importance to the extreme values and it does not based on the numerical value of all the informations. So, result of this method is not accurate as compared to product moment method. It is because that product moment method gives more importance to extreme values because it is based on all actual values.

(ii) Rank correlation is more useful when number of items are small, data are given as ranks, scores etc. and data are not numerically expressed.

QUESTIONS

COMPETENCY BASED QUESTIONS (1 MARK)

- 1) What is meant by correlation?
- 2) List some variables where accurate measurement is difficult.
- 3) What is negative correlation?
- 4) Give the meaning of positive correlation.
- 5) What is the range of simple correlation coefficient?
- 6) State the type of correlation when two variables change in the same ratio.
- 7) Give two examples of positive correlation.
- 8) Mention the principal short coming of scatter diagram as a method of estimating correlation.
- 9) Give two examples of negative correlation.
- 10) When is rank correlation method used?
- 11) Mention the names of different methods for measuring correlation.
- 12) What is the main demerit of spearman's rank method?

- 13) Mention the principal short coming of Karl Pearson's coefficient correlation.

SELECT RESPONSE TYPE QUESTIONS (1 MARK)

- 14) If $r_{xy} = 0$, then the variables X and Y are :
- (a) Linearly related
 - (b) Not linearly related
 - © Uncorrelated
- 15) The unit of correlation coefficient between height in feet and weight in kilograms is :
- (a) kg / feet
 - (b) percentage
 - © non-exist
- 16) Which method of measuring correlation is confined to linear relations.
- (a) Karl Pearson's Co-efficient of correlation.
 - (b) Spearman's rank correlation.
 - (c) Scattered Diagram.
- 17) If precisely measured data are available, the simple co-efficient correlation is :
- (a) more accurate than rank correlation co-efficient.
 - (b) less accurate than rank correlation co-efficient.
 - (c) as accurate as the rank correlation co-efficient.
- 18) If the Pearson Product Correlation Coefficient shows zero value, this definitely means absence of any relationship between the two variables. (True/False)
- 19) To measure ranked variables the following correlation coefficient is used
- (a) Pearson's
 - (b) Spearman's
 - © Fisher's
 - (d) Marshall's
- 20) The correlation coefficient:
- (a) has no unit
 - (b) Always expressed in measure units

- (c) Can be measured between more than two variables together.
 - (d) All of these.
- 21) A correlation coefficient:
- (a) Efficiently summarises some of the information in a scatter plot.
 - (b) Is a sort of index of how close the points of a scatter diagram deviate from the best fitting straight line through those points
 - (c) Tells you the direction of the slope of the scatter diagram.
 - (d) All of these.

COMPETENCY BASED QUESTIONS (1 MARK)

The following information concerning five individuals is needed to answer Questions 22 to 24. The data consist of scores on three different scales of Political attitudes.

Scale-A	Scale-B	Scale-C
3	5	4
2	6	6
1	5	8
5	2	2
7	8	1

- 22) The Scale-A and the Scale-C are likely to:
- (a) Correlate positively.
 - (b) Have identical means.
 - © Reciprocate.
 - (d) Correlate negatively.
- 23) For the correlation between the Scale-A and the Scale-C, N =
- (a) 7
 - (b) 5
 - (c) 8
 - (d) 6

SELECT RESPONSE TYPE QUESTIONS (1 MARK)

- 24) What is the Spearman rank correlation coefficient between the Scale-A and the Scale-C?
(a) -1.0 (b) 1
© -0.1 (d) 0
- 25) Rank the score of 3 in the following set: 1, 3, 2, 3, 5, 6, 9
(a) 3 (b) 4.5
(c) 4 (d) 2.5
- 26) Rank the score of 6 in the following set of scores: 9, 3, 6, 10, 8, 6, 9, 6, 3, 4
(a) 4 (b) 5
© 5.5 (d) 6
- 27) A researcher carefully computes the correlation coefficient between two variables and gets $r = 1.13$. What does this value mean?
- 28) Examples of negative correlation are
(a) Demand of a commodity may go down as a result of rise in prices.
(b) Age of husband and age of wife.
(c) The family income and expenditure on luxury items.
(d) Increase in height and weight.
- 29) If the plotted points in the plane are spread all over the diagram there is
(a) Highly Positive Correlation
(b) No Correlation
(c) Highly Negative Correlation
(d) None of the above
- 30) Following are the examples of positive correlation except
(a) Increase in height and weight.
(b) Price of commodity and amount of supply.
(c) Age of husband and age of wife.
(d) Sale of woolen garments and rise in day temperature.

- 31) Degree of Correlation Between + 0.25 and + 0.75 is
- (a) Perfect
 - (b) Moderate
 - (c) High
 - (d) Low
- 32) The relationship between three or more variables is studied with the help of correlation
- (a) Double
 - (b) Multiple
 - (c) Single
 - (d) None
- 33) The correlation coefficient is used to determine:
- (a) A specific value of the y-variable given a specific value of the x-variable
 - (b) A specific value of the x-variable given a specific value of the y-variable
 - (c) The strength of the relationship between the x and y variables
 - (d) None of these
- 34) If there is a very strong correlation between two variables then the correlation coefficient must be
- (a) any value larger than 1
 - (b) much smaller than 0, if the correlation is negative
 - (c) much larger than 0, regardless of whether the correlation is negative or positive
 - (d) Value equal to 1 or less 1
- 35) If two variables, x and y, have a very strong correlation, then
- (a) there is evidence that x causes a change in y
 - (b) there is evidence that y causes a change in x
 - (c) there might not be any causal relationship between x and y
 - (d) None of these alternatives is correct.
- 36) Suppose the correlation coefficient between heights (as measured in feet) versus weight (as measured in pounds) is 0.40. What is the correlation coefficient of height measured in inches versus weight measured in ounces? [12 inches = one foot; 16 ounces = one pound]

- (a) 0.40
 - (b) 0.30
 - © 0.533
 - (d) cannot be determined from information given
- 37) Assume the same variables as in question above; height is measured in feet and weight is measured in pounds. Now, suppose that the units of both variables are converted to metric (meters and kilograms). The impact on the slope is:
- (a) the sign of the slope will change
 - (b) the magnitude of the slope will change
 - (c) both a and b are correct
 - (d) neither a nor b are correct
- 38) The correlation between shoe-size and intelligence is:
- (a) Zero
 - (b) Positive
 - (c) Negative
 - (d) None of these
- 39) Rank the score of '6' in the following set of scores:
9, 3, 6, 10, 8, 6, 9, 6, 3, 4
- (a) 4
 - (b) 5
 - (b) 6.5
 - (d) 6

COMPETENCY BASED QUESTIONS (1 MARK)

Assertion (A) and Reason ® Question

Directions for the questions 40 to 45.

In each of the questions given below, there are two statements marked as Assertion (A) and Reason ®. Mark your answer as per the codes provided below:

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

(e) Both A and R are false.

40) **Assertion (A)** : If you spend less hours in your studies, chances of scoring low marks/grades increase.

Reason (R) : This is an instance of negative correction

41) **Assertion (A)** : If the data contains some extreme values, Spearman's Rank correlation coefficient can be very useful

Reason (R) : Rank correlation coefficient is not affected by extreme values.

42) **Assertion (A)** : Karl Pearson's coefficient of correlation should be used only when there is a linear relation between the variables

Reason (R) : When there is a non-linear relation between X and Y, then calculating the Karl Pearson's coefficient of correlation can be misleading.

Case-based Questions (1 Mark)

Suppose we are trying to estimate the correlation between the heights and weights of students in a remote village where neither measuring rods nor weighing machines are available.

43) In such a situation, can we measure the precise correlation? (Yes/No)

44) Which method can be used to measure coefficient of correlation in the above situation

(a) Karl Pearson's coefficient of correlation

(b) Spearman's rank correlation

(c) Scatter Diagram

(d) All of the above

45) Will the value of correlation be affected by extreme Height and Weight (Yes/No).

CONSTRUCTED RESPONSE QUESTIONS (3–4 MARKS)

1) State the objectives of classification.

39) Rank the score of '6' in the following set of scores:

9, 3, 6, 10, 8, 6, 9, 6, 3, 4

(a) 4

(b) 5

(c) 15

(d) 6

Short Answer Type Questions (3/4 Mark Questions) :-

1. What is meant by correlation? What are the properties of coefficient of correlations?
2. Interpret the values of r as 1, -1 and 0.
3. Calculate the correlation coefficient between X & Y and comment on their relationship.

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

(Ans. $r = 0$)

4. Calculate the correlation coefficient between X & Y and comment on their relationship :

X	1	2	3	4	5
Y	3	4	6	7	10

(Ans. $r = +1.05$)

5. Plot the following data as a scatter diagram and comment over the result :

X	11	10	15	13	10	16	13	8	17	14
Y	6	7	9	9	7	11	9	6	12	11

6. Calculate the Karl Pearson's coefficient of correlation from the following data :

X	20	25	30	35	40	45	50	55	60
Y	16	20	23	25	33	38	46	50	55

(Ans. $r = +0.99$)

7. From the following data, compute the product movement correlation between x and y.

	X series	Y series
i) No. of items	15	15
ii) Arithmetic mean	25	18
iii) Square of deviations From arithmetic mean	136	138
iv) Summation of products of deviations of X and Y series from respective means = 122		(Ans. $r = 0.89$)

8. Number of pairs of observations of X and Y series = 10

X series Arithmetic average = 65
 Standard deviation = 23.33

Y series Arithmetic average = 66
 Standard deviation = 14.9

Summation of products of corresponding deviation of X and Y series = + 2704

Calculate product moment correlation of x and y series.

(Ans. $r = +0.78$)

9. Calculate the Spearman's rank correlation from the following data X 10

X	10	12	8	15	20	25	40
Y	15	10	6	25	16	12	8

(Ans. $r = +0.14$)

10. Two judges in a beauty competition rank the twelve entries as follows:

Without Make-up	1	2	3	4	5	6	7	8	9	10	11	12
With Make-up	12	9	6	10	3	5	4	7	8	2	11	1

(Ans. $r = -0.45$)

Calculate rank correlation coefficient.

11. Calculate the rank coefficient correlation of the following data :

X	68	75	90	75	50	62	40	35
Y	10	12	14	10	10	13	9	8

(Ans. $r = +0.76$)

12. Does correlation imply causation?
13. Does zero correlation mean independence ?
14. How correlation coefficient differ from Karl Pearson's coefficient of correlation?

15. When is rank correlation coefficient more precise than simple correlation coefficient?

CONSTRUCTIVE RESPONSE QUESTIONS (6 MARKS)

- 1) Discuss Karl Pearson's method of calculating coefficient of correlation. Give its merits and limitations.
- 2) In a beauty contest, three judges accorded following ranks to 10 participants :

Judge I	1	6	5	1	0	3	2	4	9	7	8
Judge II	3	5	8	4	7	1	0	2	1	6	9
Judge III	6	4	9	8	1	2	3	1	0	5	7

Find out by Spearman's rank difference method which pair of judges has a common taste in respect of beauty.

(Ans. $r_{kI \& II} = -0.21$; $r_{kII \& III} = -0.29$)

3. What are the advantages of spearman's rank correlation coefficient over Karl Pearson's correlation coefficient? Explain the method of calculating Spearman's rank correlation coefficient.
4. Following are the heights and weights of 10 students in a class. Draw a scatter diagram and find whether the correlation is positive or negative.

Height (in inches)	72	60	63	66	70	75	58	78	72	62
Weight (in Kg.)	65	54	55	61	60	54	50	63	65	50

5. Calculate the correlation coefficient of marks obtained by 12 students in Mathematics and Statistics and interpret it.

Marks (in Maths)	50	54	56	59	60	62	61	65	67	71	71	74
Marks (in Statistics)	22	25	34	28	26	30	32	30	28	34	36	40

(Ans. $r = 0.78$)

ANSWERS OF ONE (1) MARK QUESTIONS

1. Correlation is a statistical tool which studies the relationship between two variables.
2. Beauty, bravery, wisdom, ability etc.
3. The correlation is said to be negative when the variable move in opposite direction.
4. The correlation is said to be positive when the variable move together in the same direction.
5. $-1 \leq r \leq 1$
6. Perfect correlation.
7. i) Age of husband and age of wife.
ii) Increase in height and weight.
8. Scattered diagram does not indicate the exact numerical value of correlation.
9. i) Sale of wollen garments and day temperature.
ii) Yield of crops and price.
10. When data are of qualitative nature like beauty, honesty etc.
11. i) Scatterred diagram
ii) Karl Pearson's coefficient of correlation.
iii) Spearman's Rank correlation coefficient.
12. This method can not be employed for finding out correlation in a grouped frequency distribution.
13. The value of the coefficient is affected by extreme items.
14. Independent
15. Non-exist
16. Karl Pearson's coefficient of correlation.
17. (c) 18. False 19. (b) 20. (a)
21. (d) 22. (d) 23. (b) 24. (a)
25. (b) 26. (d)

27. Correlation coefficient is wrong it can't be more than 1
28. (a) 29. (d) 30. (d) 31. (b)
32. (b) 33. (c) 34. (d) 35. (d)
36. (a) 37. (d) 38. (a) 39. (d)
40. (b) 41. (a) 42. (a) 43. (No)
44. (b) 45. (No)

Frequently Asked Questions

- Q1. Who gave the rank difference method of correlation? (1 Marks)
- Q2. Define correlation. Give an example each of positive and negative correlation. (3 Marks)
- Hints : Positive correlation :- Increase in Price of a good and increase in supply of a good.
- Negative correlation :- Rise in price of a good and fall in demand of a good.
- Q3. Compute the Karl Pearson's coefficient of correlation from following data: (6 Marks)

X	10	12	11	13	12	14	9	12	14	13
Y	7	9	12	9	13	8	10	2	7	13

Hints :

- i) Compute the mean of both series (\bar{x} \bar{y})
- ii) Take the deviation from the mean (xy)
- iii) Square the deviation of (x^2y^2)
- iv) Compute the product of (xy)
- v) Use the following formula :

$$r = \frac{\sum xy}{\sum x^2 \times \sum y^2}$$

Ans. $r = -0.115$ (Low degree of negative correlation)

4. Find out rank correlation between X and Y. (6 Marks)

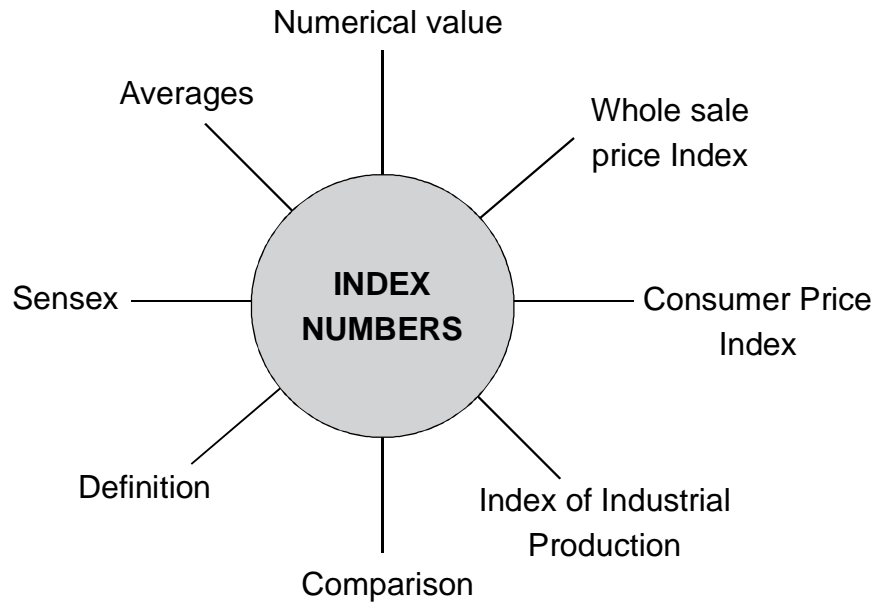
X	80	78	75	75	58	67	60	59
Y	12	13	14	14	14	16	15	27

X	R ₁	Y	R ₂	D=R ₁ -R ₂	D ²
80	1	12	8	-7	49
78	2	13	7	-5	25
75	3.5	14	5	-1.5	2.25
75	3.5	14	5	-1.5	2.25
58	8	14	5	3	9
67	5	16	2	3	9
60	6	15	3	3	9
59	7	17	1	6	36

$$\sum D^2 = 141.5$$

Ans. $r = -0.714$ (High degree negative correlation)

(iv) INTRODUCTION TO INDEX NUMBERS



Index Numbers: An index number is a statistical measure designed to show changes in magnitude of a variable or group of related variables with respect to time, geographical location or other characteristics.

- **Characteristics of Index Numbers :**

1. Index numbers are not qualitative statements like prices are rising or falling. It is a precise measurement of quantitative changes in the concerned variable.
2. Index numbers show changes in terms of averages. For example when it is said that price level has been increased that **does not mean that price of all goods and services have been increased. But it means that on and average prices have been increased.
3. An Index number, indicating change in magnitude, as of price, wage, employment, or production. It is, relative to the magnitude at a standard or base value usually taken as 100.

- **Types of Index Numbers**

1. **Price Index** : It measure changes in price over a specified period of time. It is basically the ratio of the price of a certain number of commodities at a present year as against base year.

Wholesale price Index (WPI),

Consumer Price Index (CPI) Or Cost of Living Index (COLI).

2. **Quantity Index** : These indices pertain to measuring change in volume of commodities like goods produced or goods consumed E.g. Index of Industrial production (IIP)
3. **Value Index** : It compare changes in the monetary value of imports, exports production or consumption of commodities.
4. **Base Year** : It refer to the year of reference with which prices of current year are compared to measure the changes
5. **Rate of Inflation** : The rate of inflation is measured as the percentage change between price levels over a specific period of time. Inflation is the general and ongoing rise in the level of prices in an economy.

$$\text{Inflation Rate} = \frac{i_1 - i_0}{i_0} \times 100$$

i_1 = Price Index in current year

i_0 = Price Index in base year

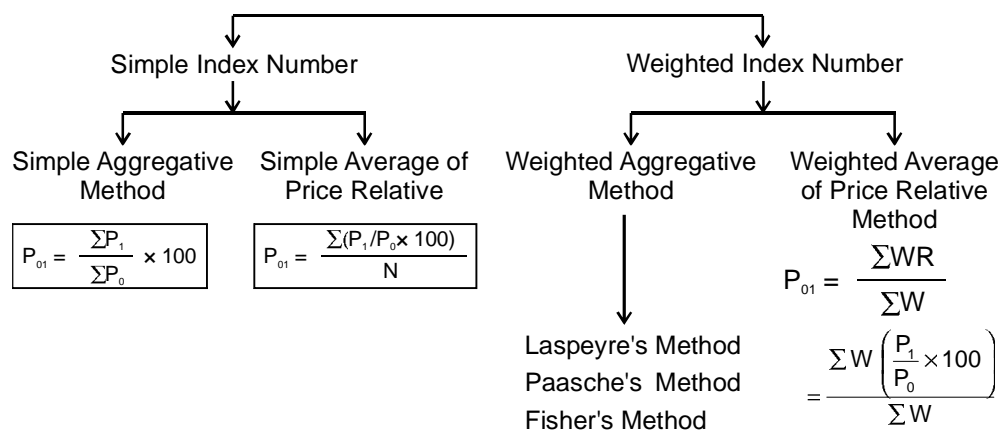
It gives a sense of how overall prices in the economy are evolving

Sensex : It is a short form of Bombay Stock Exchange (BSE) sensitive Index with 1978-79 as base. The value of the sensenx is with reference to this period. It is the benchmark index for the Indian stock market.

Note : Students now you all can do the following questions with the help of the above Rey-words.

1. What do you mean by index numbers?
2. Define base year.
3. State the three type of index numbers.
4. Give the formula to calculate the rate of inflation.

• **Methods of Constructing Index Numbers**



(i) Laspeyre's Method (L) $P_{01} = \frac{\sum P_1 q_0}{\sum P_0 q_0} \times 100$

(ii) Paasche's Method (P) $P_{01} = \frac{\sum P_1 q_1}{\sum P_0 q_1} \times 100$

(iii) Fisher's Method (F) $P_{01} = \sqrt{L \times P}$

$$P_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1}} \times 100$$

P_1 = Current year price

P_0 = Base year price

q_0 = Base year quantity

q_1 = Current year quantity

- Ideal Index Number : Fisher's Index number.
 1. It considers both base year and current year quantity
 2. It is based on the Geometric mean which is considered as best average
 3. It satisfies time reversal and factor reversal test.

Some Solved Examples:

Q.1. Calculate the simple Price relative index number. Also interpret the result(3 marks)

Commodity	Price in 2016	Price in 2021
A	2	4
B	5	6
C	4	5
D	2	3

Hint : $P_{01} = \frac{1}{n} \sum \frac{p_1}{p_0} \times 100$

N is the number of commodities (Ans: 148.75)

Q.2. Calculate a weighted Index Number for 2021 with 2015 as base year

Commodity	Weight in %	Price in 2015	Price in 2021
A	40	2	4
B	30	5	6
C	20	4	5
D	10	2	3

Hint : $P_{01} = \frac{\sum RW}{\sum W}$

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

Then calculate WR

$$\sum WR$$

(Ans: 156)

Do and Evaluate Yourself

Q.3. From the following data, construct index of industrial production

Industry	Output (in units)		Weights W
	2010 q_0	2020 q_1	
Mineral	125	190	35
Chemical	80	140	40
Electrical	170	272	10
Clothes	220	308	15

$$\text{Hint : IIP} = \frac{\sum \left(\frac{q_1}{q_0} \times 100 \right) w}{\sum W}$$

(Ans = 160.2)

QUESTION

COMPETENCY BASED QUESTIONS (1 MARK)

- 1) What do you mean by index numbers ?
- 2) Define base year.
- 3) State the three different index numbers.
- 4) Give the formula to calculate the rate of inflation.

CONSTRUCTED RESPONSE QUESTIONS (3 – 4 MARK)

- 1) Mention three advantages of index number.
- 2) Construct the index no. for 2017 taking 2011 as base year by simple average of price-relatives.

Items	A	B	C	D	E	
2011 (prices)	15	22	38	25	50	
2017 (prices)	30	25	57	35	63	Ans. $P_{01} = 145.9$

- 3) Explains the limitations of index number.

CONSTRUCTED RESPONSE QUESTION (6 MARK)

- 1) Explain the problems to construct an index number.
- 2) Explain the importance of index number.
- 3) Calculate consumer price Index No. Using Family Budget Method.

Items	Weight	Base year price	Current year price
Food	45	300	350
Rent	20	200	225
Fuel	8	100	110
Clothing	10	150	175
Others	17	250	300

Ans. 115.87

ANSWER OF COMPETENCY BASED QUESTIONS

- 1) An index number is a statistical device for measuring changes in the magnitude of a group of relative variables.
- 2) It refer to year of reference with which prices of current year are compared to measure the changes.
- 3) (a) consumer price index (b) wholesale price index (c) Index of industrial production

4)
$$\frac{i_1 - i_0}{i_0} \times 100$$

Frequently Asked Questions Index Numbers

1. What is the symbol of the price of the base year ? (Hint: P_0)
2. State the characteristics of index number.
Hint :
 - (i) Expressed in numbers
 - (ii) Relative measure
 - (iii) Average of percentage
 - (iv) Basis for comparison
 - (v) Universal utility
3. Write three uses of Wholesale Price Index.
Hints :
 - (i) Forecasting of demand and supply.
 - (ii) Determination of Real Change in Aggregate.
 - (iii) Indicator of Rate of Inflation.

INDEX NUMBER

Multiple Choice Questions :- (1 Mark Questions)

1. Price Index can't go below base year price (True / False)
2. 'SENSEX' is an Index number indicating change in price of top 30 shares traded at Stock Exchange.
3. **Reference year for Index number is:**
 - (a) Current Year
 - (b) First Year
 - (c) Previous Year
 - (d) Base year
4. Increase in the price of air fare tickets will increase the consumer price index of agricultural labourers. (True/False)
5. Define weighted Index numbers.
6. **Which of the following items has the highest weight in consumer price index for industrial workers?**
 - (a) Housing
 - (b) Food
 - (c) Clothing
 - (d) Health

- 7. Change in the cost of living is best shown by the**
- (a) Wholesale price index
 - (b) Consumer price index
 - (c) Human development index
 - (d) Industrial production index
- 8. Price index formula $P_{01} = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$ given by**
- (a) Lespeyre's
 - (b) Pearson
 - (c) Paasche's
 - (d) Fisher
- 9. The impact of change in the price of a commodity with less weight in the index will be on index number, (small/large) (choose the correct option)**
- 10. In notation P_{01} , 0 stands for**
- (a) Base year
 - (b) Current year
 - (c) Reference year
 - (d) Both (a) and (c)
- 11. Index number measures the absolute changes in the variables over the time. (True/False)**
- 12. Which of the following index number suggest an increase in level of economic activities in the economy?**
- (a) Increase in SENSEX
 - (b) Increase in CPI
 - (c) Increase in WPI
 - (d) Increase in IIP
- 13. Index number for the base year depend upon price relatives of current year (True/False).**

- 14. Which of the following plays an important role in construction of Index numbers**
- (a) Base year price (b) Current year price
(c) Weights (d) All of the above
- 15. Index number is equals to of price relatives. (Sum/average/product) (choose the correct option)**
- 16. The index number is a special type of average. (True/False)**
- 17. Which of the following is weighted index number**
- (a) Lespeyre's (b) Paasche's
- (c) $P_{01} = \frac{\sum RW}{\sum W}$ (d) All of the above
- 18. Index numbers are expressed in:**
- (a) Units of measurement (b) Ratios
(c) Price of goods (d) Percentages
- 19. Which of the following is not a type of index number?**
- (a) SENSEX (b) Inflation rate
(c) NIFTY (d) Index of Industrial Production
- 20. A weighted aggregate price index where the weight for each item is its current-period quantity is called the**
- (a) Simple Aggregative index (b) Fisher Index
(c) Laspeyres Index (d) Paasche Index
- 21. Purchasing power of money is:**
- (a) Reciprocal of price index number
(b) Equal to price index number
(c) Unequal to price index number
(d) None of these

22. The price level of a country in a certain year has increased 25% over the base period. The index number is:

- (a) 25 (b) 125
(c) 225 (d) 2500

23. If $\sum p_0q_0 = 1360$, $\sum p_1q_0 = 1900$, $\sum p_0q_1 = 1344$, $\sum p_1q_1 = 1880$

Then the Laspeyre's index number is

- (a) 0.71 (b) 1.39
(c) 1.75 (d) None of these

ANSWERS OF ONE (1) MARK QUESTIONS

1. False
2. Bombay
3. (d)
4. False
5. It indicate the relative importance of items included in the calculation of an index.
6. (b)
7. (b)
8. (a)
9. Small
10. Base year
11. False
12. (d)
13. False
14. (d)
15. Average
16. True
17. (d)
18. (d)
19. (b)
20. (d)
21. (a)
22. (b)
23. (b)

CONSTRUCTIVE RESPONSE QUESTIONS (3–4 MARKS)

1. Calculate simple aggregative price index number from the following data

Items	Base Year		Current Year	
	Price	Quantity	Price	Quantity
A	12	8	18	12
B	15	10	19	14
C	7	20	10	25
D	6	15	8	18

2. Salary of Amar was rupees ₹ 15000 in base year and his present year salary is ₹ 20000. How much increment should Amar get to maintain same living standard if consumer price index (CPI) is 150?
3. Consumer price index increase from last year's 250 to current year's 280. How much salary should Amar get to maintain same living standard which he was maintaining with ₹ 60000 salary in last year.
4. Month: April May June July August September
WPI: 200 210 231 245 255 250

On the basis of the data given above answer the following questions

- (i) In which month inflation rate was highest?
(ii) In which month inflation rate was lowest?
(iii) What was the inflation rate in the month of June?

Exam Oriented Questions with Answers

Q.1. What are the difficulties or problems in the construction of index numbers?

Ans. The main difficulties or problems in the construction of index numbers are as follows :

1. **Purpose of Index Number** : Different index number serve different purposes. So before constructing an index number, one must define the objective.

2. **Selection of Base Year** : Base year is the year with which prices of the current year are compared. So it should be selected with due care. It should be a normal year without much ups and downs.
3. **Selection of the Price of the Goods and Services** : In the construction of price index, selection of prices is a major difficulty. The problem is that which prices should be taken into consideration. Wholesales prices or retail prices. Besides it, prices at different places are different. So, one should be careful in its selection.
4. **Selection of Goods and services** : Which goods and services should be included for measuring index number, is another major problem. So, one should keep the purpose of index number into consideration. While selecting it.
5. **Selection of Method** : There are various methods to measure index number. So, which method should be used, is another problem.

Q.2. What are the steps to construct consumer price index (CPI).

Ans. The steps to construct consumer price index are as follows :

1. **Selection of the Consumer Class** : First of all, it should be determined, for whom CPI is to calculate i.e., for industrial labour, farmers, govt employee etc.
2. **Information about the Family Budget** : After the selection of consumers class, information about their family budget should be collected i.e., what they consume, how much they consumers, prices of the concerned goods and services etc.
3. **Choice of Base Year** : After this, base year selection should be done. It should be a normal year without much ups and downs.
4. **Information about Prices** : The data regarding retail prices of selected goods and services should be collected from the concerned area, where the selected consumer group lines and makes the purchases.
5. **Weightage** : Selected items should be given weights according to their relative importance.

6. **Selection of Method** : At the end, it should be decided that aggregative expenditure method should be used or family budget method should be used to measure CPI.

Q.3. What is the importance of CPI or cost of living index.

Ans. Importance of CPI

1. It helps government in formulation of various policies regarding taxation, prices, rent control, general economic and fiscal policies etc.
2. It helps in determination of dearness allowance, on the basis of which govt employees salaries are hiked to compensate the rising prices level.
3. It is used to measure the real value of the rupee or its purchasing power and real income.

Q.4. What are the limitations of index numbers?

Ans. These are the following limitations of index numbers :

1. It provides only relative changes.
2. It considers only quantitative changes.
3. Index numbers does not reflect perfect accuracy.
4. Different methods of measuring index number give different results.

SOME MATHEMATICAL TOOLS USED IN ECONOMICS

Relationship between two variables can express in three ways -

- (1) In the form of table
- (2) In the form of diagram
- (3) In the form of an algebraic equation.

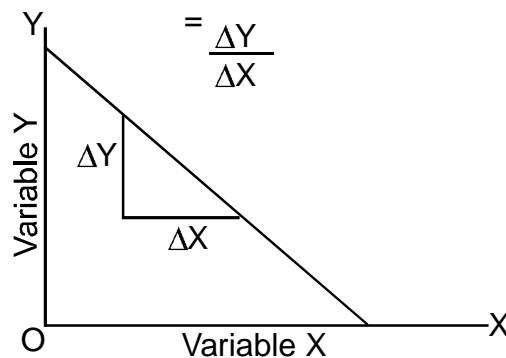
Economics now prefers to describe relationship between different variables in terms of algebraic equations

Functional Relationship - It refers to the 'cause and effect' relationship between the variables.

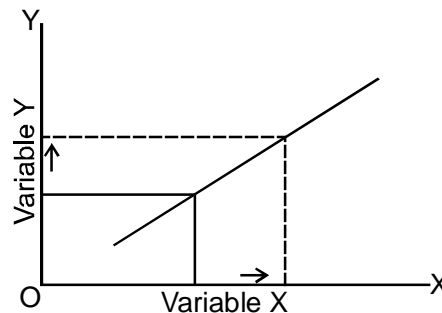
(I) SLOPE OF A LINE (LINEAR GRAPH)

Straight lines have the same slope. It means change in one variable in response to a unit change in other is same everywhere on the straight line. The slope of a straight line is calculated as :

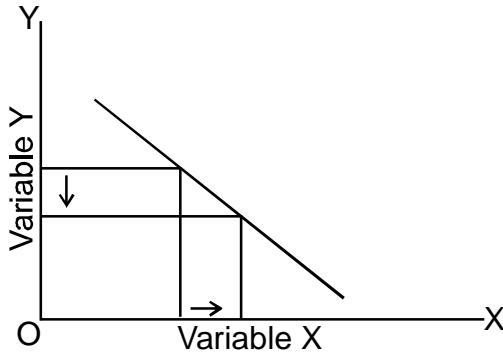
$$\text{Slope} = \frac{\text{Change in variable on the Y - axis}}{\text{Change in variable on the X - axis}}$$



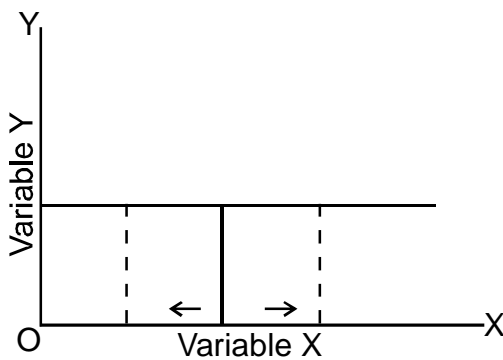
- 1) **Positive Slope** - If the line is upward sloping then the two variable are directly related.



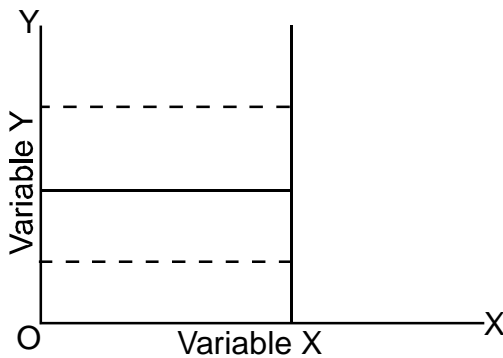
- 2) Negative Slope - When the Line is downward Slopping, then the two variable are inversely related.



- 3) Zero Slope – In case of a horizontal straight line, the slope is Zero as OY is zero.



- 4) Infinite Slope – In case of a vertical straight line, the slope is infinite as OY is too big to be measured.

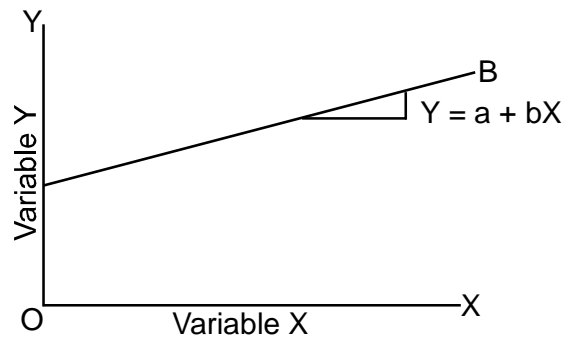


(II) Equation of Line

If the slope is constant throughout, the curve will be a straight line.

- 1) Equation of an upward sloping straight line curve:

$$Y = a + bX$$



where a = Value of the Y - axis intercept (OA) of the curve AB.

$$b = \text{It is coefficient} = \frac{\Delta Y}{\Delta X}$$

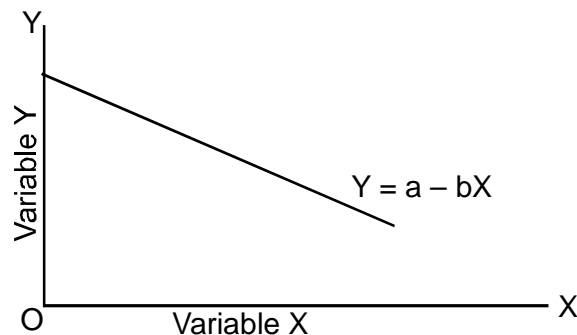
X = Independent Variable

$+$ = Sign indicate direct relation between x and y

- 2) Equation of a downward sloping Straight Line curve –

$$Y = a - bX$$

$(-)$ = Sign indicate inverse relation between x and y



III SLOPE OF A CURVE

A non-linear curve is the one, whose slope changes. Unlike the slope of a straight line, the slope of a curve is continuously changing.

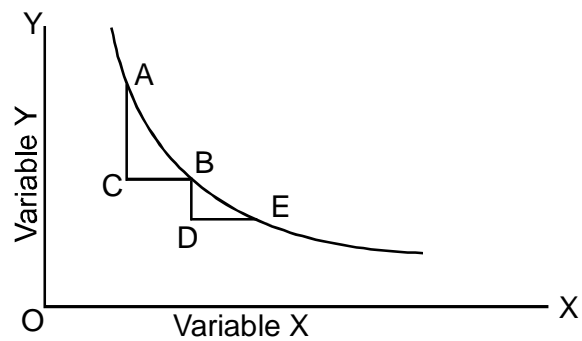
- 1) Downward sloping convex curve to the origin

In case of movement from A to B

$$\text{Slope} = \frac{\Delta Y}{\Delta X} = \frac{AC}{CB}$$

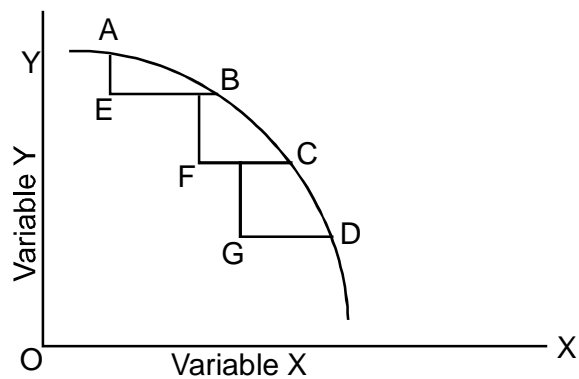
In case of movement from B to E

$$\text{Slope} = \frac{\Delta Y}{\Delta X} = \frac{BD}{DE}$$



- 2) Downward sloping concave curve to the origin

The slope of concave curve tends to rise.



PART-B: INTRODUCTORY MICROECONOMICS

UNIT 1

INTRODUCTION

INTRODUCTION

- Economics
 - Micro Economics
 - Macro Economics
 - Positive Economics
 - Normative Economics
- Economy
- Central Problems of Economy
 - What to produce
 - How to produce
 - For whom to produce
- Production Possibility Frontier
 - Meaning and Shape
 - Properties
 - Type of shift and their Reason
- Opportunity Cost
- Marginal Rate of Transformation (MRT)

Points to Remember

- **Microeconomics**
 - (i) Microeconomics, we study the behaviour of individual economic agents in the markets
 - (ii) For different goods and services and try to figure out how prices and quantities of goods and services are determined through the interaction of individuals demand and supply in these markets,
 - (iii) In this we study the consumer's equilibrium, producer's equilibrium, price theory, Utility analysis etc.
 - (iv) Some of the important questions that are studied in microeconomics are as follows

How the price of a goods is determined in a market? How consumers equilibrium will be determined? What will be the level of production of a producer? How producers will be in equilibrium in perfectly competitive market? etc.

❑ **Macroeconomics**

- (i) In macroeconomics, we try to get an understanding of the economy as a whole
- (ii) In this we focus our attention on aggregate measure such as total output, employment and aggregate price level.
- (iii) In Macro we are interested in finding out how the levels of these aggregate measures are determined and how the levels of these aggregate measures change over time.
- (iv) Some of the important questions that are studied in macroeconomics are as follows: What is the level of total output in the economy? How is the total output determined? How does the total output grow over time? Are the resources of the economy (eg labour) fully employed? What are the reasons behind the unemployment of resources? Why do prices rise?

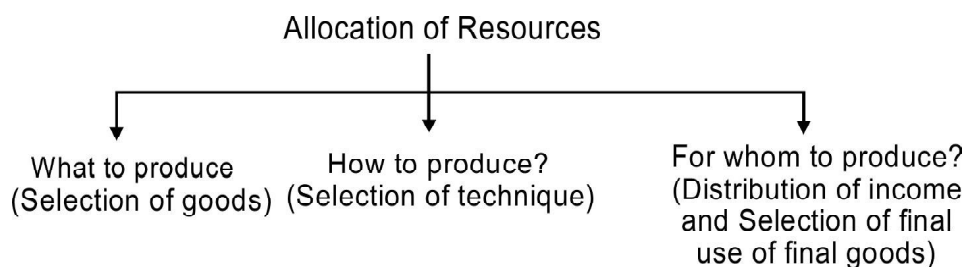
❑ An economy is a system that helps to produce good and services and enables people to earn their living.

❑ Economic problem is the problem of making the choice of the use of scarce resources for satisfying unlimited human wants.

❑ Causes of economic problems are :

- (a) Unlimited Human Wants
- (b) Scarcity of Economic Resources
- (c) Alternative uses of Resources

❑ **Central Problems of an Economy**



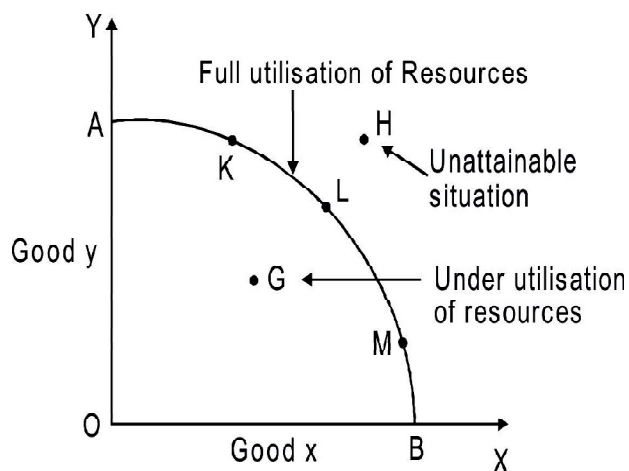
❑ **Central Problems of an Economy**

- As we know that each society has unlimited wants and limited resources that have alternative uses also so every economic agent has to face the problem of allocation of resources.
- Every economy faces the problem of allocating the scarce resources to the production of different possible goods and services and of distributing the produced goods and services among the individuals within the economy. The allocation of scarce resources and the distribution of the final goods and services and choice of technique are the central problems of any economy.

Following three are the central problems

- (i) What to produce and in what quantities?
 - Every society must decide on how much of each of the many possible goods and services it will produce.
 - Whether to produce more of food, clothing, housing or to have more of luxury goods.
 - Whether to have more agricultural goods or to have industrial products and services.
 - Whether to use more resources in education and health or to use more resources in building military services.
 - Whether to have more of basic education or more of higher education.
 - Whether to have more of consumption goods or to have investment goods (like machine) which will boost production and consumption tomorrow.
- (ii) How are these goods produced?
 - Every society has to decide on how much of which of the resources to use in the production of each of the different goods and services.
 - Whether to use more labour (labour intensive technique) or more machines (capital intensive technique).
 - Which of the available technologies to adopt in the production of each of the goods and services.

- (iii) For whom are these goods produced?
- Who gets how much of the goods that are produced in the economy?
 - How should the produce of the economy be distributed among the individuals in the economy?
 - Who gets more and who gets less?
 - Whether or not to ensure a minimum amount of consumption for everyone in the economy.
 - Whether or not elementary education and basic health services should be available freely for everyone in the economy
- Opportunity cost of a given resource can be defined as the value of the next best use to which that resource could be put.
- Production possibility frontier shows all possible combinations of two goods that an economy can produce with given resources and available technology, assuming that all resources are fully and efficiently utilised as shown in Fig. points K, L and M.
- Point H is beyond the capacity of production



- Any point below the PPF shows that Resources are either under employed or employed in wasteful manners as point G. in Fig.
- Economising of resources means use of resources in best possible manner.
- Features of Production Possibility Frontier

- (a) Slopes downward from left to right because to increase the production of one good, some units of other good has to be sacrificed.
- (b) Concave to the origin because of increasing Marginal Opportunity Cost (MOC) or Marginal Rate of Transformation (MRT). MRT is increasing because all resources are not equally efficient in the production of both goods.

□ **Different type of shift of PPC**

- **Rightward shift in the PPF indicates** the increase in resources or improvement in technology in case of both the goods

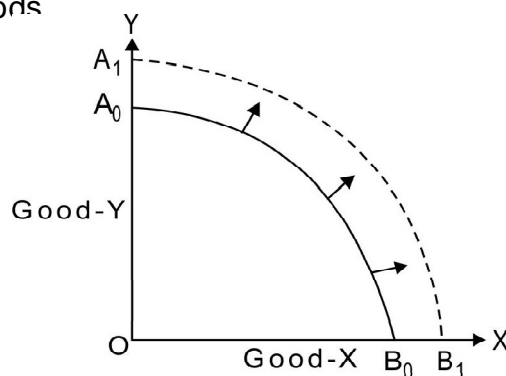


Fig. 1

- **Leftward shift of PPF indicates** decrease in resources or degradation in technology in case of both the goods

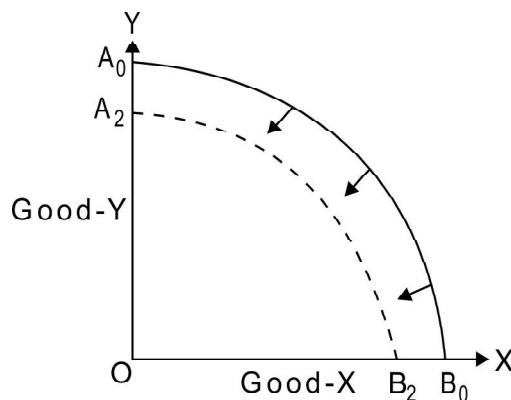
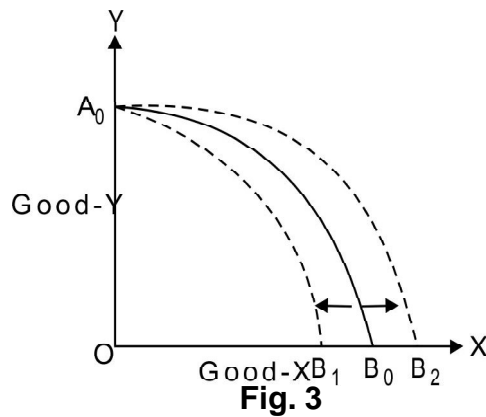
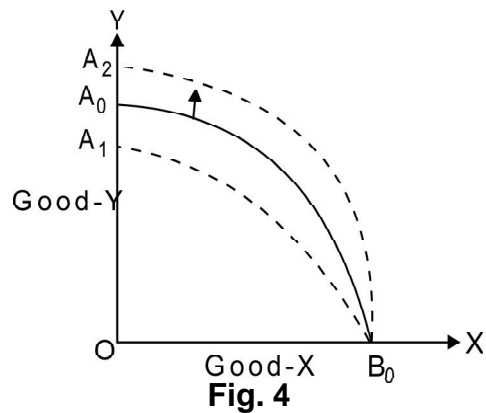


Fig. 2

- Rightward/Leftward shift in PPF when no change in quantity of good Y and only change in quantity of good X.



- Upward/Downward shift in PPF when no change in quantity of good Y and change only in good X.



Upwards/Downward shift in PPF when no change in Quantity good X and change only in Good Y.

- ❑ PPC will shift rightwards due to all those reasons which enhances production potential, quantity and efficiency of resources in an economy.

Reasons for Rightwards shift	Reasons for Leftward Shift	No Change in PPC
1. Increase in Resources	1. Decrease in Resources	1. Transfer of Resources
2. Improvement in technology	2. Technological obsolescence	2. Unemployment Eradication Programme
3. Skill Development Programme (Training)	3. Natural Calamities (Flood, Earthquake, Tsunami, Drought et(c))	
4. Education for all (Health)	4. Migration	
5. Clean India Campaign (Health)	5. War, terrorism	

6. Yoga Enhancement Plans (Health).
7. Beti Bachao, Beti Padhao (Education)
8. Make in India (Investment)
9. Increase in Foreign Capital (Foreign Investment)

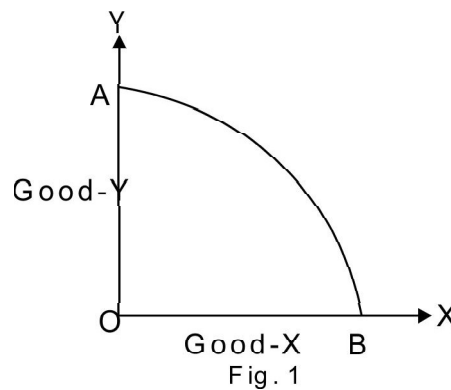
- ❑ Marginal Rate of Transformation (MRT) is the ratio of number of units of a good sacrificed to increase one more unit of the other good.

$$\text{MRT} = \frac{\Delta Y}{\Delta X}$$

- ❑ MRT can also called Marginal Opportunity Cost. It is defined as the additional cost in terms of number of units of a good sacrificed to produce an additional unit of the other good.
- ❑ **Slope of PPF depends on MRT/MOC.**
 - When MOC increases, PPF is concave to origin.
 - When MOC decreases PPF is convex to origin.
 - When MOC remains constant, PPF is downward sloping straight line.

The slope of PPC depends on MRT/MOC

- In General MOC/MRT is increases therefore the PPC is concave to the origin as shown in Fig. 1.



- If **MOC** is constant the **PPC** will be a straight line and downward sloping as shown in Fig. 2.
- If **MOC** is Decreasing the **PPC** will be convex to the origin as shown in Fig. 3.

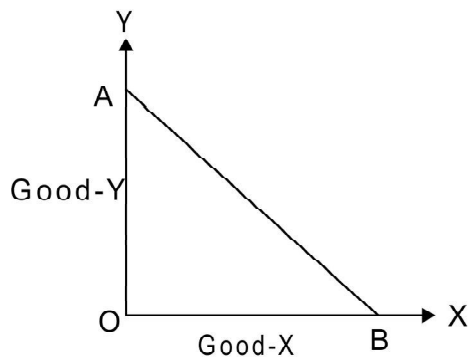


Fig. 2

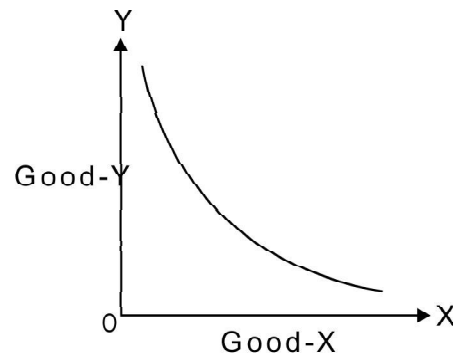


Fig. 3

❑ **Positive Economics:**

- In positive Economics analysis we study how the different Mechanisms functions.
- It deals with the things in the Actual “as they are”
- It studies the facts which can be verified. Examples India is over populated; prices are Rising in India.

❑ **Normative Economic**

- In normative Economics we try to understand whether the different Mechanism are desirable or not.
- It deals with the idealistic situation instead of actual situation.
- It studies the statements about facts that can't be verified. Example we should controll the over population. Prices should not Rise etc.

SELECT RESPONSE TYPE
MULTIPLE CHOICE QUESTIONS (1 MARK)

- Which of the following subject matter study in Micro Economics,
 - Money supply
 - Aggregate demand
 - Market demand of a good
 - National Income

2. Which subject matter does not study in macro economics,
(a) Employment Level (b) Aggregate Supply
(c) National Income (d) Determination of market price
3. Economic Problem arises due to
(a) High population of a country
(b) Competition among buyers
(c) Resources have alternative uses
(d) Producer wants maximum profit
4. Which of these is a central problem of an Economy?
(a) Deficit demand
(b) Equilibrium of an economy
(c) For whom to produce
(d) Decreasing return to a factor
5. Any point beyond the PPF shows:
(a) Under utilisation of Resource
(b) Unattainable combination of output
(c) Efficient utilisation of Resources
(d) Decrease in resources.
6. In which situation PPF shifts towards right
(a) Increase in foreign capital
(b) Resources are reduced
(c) Fully efficient use of resources
(d) Increase in employment
7. Production Possibility Frontier can be a straight line: when
(a) Decrease in production of both goods
(b) More of both goods can be produced
(c) All resources are equally efficient in production of both goods
(d) All resources are not equally efficient in production of both goods.

8. Which of the followings are assumptions of PPF
- (a) Available Resources are fully and efficiently utilized
 - (b) Technology remain stable
 - (c) Resources are not equally efficient in production of all goods
 - (d) All of the above
9. Which of these statement is correct about Opportunity cost?
- (a) Opportunity cost is always higher than the given price.
 - (b) Opportunity cost is always less than the given price.
 - (c) Opportunity cost is always calculated in money.
 - (d) Opportunity cost can be less than, more than or equal to given price.
10. Which of these is Normative Economics.
- (a) 25 percent population of India is below poverty line.
 - (b) Increase in FDI has increased the GDP of India.
 - (c) Equal distribution of income will make India poverty free.
 - (d) Higher welfare spending by government increases the Aggregate Deman(d)
11. In which situation ,can PPF be a straight line:
- (a) When MRT is decreasing
 - (b) When MRT is increasing
 - (c) When MRT is constant
 - (d) When MOC is decreasing
12. PPF is concave to the point of origin due to :
- (a) increasing MRT
 - (b) decreasing MRT
 - (c) constant MRT
 - (d) decreasing MOC

13. PPF can be convex to the point of origin due to:
- (a) increasing MRT
 - (b) decreasing MRT
 - (c) constant MRT
 - (d) increasing MOC
14. Which of the following central problem of an economy deals with technique of production ?
- (a) What to produce
 - (b) How to produce
 - (c) For whom to produce
 - (d) When to produce
15. Which of the following central problem of an economy deals with deciding the quantity of goods to be produced?
- (a) What to produce
 - (b) How to produce
 - (c) For whom to produce
 - (d) When to produce
16. Which of the following central problem of an economy deals with selection of category of people who will ultimately consume the goods?
- (a) What to produce
 - (b) how to produce
 - (c) For whom to produce
 - (d) When to produce
17. Which of the following will not lead to shift in PPF?
- (a) Improvement in technology
 - (b) Growth of resources
 - (c) Degradation in technology
 - (d) Unemployment

18. Which of the following will lead to shift PPF rightward ?
- (a) Improvement in technology
 - (b) Destruction of resources
 - (c) Degradation in technology
 - (d) Unemployment
19. Which of the following will lead to shift PPF leftward?
- (a) Improvement in technology
 - (b) Growth of resources
 - (c) Degradation in technology
 - (d) Unemployment
20. A point inside the PPF indicates:
- (a) Efficient use of resources
 - (b) Unattainable combination
 - (c) Fuller utilization of resources
 - (d) Under utilization of resources
21. A point on the PPF indicates:
- (a) Inefficient use of resources
 - (b) Unattainable combination
 - (c) Fuller utilization and efficient use of resources
 - (d) Under utilization of resources
22. An economic problem arises due to :
- (a) Limited human wants
 - (b) Unlimited human wants and unlimited resources
 - (c) Limited human wants and limited resources
 - (d) Unlimited human wants and limited resources

23. Opportunity cost is the :
- (a) Number of units gained
 - (b) Number of units sacrificed
 - (c) Cost of the next best alternative foregone
 - (d) Cost of the next best alternative gained
24. Which of the following is an example of microeconomics?
- (a) National income
 - (b) Income and employment
 - (c) Price of a commodity
 - (d) Price level
25. Which of the following is an example of macroeconomics?
- (a) Individual income
 - (b) Income and employment
 - (c) Price of a commodity
 - (d) Demand for a commodity
26. Which of the following is not an example of economic activity
- (a) Production
 - (b) Consumption
 - (c) Exchange
 - (d) social welfare
27. Positive economics deals with:
- (a) Opinions
 - (b) Facts
 - (c) Value judgement
 - (d) Suggestions
28. Normative economics deals with:
- (a) what was
 - (b) what ought to be
 - (c) what is
 - (d) what would be

29. Main characteristics of resources are
- (a) they are limited
 - (b) they are unlimited
 - (c) they have alternative uses
 - (d) both (a) and (c)

Competency Based Question

Q.30. Ram : My corn harvest this year is poor.

Krishna: Don't worry price increase will compensate for fall in quantity supplied.

Sita: Climate affects crop yields certain year are bad, others are good

Radha: The government ought to guarantee that our income should not fall. In this conversation, the normative statement is made by

- (a) Ram
- (b) Krishana
- (c) Sita
- (d) Radha

Ans. 1. (c); 2. (d); 3. (c); 4. (c); 5. (b); 6. (a); 7. (c); 8. (d); 9. (d); 10. (c) 11. (c) 12. (a) 13. (b) 14. (b) 15. (a) 16. (c) 17. (d) 18. (a) 19. (c) 20. (d) 21. (c) 22. (d) 23. (c) 24. (c) 25. (b) 26. (d) 27. (b) 28. (b) 29. (d) 30. (d)

Competency Based Questions

Question no.2: Fill appropriate word in the blanks-

- (i) Scarcity of resources gives rise to problem of(plenty/ choice)
- (ii) Choice is the result of.....(excess/scarcity)
- (iii) Production possibility curve is.....to the point of origin, (convex/concave)
- (iv) is the ratio of number of units of a good sacrificed to increase one more unit of other good.(opportunity cost/ marginal rate of transformation)

- (v) of a given resource can be defined as the value of the next best use to which that resource could be put. (opportunity cost/ marginal rate of transformation)
- (vi) is the slope of production possibility curve, (marginal rate of transformation/ marginal rate of substitution)

- Ans:** (i) choice (ii) scarcity
 (iii) concave (iv) marginal rate of transformation
 (v) opportunity cost (vi) marginal rate of transformation

Constructed Response Questions

Short Answer Type Questions (3-4 Marks)

1. Distinguish between microeconomics and macroeconomics. Give example.
2. Why does an economic problem arise? Explain the problem of 'How to Produce'?
3. Explain the problem of 'What to Produce' with the help of an example.
4. 'For whom to produce' is a central problem of an economy. Explain.
5. Define opportunity cost with the help of an example, how does it differ from marginal opportunity cost?
6. What is 'Marginal Rate of Transformation'? Explain with the help of an example.
7. Why is a production possibility curve concave? Explain.
8. What is PP Frontier? Write its assumptions.
9. Show the following situation with PPF (PPC).
 - (a) Fuller utilisation of resources
 - (b) Increase in the resources
 - (c) Under utilisation of resources.
10. Distinguish between positive economics and normative economics.
11. A lot of people died and many factories were destroyed because of a severe earthquake in a country. How will it affect the country's PPF?

12. Calculate MRT from following table. What will be the shape of PPF and why?

Combinations	Green Chilly (Units)	Sugar (Units)
A	100	1
B	95	1
C	85	2
D	70	3
E	50	4
F	25	5

13. Given that no resource is equally efficient in producing all goods. Write name of such curve which shows production potential of an economy. Explain features of this curve along with the reasons?
14. If an Economy is not able to utilise its available resources efficiently, what will be the effect on PPF? What will you suggest for economic growth?
15. Govt started employment generation program MGNREGA explain its impact on PPF.
16. 'Make in India' is a Govt. policy to attract foreign investment explain its impact on PPF.
17. The out break of covid-19 pan-demic. There was a complete lock down. How was the utilisation of resources affected. Explain with the help of PPF

Ans. Hint: 1. Under utilisation of resources
2. Suitable fig of PPF

EXAM Oriented Questions with Answer

Very Short Answer Question (1 Mark)

Q. 1. Define Economy.

Ans. An economy is a system that helps to produce goods and services and enables people to earn their living.

Q. 2. What is the meaning of scarcity of resources?

Ans. Scarcity of resources means shortage of resources as compared to its demand.

Q. 3. Write the meaning of Economic Problem.

Ans. Economic problem is the problem of making the choice of the use of scarce resources for satisfying unlimited human wants.

Q. 4. Define MRT.

Ans. Marginal Rate of Transformation (MRT) is the ratio of number of units of a good sacrificed to increase one more unit of the other

$$\text{good MRT} = \frac{\Delta Y}{\Delta X}$$

Q. 5. Define opportunity cost.

Ans. Opportunity cost of a resource is its value in next best alternative use.

Q. 6. Government has started promoting foreign investments. What will be its economic value in the context of PPF?

Ans. Production will increase with more foreign investments. Thus PPF will shift rightward

Q. 7. What is the meaning of economising of resources?

Ans. Economising of resources means best possible use of available resources.

Constructed Response Questions

3-4 Marks Questions

Q. 1. Why is a production possibility curve concave? Explain.

Ans. The production possibility curve being concave means that MRT increases as we move downward along the curve. MRT increases because it is assumed that no resource is equally efficient in production of all goods. As resources are transferred from one good to another, less and less efficient resources have to be employed this raises cost and raises MRT.

Q. 2. Explain properties of a production possibility curve.

Ans. There are two properties of a production possibility curve.

1. **Downward sloping** : It is because as more quantity of one good is produced some quantity of the other good must be sacrificed as resources are scarce. More of both goods cannot be produced
2. **Concave to the origin** : It is because the marginal rate of transformation increases as more of one good is produced.

Q. 3. Explain the problem of 'what to produce'.

Ans. An economy can produce different possible combinations of goods and services with given resources. The problem is that, out of these different combinations, which combination is produced. If production of one good increases then less resources will be available for other goods, because resources are limited and have alternative uses.

Q. 4. What is 'Marginal Rate of Transformation'? Explain with the help of an example.

Ans. MRT is the rate at which the units of one good have to be sacrificed to produce one more unit of the other good in a two goods economy. Suppose an economy produces only two goods X and Y. Further suppose that by employing these resources fully and efficiently, the economy produces $1X + 10Y$. If the economy decides to produce $2X$, it has to cut down production of Y by 2 units. Then $2Y$ is the opportunity cost of producing $1X$. Then $2Y : 1X$ is the MRT.

Q. 5. Explain the problem 'How to produce'.

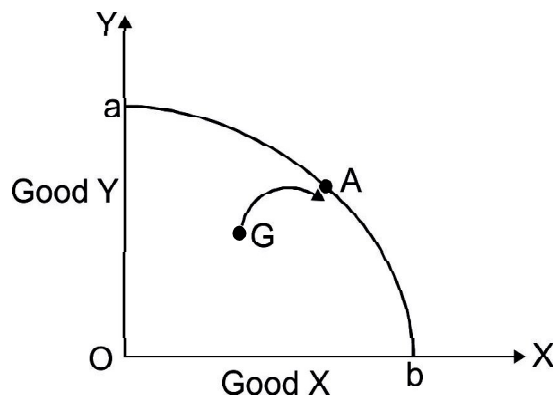
Ans. The central problem 'How to Produce' is the problem of choosing the appropriate technique of production for producing goods. There can be more than one method for producing a good. More labour

and less capital (i.e., labour intensive technique) or more capital and less labour (i.e., capital intensive technique) can be used for production of a good. Since resources are scarce, decision has to be taken about which technique should be used on the basis of availability of resources.

Example : A given quantity of cloth can be manufactured by combining factors of production in different proportions, making it capital-intensive or labour intensive method

Q. 6. For labourers working under MGNREGA Government has increased minimum employment from 100 to 150 days. How will this affect real and potential level of production.

Ans. Real level of production will be increased by improvement in employment. But potential level of production will not increase (No shifting of PPC will take place). Reason being PPC is based on the assumption that available resources are fully utilised



Tends to shift towards PPF as shown in the above may or may not be on PPF like G

Q. 7. Explain the central problem 'for whom to produce'.

Ans. For whom to produce means that who will buy the goods and services produced. Clearly, those people who have income will be able to buy. So, the problem amounts to how the national income is distributed in an economy.

Q. 8. Giving reason comment on the shape of Production Possibilities curve based on the following schedule :

Good X (units)	0	1	2	3	4
Good Y (units)	10	9	7	4	0

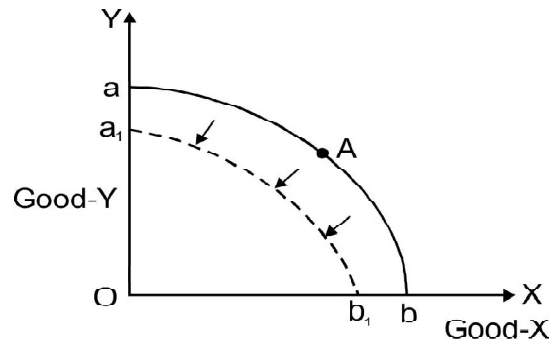
Ans.

Good X (units)	Good Y (Units)	MRT
0	10	–
1	9	1Y : 1X
2	7	2Y : 1X
3	4	3Y : 1X
4	0	4Y : 1X

Since MRT is increasing, the PP curve is downward sloping and concave to the origin.

Q. 9. Explain the effects of floods in Jammu and Kashmir on its production possibilities frontier.

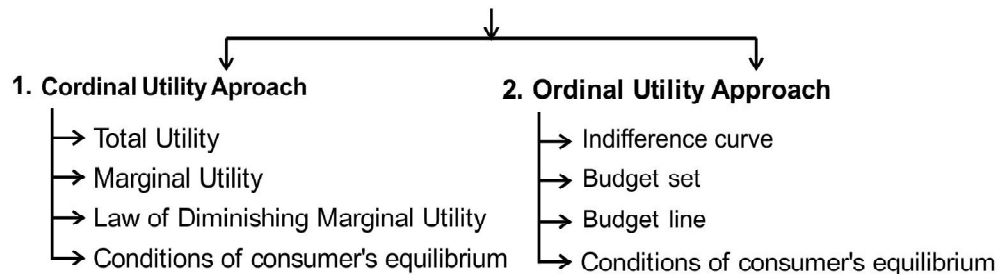
Ans. Floods have damaged and reduced resources. Since potential production declines, the production possibility frontier shifts to the left.



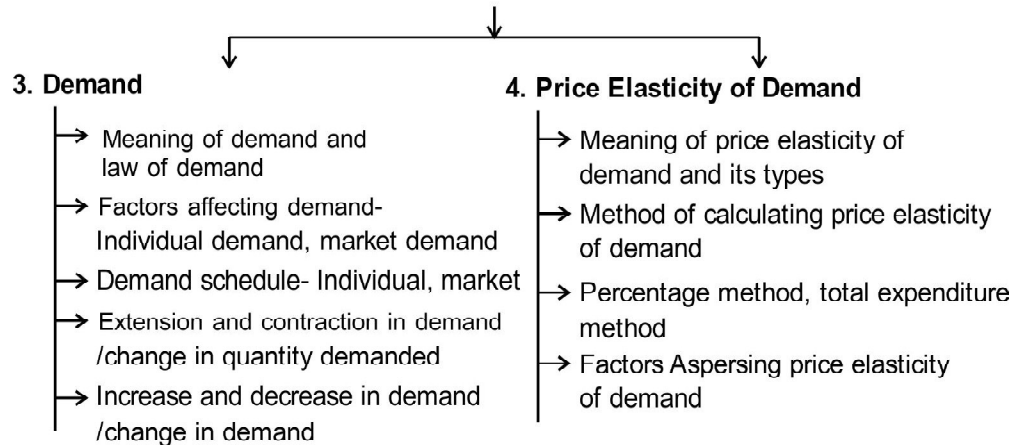
UNIT II

CONSUMER'S EQUILIBRIUM & DEMAND

I - CONSUMER'S EQUILIBRIUM ANALYSIS



II - DEMAND ANALYSIS



Points to Remember

- ❑ **Consumer** : is an individual who consumes final goods and services to fulfill his basic needs.
- ❑ **Utility** : Wants satisfying power of a commodity is called utility.
- ❑ **Total utility** : It is the sum of satisfaction/utility a consumer gets from consumption of all the units of a commodity at a given time.

- ❑ **Marginal Utility** : It is increase in total utility by consuming an additional unit of a commodity.
- ❑ **Law of Diminishing Marginal Utility** : According to this law when consumer consumes more and more units of a commodity the Marginal Utility derived from each successive units goes on declining.
- ❑ **Budget set** : It is combination of quantity of two commodities that a consumer can purchase from his given income at prevailing market prices of the commodities.

$$\text{Equation of Budget Set : } P_x \cdot q_x + P_y \cdot q_y \leq M$$

- ❑ **Budget Line** : It is a line showing different combinations of two goods which a consumer can buy by spending his whole income at given price of the goods.

$$\text{Budget line : } M = P_x \cdot q_x + P_y \cdot q_y$$

- ❑ Marginal Rate of Substitution (MRS):
- ❑ Indifference curve:
- ❑ Indifference Map:
- ❑ Characteristics of Indifference Curve
- ❑ Monotonic Preferences:
- ❑ Change in Budget Line
- ❑ Consumer's Equilibrium:
- ❑ **Indifference Map** : It refers to of indifference curves of a consumer placed together in a diagram.
- ❑ **Characteristics of Indifference Curve**
 1. **Indifference curves are negatively sloped** : because to increase quantity of one good some units of other has to be sacrificed to remain on same satisfaction level.
 2. **Indifference curves are convex to the point of origin** : due to decreasing MRS. MRS decreases due to law of diminishing marginal utility.

3. Indifference curves never touch or intersect each other : each indifference curve shows different level of satisfaction and Intersection point shows same satisfaction level of satisfaction which is not possible.

4. Higher Indifference curve represents higher level of satisfaction : due to monotonic preference. Higher indifference curve shows bundles having more of one commodity and not less of other good incomparision of lower indifference curve.

❑ **Consumer's Equilibrium :** It is a situation where a consumer is spending his income in such a way that he is getting maximum satisfaction and has no tendency to change.

❑ **Condition of Consumer's Equilibrium**

(I) **Cardinal approach (Utility Analysis) :** According to this approach utility can be measured. "Utils" is the unit of utility.

Conditions of Equilibrium :

(1) In case of one commodity

$$i. \quad MU_m = \frac{MU_x}{P_x} \text{ [If } MU_m = 1, MU_x = P_x \text{]}$$

Where, MU_m = Marginal utility of money

MU_x = Marginal utility of 'good x',

P_x = Price of 'good x'.

ii. MU is decreasing:

$$2. \quad \text{In case of two commodities : (i) } \frac{MU_x}{P_x} = \frac{MU_y}{P_y} = MU_m$$

(ii.) MU must be decreasing.

(II) **Ordinal approach (Indifference Curve Analysis) :** According to this approach utility can't be measured but can be

expressed in order or ranking.

Condition of Equilibrium :

(i) $MRS_{xy} = \frac{P_x}{P_y}$

where P_x is Price of x

P_y is Price of y

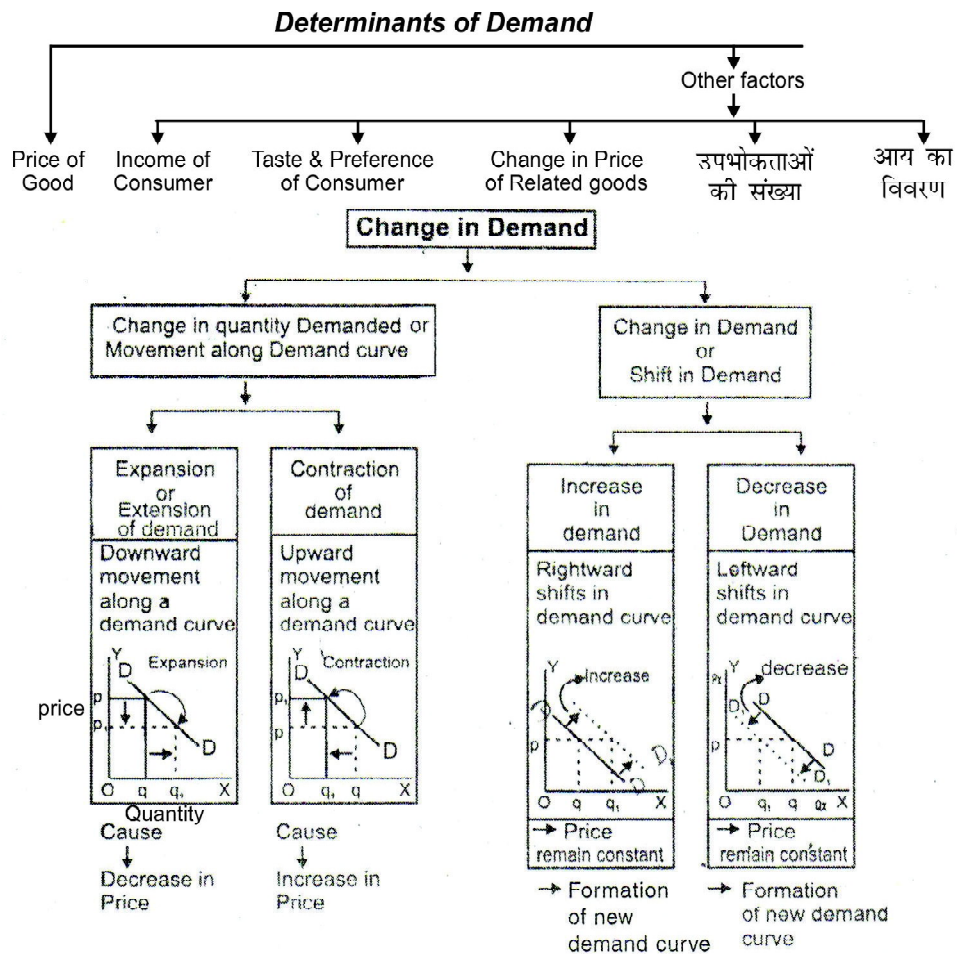
MRS_{xy} is Marginal Rate of Substitution of x for y.

or budget line must be tangent to indifference curve.

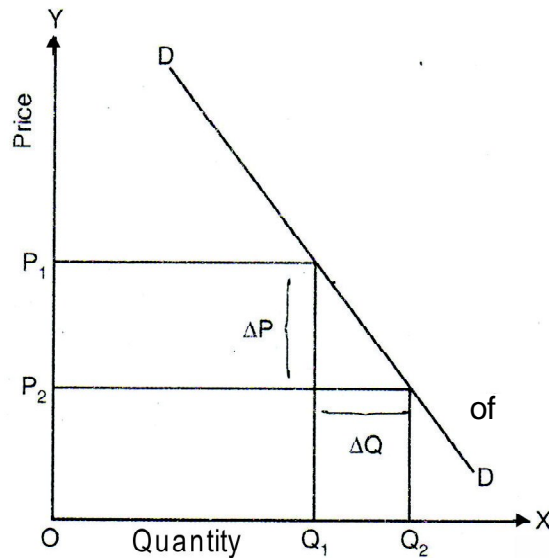
(ii) MRS must be decreasing

or Indifference curve must be convex to the origin.

- ❑ **Quantity Demanded :** It is that quantity which a consumer is able and is willing to buy at given price and in a given period of time
- ❑ **Market Demand :** It is the total quantity purchased by all the consumers in the market at given price and in a given period of time.
- ❑ **Demand Function :** It shows the functional relationship between the demand of a good and factors affecting demand.
 $D = f(P_x, P_r, Y, T, N, Y_d)$.
- ❑ **Demand Schedule :** Demand schedule is a table which shows the quantity demanded of a commodity at various prices.
- ❑ **Law of Demand :** If remaining things are being constant as price of a commodity increases quantity demanded of the commodity decreases and as price of a commodity decreases quantity demanded of the commodity increases, it is called law of demand.
- ❑ **Change in Demand :** When demand changes due to change in any one of its determinants other than the price.



- ❑ **Change in Quantity Demanded** : When quantity of demand changes due to change in own price of commodity while other factors remain constant.
- ❑ **Demand Curve** : It is a graphical presentation of demand schedule, which shows quantity demanded at various prices of commodity. There is inverse relation between price and quantity demanded of commodity.
- ❑ Demand curve and its slope :



$$\text{Slope of demand curve} = \frac{\text{Change in price}}{\text{Change in quantity demanded}}$$

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

- ❑ **Price Elasticity of Demand** : Price Elasticity of Demand is a measurement of change in quantity demanded in response to a change in price of the commodity.
- ❑ **Percentage Method** :

$$E_d = \frac{Q_1 - Q_0}{P_1 - P_0} \times \frac{P_0}{Q_0}$$

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

$$\text{Or } = \frac{1}{\Delta P / \Delta Q} \times \frac{P_0}{Q_0} \quad (\text{where } \frac{\Delta P}{\Delta Q} = \text{Slope of Demand Curves})$$

Where,

Ed. = Elasticity of Demand

ΔQ = Change in quantity demanded

ΔP = Change in Price

P = Initial Price

Q = Initial Quantity

$$E_d = \frac{\text{Percentage Change in Quantity demanded of a commodity}}{\text{Percentage Change in Price of a commodity}}$$

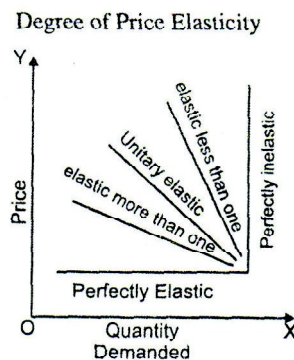
$$\text{Percentage change in quantity demanded} = \frac{\Delta Q}{Q} \times 100$$

$$\text{Percentage change in price} = \frac{\Delta P}{P} \times 100$$

Degrees of Price Elasticity of demand

Add in price elasticity of demand

Degree/types of price elasticity of demand



1. Perfectly Elastic [$ed = \infty$]

2. More Than Unity [$ed > 1$]

3. Unitary Elastic [$ed = 1$] Equal to unity (or unitary Elastic)

4. Less than unity [$ed < 1$]

5. Perfectly Elastic [$ed = 0$]

Total Expenditure Method

In this method price elasticity of demand is determined on the basis change in total expenditure due to change in price. This

method can be used to calculate following three types of price elasticity of demand:

- (i) **ed > 1** : If there is opposite relation exists between price of a commodity and total expenditure made on it then price elasticity of demand is more than unity.
- (ii) **ed < 1** : If there is direct relation exists between price of a commodity and total expenditure made on it then price elasticity of demand is less than unity.
- (iii) **ed = 1** : If there is no change occurs in total expenditure made on a commodity due to change in its price then price elasticity of demand is unitary elastic.

❑ Factors affecting Price elasticity of Demand

- (a) Nature of the Commodity.
- (b) Availability of Substitute goods.
- (c) Income of the consumer.
- (d) Possibility of postponement of commodity
- (e) Time Period.
- (f) Different use of the commodity.
- (g) Habit of the consumer.

Competency Based Questions

MULTIPLE CHOICE QUESTIONS (1 MARK)

1. Define utility
2. What do you understand by cardinal utility.
3. Write the meaning of marginal utility.
4. What is meant by ordinal utility?
5. Define marginal Rate of substitution.
6. Write the equation of the budget line

7. What do you understand by budget set?
8. What is meant by consumer's equilibrium?
9. Define demand?
10. Define a normal good
11. Write the meaning of substitute goods.
12. In which direction does the demand curve shift due to increase in income in case of inferior goods?
13. In which direction does the demand curve shift due to decrease in the number of consumers?
14. Define price elasticity of demand.
15. Write the formula to calculate price elasticity of demand?
16. What is the shape of the demand curve when the price elasticity of demand is unity?
37. Total Utility of a commodity is maximum when-
 - (a) Consumption of goods is maximum
 - (b) Marginal utility is maximum
 - (c) Average utility is maximum
 - (d) Marginal utility is zero
38. Marginal Utility of a commodity
 - (a) Always decreases with increase in quantity
 - (b) Decreases only when total utility decreases
 - (c) Decrease but always remain positive
 - (d) First increase and start decreasing after reaching maximum point
39. A consumer gets maximum satisfaction, when?
 - (a) The price of commodity is minimum

- (b) Total Utility is maximum
- (c) Total utility he gets is equal to total utility he give up in terms of money.
- (d) Utility he gets from last unit is equal to utility he give up in terms of money.
40. A consumer consumes two goods. Consumer is said to be in equilibrium, when:
- (a) Marginal utility of two goods is equal.
- (b) Total utility of two goods is equal.
- (c) Price of two goods is equal.
- (d) Per rupee marginal utility is equal.
41. When marginal utility is negative, total utility_____
- (a) Total utility increase at decreasing rate
- (b) Total utility starts diminishing
- (c) Average utility becomes zero
- (d) Total utility becomes negative
42. If price of commodity is zero. The consumer will consume-
- (a) Unlimited units of commodity
- (b) Till Marginal utility reaches maximum
- (c) Till Marginal utility becomes zero
- (d) till total utility becomes zero
43. Which of the following condition is necessary for consumer equilibrium in case of one commodity?
- (a) $\frac{MU_m}{MU_x} = P_x$
- (b) $\frac{MU_x}{P_x} = MU_m$
- (c) $\frac{P_x}{MU_x} = MU_m$
- (d) $\frac{MU_m}{P_x} = MU_x$

44. As per consumer's equilibrium theory, to reach consumer's equilibrium a consumer can_____
- Decrease the price of the commodity
 - Increase the Income of the consumer.
 - Change the quantity of the commodity
 - Increase the consumption of both goods.
45. The situation of consumer's disequilibrium $\frac{MU_x}{P_x} > \frac{MU_y}{P_y}$ arise
- due to increase in consumption of good X,
 - due to decrease in the price of good Y.
 - due to increase in the price of good X
 - due to increase in the price of good Y.
46. In case of two commodities a consumer strikes equilibrium when
- $\frac{P_x}{MU_x} = \frac{P_y}{MU_y} = MUm$
 - $\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = MUm$
 - $\frac{MU_x}{P_x} = \frac{MU_y}{P_y} = MRS_{xy}$
 - $MUm = \frac{MU_x}{P_x}$
47. Number of Budget sets of a consumer are
- Unlimited, but within budget line
 - Limited, depends upon the Income of consumer
 - Limited, depends upon price of commodities

- (d) Limited, depends upon price and income of consumer.
48. Which of the following is not a characteristic of indifference curve
- (a) Indifference Curve is convex to the origin
 - (b) Higher Indifference Curve indicates higher level of satisfaction
 - (c) Indifference Curve do not intersect each other
 - (d) Indifference Curve is concave to the origin
49. Which of the following is not a determinants of individual demand function
- (a) Distribution of Income
 - (b) Price
 - (c) Income of Consumer
 - (d) Taste and preferences
50. A consumer demands more quantity of a commodity when price decreases because
- (a) Total utility increases and become more than the price
 - (b) Marginal utility becomes more than price
 - (c) Marginal utility of money increases with decrease in the price
 - (d) Marginal utility decreases with decrease in price
51. Demand curve shifts rightward in case of
- (a) Decrease in price of the commodity
 - (b) Decrease in the price of substitute good.
 - (c) Increase in the price of complementary good.
 - (d) Increase in the number of buyers
52. Price elasticity of demand of a commodity is - 2.5. Price of commodity increased by 20 percent. What will be the change in quantity demanded?
- (a) Decrease by 50 units
 - (b) Increase by 50 units

- (c) Decrease by 8 percent
 - (d) decrease by 50 percent
53. A consumer has monotonic preferences, find the most preferred bundle by him
- (a) 4 units of X good and 6 units of Y good
 - (b) 6 units of X good and 5 units of Y good
 - (c) 6 units of X good and 6 units of Y good
 - (d) 4 units of X good and 5 units of Y good
54. What is the maximum number of Indifference curves of a consumer?
- (a) Unlimited numbers of Indifference curves
 - (b) Upto his maximum satisfaction level
 - (c) Depends upon his Budget line
 - (d) Equal to various bundles of budget sets.
55. Slope of the demand curve is zero, its elasticity of demand is
- (a) Elasticity of demand is zero
 - (b) Elasticity of demand is inelastic
 - (c) Elasticity of demand is infinity
 - (d) Elasticity of demand is elastic
56. Which of these is not a factor effecting elasticity of demand
- (a) Nature of goods
 - (b) Number of uses of the commodity
 - (c) Availability of substitute goods
 - (d) Quantity of the commodity demanded
57. What is the value of total utility at the point of satiety:
- (a) Maximum
 - (b) Minimum

- (c) Zero
 - (d) Negative
58. When the value of total utility is maximum what is the value of marginal utility?
- (a) Maximum
 - (b) Minimum
 - (c) Zero
 - (d) Negative
59. What is the value of marginal utility at the point of satiety:
- (a) Maximum
 - (b) Minimum
 - (c) Zero
 - (d) Negative
60. When total utility increases at diminishing rate, what happens to marginal utility?
- (a) It increase
 - (b) It decreases
 - (c) It becomes Zero
 - (d) It becomes Negative
61. When total utility decreases , what happens to marginal utility?
- (a) It increases
 - (b) It decreases(c)
 - (c) It becomes zero
 - (d) It becomes negative
62. If the consumption of an additional unit of a commodity causes no change in total utility, then the resultant marginal utility is :
- (a) Zero
 - (b) Constant

- (c) Positive
- (d) Negative
63. According to law of diminishing marginal utility, satisfaction obtained from consumption of each successive unit:
- (a) Increases
- (b) Decreases
- (c) Remains same
- (d) Either increases or decreases
64. In case of single commodity, consumer's equilibrium condition under utility approach is :
- (a) $MU_x > P_x$
- (b) $MU_x < P_x$
- (c) $MU_x = P_x$
- (d) $MU_x * P_x$
65. In case of two commodities, consumer's equilibrium condition under utility approach is :
- (a) $MRS_{XY} = P_x/P_y$
- (b) $MU_x = P_x$
- (c) $MU_x/P_x = MU_y/P_y$
- (d) $MU_x = P_x$
66. Which of the following is a condition of consumer's equilibrium under indifference curve analysis:
- (a) $MRS_{XY} = \frac{P_x}{P_y}$
- (b) $MU_x = P_x$
- (c) $MU_x/P_x = MU_y/P_y$
- (d) $MU_x = MU_y$
67. If $MU_x/P_x > MU_y/P_y$, then to reach at the equilibrium position ,what should the consumer do ?
- (a) Stop buying both commodities

- (b) Buy both the commodities in equal quantity
 - (c) Buy more of X and less of Y
 - (d) Buy more of Y and less of X
68. If $MU_X/P_X < MU_Y/P_Y$, then to reach at the equilibrium position, what should the consumer do ?
- (a) Stop buying both commodities
 - (b) Buy both the commodities in equal quantity
 - (c) Buy more of X and less of Y
 - (d) Buy more of Y and less of X
69. Which of the following is not a property of indifference curve?
- (a) Indifference curve slopes downwards
 - (b) Indifference curve is concave to the point of origin
 - (c) Higher indifference curve represents higher level of satisfaction
 - (d) Two indifference curves cannot intersect each other
70. Which of the following is a property of indifference curve?
- (a) Indifference curve slopes upwards
 - (b) Indifference curve is concave to the point of origin
 - (c) Higher indifference curve represents higher level of satisfaction
 - (d) Two indifference curves can intersect each other
71. Indifference curves are convex to the point of origin due to :
- (a) Increasing MRS
 - (b) Increasing MRT
 - (c) Decreasing MRT
 - (d) Decreasing MRS
72. If Marginal Rate of Substitution is constant throughout, the indifference curve will be:
- (a) Downward sloping concave
 - (b) Downward sloping convex

- (c) Downward sloping straight line
 - (d) Parallel to X-axis
73. Marginal utility is :
- (a) the utility from the last unit consumed
 - (b) the utility from first unit of a commodity consumed
 - (c) total utility divided by number of units consumed
 - (d) always positive
74. Total utility is :
- (a) the sum of marginal utilities
 - (b) utility from first unit X number of units consumed
 - (c) always increasing
 - (d) utility from last unit X number of units consumed
75. Which of the following can be referred to as 'point of satiety' ?
- (a) Marginal utility is negative
 - (b) Marginal utility is zero
 - (c) Total utility is rising
 - (d) Total utility is falling
76. A consumer consumes only two goods. If price of one of the goods falls, the indifference curve:
- (a) Can shift both leftward and rightward
 - (b) Shifts rightward
 - (c) Does not shift
 - (d) Shifts leftward
77. A change in tastes in favour of a product will lead to in demand. (Fill the blank)
78. A consumer spends his income on goods X and Y with prices ₹ 4 and ₹ 6 per unit respectively and has income of ₹ 60. Consider bundles (i) [10,1] (ii) [12, 2] (iii) [15, 5], which of the following is true.

- (a) (i) and (ii) are in his budget set.
 - (b) (i) and (iii) are in his budget set.
 - (c) (ii) is in his budget set.
 - (d) None of the above.
79. The bundles which the consumer can afford given her income and the prices of the goods constitutes:
- (a) Goods bundles
 - (b) Budget line bundles
 - (c) Budget sets
 - (d) Desired bundles
80. When Marginal Utility is negative, Total Utility is
- (a) Increasing
 - (b) Equal to zero.
 - (c) Decreasing.
 - (d) At a maximum.
81. Price of the good on Y axis decreases, what happens to the budget line
- (a) Swings out on the Y axis
 - (b) Swings out on the X axis
 - (c) Swings in on the X axis
 - (d) Swings in on Y axis
82. Any bundle above the budget line is known as-
- (a) Preferred bundle
 - (b) Non-affordable bundle
 - (c) Affordable bundle
 - (d) Budget set
83. When demand is elastic, and there is increase in price of a commodity, quantity demanded falls more than proportionately

(True or False)

84. If Price of the good on the X axis rises then the slope of the Budget line
- (a) Increase (b) Decreases
(c) None (d) Can't say
85. Consumer will continue to consume the commodity till Marginal Utility of the product is zero if the commodity is available free. (True or False)
86. A 40% increase in the price of particular good results in 30% decrease in quantity bought. Price elasticity of demand is
- (a) - 0.25 (b) - 0.75
(c) - 1.33 (d) - 0.33
87. State in which case demand is likely to be more elastic in the following goods,
- (a) Matchbox for household consumption
(b) Text books for a student
(c) Medicine for a patient
(d) Electricity consumption
88. Ceteris paribus, An increase in Price of good on X axis, would lead to
- (a) Shift of budget line towards origin
(b) Shift of budget line towards right.
(c) Reduction in X intercept of the Budget line
(d) An increase in the Y intercept of the budget line
89. If demand curve of a commodity is depicted by $Q = a - bp$; due to change in a factor determining demand; new demand curve is depicted by $Q = 5a - bp$; which of the following holds true
- (a) Demand curve will not change
(b) Demand curve will shift towards right
(c) Demand curve will shift towards left

- (d) Demand curve will rotate and becomes more slant
90. In which of the following situations, demand curve shifts towards left
- (a) Fall in price of the commodity
 (b) Increase in price of substitute good
 (c) Decrease in price of complementary good
 (d) Increase in real income of consumer for normal goods
91. A consumer has following bundles, which of these should she prefer?
- (a) 5 Burgers and 2 Juices (b) 5 Burgers and 3 Juices
 (c) 4 Burgers and 3 Juices (d) 4 Burgers and 2 Juices
92. The Indifference Curves are convex to the origin due to
93. Slope of the Budget Line
- (a) Increases with the increase in the income of consumer
 (b) Increases with the decrease in the price of good shown on X axis
 (c) Increases with the increase in the price of good shown on Y axis
 (d) Is the ratio of the price of good shown on X axis and price of good shown on Y axis
94. Consider the Budget line of a consumer with income ₹ 400 and the two goods under consideration priced at ₹ 20 and ₹ 40 respectively. If the following three bundles are said to be on the budget line, find the missing values (i) [_, 0] (ii) [16, _] and (iii) [_, 5]
- (a) 20, 4, 10 (b) 10, 3, 10
 (c) 20, 2, 10 (d) 12, 2, 20
95. How much a consumer can buy depends upon-
- (a) The prices of available goods in the market
 (b) The Income of the consumer.

- (c) The Quality of the good offered by seller.
 - (d) The prices of goods and the income of consumer.
96. What does increase in slope of Budget Line indicate
- (a) Increase in Income of the consumer.
 - (b) Increase in the price of good shown on X axis.
 - (c) Increase in the price of good shown on Y axis
 - (d) Decrease in the price of good shown on X axis
97. Y intercept of the Budget line is determined by
- (a) Ratio of price of good shown on Y axis and price of good shown on X axis
 - (b) Ratio of price of good shown on Y axis and the income of consumer.
 - (c) Ratio of the income of consumer and price of good shown on Y axis
 - (d) Ratio of price of good shown on X axis and price of good shown on Y axis
98. If Total Utility for consuming 5 Units and 7 Units for a consumer is respectively 24 Utils and 34 Utils. Calculate Marginal Utility for consumption of 6th unit.
- (a) 4 Utils
 - (b) 8 Utils
 - (c) 10 Utils
 - (d) 5 Utils
99. Indifference curve is locus of all the possible combinations of two goods which gives maximum satisfaction to the consumer (True/False)
100. If Coefficient of Elasticity of Apple is (-) 1.5 which of the following is true
- (a) Demand is price inelastic, 10 % increase in price will decrease quantity demanded by 15%
 - (b) Demand is price elastic, 10 % increase in price will increase quantity demanded by 15%
 - (c) Demand is price elastic, 10 % increase in price will decrease quantity demanded by 15%

- (d) Demand is price inelastic, 20 % increase in price will decrease quantity demanded by 15%

101. Which of the following presented the principle of cardinal utility?

- (a) Alfred Marshall (b) A C Pigou
(c) J R Hicks (d) None of these

23. Match items of column I with items of column II and select the correct answer.

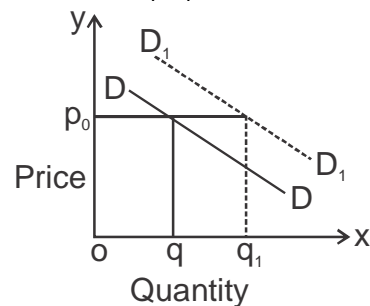
Column I	Column II
A. total utility	(i) $\Delta TU/\Delta Q$
B. consumer's equilibrium	(ii) Alfred Marshall
C. marginal utility	(iii) ΣMU
D. cardinal measurement of utility	(iv) $MU = p$
(a) A- (iii), B-(iv), C-(ii), D-(i)	(b) A- (iii), B-(iv), C-(i), D-(ii)
(c) A- (i), B-(ii), C-(iii) D-(iv)	(d) A- (iv), B-(iii), C-(i), D-(ii)

24. Match items of column I with items of column II and select the correct answer.

Column I	Column II
A. indifference curve	(i) set of indifference curves
B. slope of budget line	(ii) represents those combinations which Provides same level of satisfaction
C. marginal rate of substitution	(iii) $\frac{-P_x}{P_y}$
D. Indifference map	(iv) $-\Delta y/\Delta x$
(a) A- (ii), B-(iii), C-(iv), D-(i)	(b) A- (i), B-(ii), C-(iii), D-(iv)
(c) A- (If), B-(iii), C-(i), D-(iv)	(d) A- (iii), B-(ii), C-(iv), D-(i)

102. What does shift in demand curve from DD to D_1D_1 represent in the following diagram?

- (a) contraction in demand
(b) extension/expansion in demand
(c) increase in demand
(d) decrease in demand



103. Match items of column I with items of column II and select the correct answer.

Column I

Column II

- | | |
|--------------------------|---|
| A. decrease in demand | (i) downward movement along the demand curve. |
| B. extension in demand | (ii) rightward shift in demand curve. |
| C. increase in demand | (iii) leftward shift in demand curve. |
| D. contraction in demand | (iv) Upward movement along the demand curve. |

- (a) A- (iv), B-(ii), C-(i), D-(iii) (b) A- (iii), B-(i), C-(ii), D-(iv)
 (c) A- (i), B-(iii), C-(ii), D-(iv) (d) none of these

25. Match items of column I with items of column II and select the correct answer.

Column I

Column II

- | | |
|-------------------------------|---------------------|
| A. perfectly elastic demand | (i) $e_p = 0$ |
| B. inelastic demand | (ii) $e_p > 1$ |
| C. elastic demand | (iii) $e_p < 1$ |
| D. perfectly inelastic demand | (iv) $e_p = \infty$ |

- (a) A- (i), B-(ii), C-(iii), D-(iv) (b) A- (i), B-(ii), C-(iv), D-(iii)
 (c) A- (iv), B-(iii), C-(ii), D-(i) (d) none of these

26. Read the following statements carefully-

Statement 1: The income effect is negative for normal goods.

Statement 2: The income effect is positive for inferior goods.

Based on the given statements, choose the correct option from the following

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

27. Read the following statements carefully-

Statement 1: Due to increasing rate of marginal substitution, the indifference curve is convex towards the origin

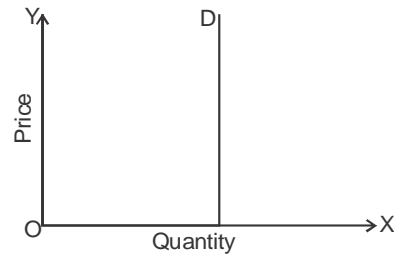
Statement 2: Due to constant rate of marginal substitution, the indifference curve is straight line.

Based on the given statements, choose the correct option from the following

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

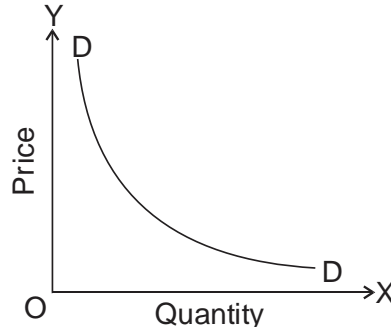
104. What does the following diagram represent?

- (a) elastic demand
- (b) perfectly elastic demand
- (c) perfectly inelastic demand
- (d) inelastic demand



105. What does the following diagram represent?

- (a) perfectly elastic demand
- (b) inelastic demand
- (c) unitary elastic demand
- (d) none of these



Study the following case study and answer the questions no. 73-75.

Cardinal utility analysis and ordinal utility analysis are two important theories which are used to attain consumer's equilibrium. According to the

advocate of the theory of cardinal utility the utility derived from a commodity can be measured in terms of numbers like 1, 2, 3, etc. On the other hand according to the advocate of the theory of ordinary utility analysis a consumer can give rank to the different bundles of commodities on the basis of utility derived from them.

31. Who was advocated the theory of cardinal utility?
32. Who was advocated the theory of ordinal utility?
33. Budget line and indifference curve are used to explain the concept of consumer's equilibrium in cardinal utility analysis. (true/false)

Study the following case study and answer the questions no. 76-78

A consumer is buying a certain quantity of coke with is given money income and price. When price of Pepsi in the market he starts to purchase Pepsi and reduces quantity of coke.

34. Coke and Pepsi mentioned in the case study are example of which type of goods?
35. In which direction fall in price of Pepsi will shift the demand curve of Coke?
36. What do you mean by increase in demand of a commodity?

Direction for the questions no. 79-81 in each of the questions given below, there are two statements marked as Assertion (A) and Reason (R). Mark your answer as per the codes provided below:

- (a) A and R are true and R is the correct explanation of A.
 - (b) Both A and R are true but R is not the correct explanation of A.
 - (c) A is true but R is false.
 - (d) A is false but R is true.
28. **Assertion (A)** : An indifference curve is convex to the origin.
Reason (R) : MRS is increasing.
 29. **Assertion (A)** : Total Utility increases.
Reason (R) : Marginal utility falls but remains positive.
 30. **Assertion (A)** : Demand for normal good decreases.
Reason (R) : Money income of the consumer's falls.

ANSWERS

17. Zero 18. utility 19. Decreases 20. Marginal utility
21. Negative 22. Consumer 23. (b) 24. (a) 25. (c)
26. (d) 27. (b) 28. (c) 29. (a) 30. (a)
31. Alfred marshall 32. J.R. Hicks 33. False
34. Substitute 35. Leftward 36. (c)
37. (d) 38. (a) 39. (d) 40. (d) 41. (b) 42. (c)
43. (b) 44. (c) 45. (d) 46. (b) 47. (d) 48. (d)
49. (a) 50. (b) 51. (d) 52. (d) 53. (c) 54. (a)
55. (c) 56. (d) 57. (a) 58. (c) 59. (c) 60. (b)
61. (d) 62. (a) 63. (b) 64. (c) 65. (c) 66. (a)
67. (c) 68. (d) 69. (b) 70. (c) 71. (c) 72. (c)
73. (a) 74. (a) 75. (b) 76. (c) 77. Shift 79. (c)
80. (c) 81. (a) 82. (b) 83. True 84. (a) 85. Wrong
86. (b) 87. (d) 88. (a) 89. (b) 90. (c) 91. (b)
92. 92 93. (d) 94. (c) 95. (d) 96. (d) 85. (c)
98. (d) 99. Wrong 100. (c) 101. (a) 102. (c) 103. (b)
104. (d) 105. (c) 73. Alfred marshall
74. J.R. Hicks & RGD Allen 75. False 76. Substitute
77. Leftward 78. (c) 79. (c) 80. (a) 81. (a)

Part B

No. 2: Fill appropriate word in the blanks-

17. When total utility is maximum .marginal utility is (minimum/ zero)
18. refers to want satisfying capacity of goods and services.(marginal utility/utility)
19. As consumer consumes more and more commodity the marginal utility derived from each successive unit goes on..... (increases/decreases)
20.is the additional utility obtained from the consumption one more unko of the given commodity.(utility/marginal utility)

21. When total utility diminishes .marginal utility is.....(zero negative)
22.is an economic agent who consumes final goods and services to fulfill his basic needs.(producer/consumer)

CONSTRUCTED RESPONSE QUESTIONS

SHORT ANSWER TYPE QUESTION (3-4 MARKS)

1. Explain the relation between total utility and marginal utility with the help of schedule?
2. Explain consumers equilibrium with utility approach in case of single good.
3. What do you mean by budget line? What are the reasons of change in budget line?
4. Explain the relationship between total utility and marginal utility with the help of schedule.

OR

What changes will take place in total utility when –

- (a) Marginal utility curve remains above X-axis
 - (b) Marginal utility curve touches X-axis
 - (c) Marginal utility curve lies below X-axis
5. State three features of indifference curve.
 6. Why does two indifference curves not intersect each other?
 7. Under what situations there will be parallel shift in budget line?
 8. Explain the effect of a rise in the prices of 'related goods' on the demand for good X.
 9. Why does demand of a normal good increases due to increase in consumer's income?
 10. Explain following factors affecting Price Elasticity of Demand

- (a) Nature of commodity
 - (b) Availability of substitutes
 - (c) Postponement of the use
11. Distinguish between expansion of demand and increase in demand with the help of diagram
12. Distinguish between change in demand and change in quantity demanded.
13. What will be the effect of following on elasticity of demand?
- (a) Income level of buyers
 - (b) Habit of the consumer
14. What will be the slope of demand curve under following situations?
- (a) Perfectly elastic demand
 - (b) Perfectly inelastic demand
 - (c) Unit elastic demand
15. State the factors of rightward shift of demand curve or increase in demand. Explain any one.
16. State the factors of leftward shift of demand curve or decrease in demand. Explain any one.
17. How does 'a proportion of income spent on the good' affect elasticity of demand?
18. When price of a good is Rs. 7 per unit a consumer buys 12 units. When price falls to Rs. 6 per unit he spends Rs. 72 on the goods. Calculate price elasticity of demand by using the percentage method. Comment on the likely shape of demand curve based on this measure of elasticity.
- Ans. $e_p = 0$
19. A consumer buys 20 units of a good at a price of Rs. 5 per unit. He

incurs an expenditure of Rs. 120 when he buys 24 units. Calculate price elasticity of demand by using the percentage method. Comment on the likely shape of demand curve based on this information.

Ans. $e = 1$

20. Price elasticity of good X is known to be thrice that of Good Y. If price of the Good X increases by 20% and price of the Good Y decreases by 40% then calculate percentage changes in quantity demanded in case of both goods.

Ans. Quantity of good X decreases by 60%, quantity of good Y increases by 40%.

21. The price elasticity of good X or Y are equal. The demand of X rises from 100 units to 250 units due to 20 percent fall in its price. Calculate the percentage rise in demand of Y, if its price falls by 8 percent.

Ans. 60%

22. Explain any four factors/determinants affecting price elasticity of demand.

23. Fill in the blanks in the following equations :

(i) $MRS_{xy} = \frac{?}{P_y}$

(ii) $? = \sum MU$

(iii) $MU_n = TU_n - ?$

(iv) $e_d = \frac{\Delta Q}{?} \times \frac{P}{Q}$

Ans. (i) P_x , (ii) TU , (iii) TU_{n-1} , (iv) ΔP

24. Differentiate between :

(i) Normal goods and Inferior goods

(ii) Complementary goods and substitute goods.

25. Why should the budget line be tangent to the indifference curve at the point of consumer's equilibrium?
26. Why does consumer stop consumption in case where marginal utility is less than price of a good?
27. What is budget line? Why is it negatively sloped?
28. A consumer consumes only two goods X & Y State and explain the conditions of consumer's equilibrium with the help of utility analysis.
29. Explain the conditions determining how many units of a good the consumer will buy at a given price.
30. Define marginal rate of substitution. Explain why is an indifference curve convex?
31. Differentiate between budget set and budget line.
32. Price elasticity of demand for the two goods X and Y are -2 and -3 respectively. Which of these is more price elastic demand and why?

CONSTRUCTED RESPONSE BASED QUESTIONS

LONG QUESTIONS (6 MARKS)

1. Explain the conditions of consumer's equilibrium with the help of the indifference curve analysis. Represent the same on a diagram.
2. Explain the conditions of consumer's equilibrium in case of two commodities with the help of utility analysis.
3. Distinguish between change in demand and change in quantity demanded.
4. Explain the factors determining price elasticity of demand.
5. With the help of diagrams, explain the effect of following changes on the demand of a commodity.
 - (a) A fall in the income of its buyer.
 - (b) A rise in price of complementary good.

6. What are the conditions of consumer's equilibrium under the indifference curve approach? What changes will take place if the conditions are not fulfilled to reach equilibrium?
7. Explain three properties of indifference curve.
8. Are the following statements true or false? Give reasons.
 - (a) Two indifference curve never intersect each other.
 - (b) Income effect of inferior good is positive.
 - (c) Change in quantity demanded is the explanations of law of demand.
9. Explain the concept of marginal rate of substitution (MRS) by giving an example. What happens to MRS when consumer moves downwards along the indifference curve? Give reasons for you answer.
10. Are the following true or false? Give reasons.
 - (i) Increase in number of consumers shifts the demand curve rightward.
 - (ii) The demand curve of a commodity becomes elastic if its substitute good is available in the market.
 - (iii) Indifference curve is convex to origin due to diminishing marginal rate of substitution.

Exam. Oriented Questions with Answer

COMPETENCY BASED QUESTIONS

VERY SHORT ANSWER QUESTION (1 MARK)

- Q. 1.** When does a good is called 'Normal Good'?
- Ans.** If the income effect of a commodity is positive and price effect is negative, it is called 'Normal Good'.
- Q. 2.** When does a good is called 'Inferior Good'?
- Ans.** If the income effect of a commodity is negative, it is called 'Inferior Good'.
- Q. 3.** Why the demand of water is Inelastic?
- Ans.** Because water is a necessary good.
- Q. 4.** Define Market Demand.
- Ans.** Market Demand refers to various quantities that all the consumers in a market are ready and able to purchase at various prices in a given period of time.
- Q. 5.** What is the meaning of Marginal Rate of Substitution?
- Ans.** MRS is the rate at which a consumer is willing to substitute good Y for good X, assuming that there is no change in the level of satisfaction.
- Q. 6.** What is the meaning of 'Monotonic Preference'.
- Ans.** Consumer's preference is called monotonic when between any two bundles, consumer give preference to that bundle, which contains more quantity of at least one commodity and not less quantity of other commodity.
- Q. 7.** Write equation of Budget line
- Ans.** $P_x \cdot q_x + P_y \cdot q_y = M$
- Q. 8.** Write equation of Budget set
- Ans.** $P_x \cdot q_x + P_y \cdot q_y \leq M$
- Q. 9.** State the reason of downward movement on same demand curve.
- Ans.** Decrease in price of good.

Q.10. How does the shape of demand curve in the situation of unit elastic demand.

Ans. Rectangular hyperbola.

CONSTRUCTED RESPONSE QUESTIONS

3-4 MARKS QUESTIONS

Q. 1. Distinguish between increase in demand and increase in quantity demanded of a commodity.

Ans. When demand increase at given price due to the change in other factor. It is called increase in demand. On the other hand when other things remain constant and demand increase by decrease in the price of a commodity then, it is called increase in quantity demanded.

Q. 2. Given price of a good, how does a consumer decide as to how much of that good to buy?

Ans. Consumer purchases upto the point where marginal utility is equal to the price ($MU = P$). So long as marginal utility is greater than price, he keeps on purchasing. As he makes purchases MU falls and at a particular quantity of the good MU becomes equal to price. Consumer purchases upto this point.

Q. 3. A consumer consumes only two goods X and Y. State and explain the conditions of consumer's equilibrium with the help of utility analysis.

Ans. There are two conditions of consumer equilibrium.

Explain :

$$(i) \frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

When $\frac{MU_x}{P_x} > \frac{MU_y}{P_y}$. In this case, the consumer is getting more marginal utility per rupee in case of good x as compared to good y. Therefore, he will buy more of x and less of y. This will lead to fall in MU_x and rise in MU_y . The consumer will continue

to buy more of x till $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$

When $\frac{MU_x}{P_x} < \frac{MU_y}{P_y}$. In this case the consumer is getting

more marginal utility per rupee in case of good y as compared to x. Therefore, he will buy more of y and less of x. This will lead to fall in MU_y and rise in MU_x . The consumer will continue

to buy more of y till $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$.

- (ii) **MU falls as consumption increases** : If MU does not fall as consumption increases the consumer will end up buying only good which is unrealistic or consumer will never reach the equilibrium position.

Q. 4. Explain how the demand for a good is affected by the change in price of its substitute good. Give examples.

Ans.

Substitute Goods : When price of a substitute falls, it becomes cheaper than the given good. So the consumer substitutes it for given good then demand of given good will decrease.

Similarly, a rise in the price of substitute will result in increase in the demand for given good. For example : Tea and Coffee.

Q. 5. Distinguish between Normal Goods and Inferior Goods. Give one example of each.

Ans. Normal Goods : These are the goods the demand for which increase as Income of the buyers rise. There is a positive relationship between Income and demand or in case of normal goods income effect is positive.

Ex. Home appliances

Inferior Good : There are the goods the demand for which decreases as income of buyer rises. Thus, there is negative relationship between income and demand or income effect is negative.

Ex. Coarse grain

Q. 6. Explain any four factors that affect price elasticity of demand.

- Ans.**
1. **Nature of Commodity** : Necessaries like Salt, Kerosene oil etc. have inelastic demand and luxuries have elastic demand.
 2. **Availability of substitutes** : Demand for goods which have close substitute is relatively more elastic and goods without close substitutes have less elastic demand.
 3. **Different uses of a commodity**: Commodities that can be put to different uses have elastic demand for instance electricity has different uses.
 4. **Habit of the consumer** : Goods to which consumer become habitual will have inelastic demand.

Example : Liquor and Cigarette.

- Q. 7.** Explain relationship between total utility and marginal utility with help of a schedule.

Ans.

<i>Quantity (Units)</i>	<i>Total Utility</i>	<i>Marginal Utility</i>
0	0	–
1	8	8
2	14	6
3	18	4
4	20	2
5	20	0
6	18	–2

- (1) As long as MU decreases but is positive, TU increases at decreasing rate.
- (2) When marginal utility is equal to zero then total utility is maximum, and constant.
- (3) When marginal utility is negative. Total utility starts diminishing.

- Q. 8.** Define marginal utility. State the law of diminishing marginal utility.

Ans. **Marginal Utility** : It is addition to the total utility as consumption is increased by one more unit of the commodity.

Law of Diminishing Marginal Utility : It states that as consumer consumes more and more units of a commodity, the utility derived from each successive unit goes on decreasing. According to this law TU increases at decreasing rate and MU decreases.

Q. 9. Price elasticity of demand for the two goods X and Y are -1 and -2 respectively. Which of these is more price elastic demand and why?

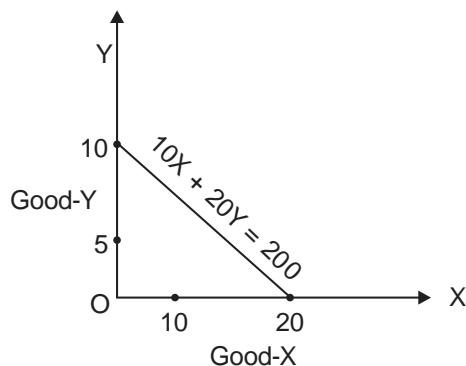
Ans. Price elasticity of demand of good Y is more elastic than good X because incase of good Y percentage change in quantity demanded is more due to percentage change in price.

Q. 10. Income of an individual is ₹ 200 which he spends on the purchase of two commodities commodity-X and commodity-Y. If prices of commodity X and commodity-Y are ₹ 10 and ₹ 20 respectively, then answer the following questions.

- (i) Write the equation of budget line.
- (ii) Draw budget line.
- (iii) Write the slope of the budget line.
- (iv) Can a consumer buy $8X + 6Y$? Give reason.

Ans. (i) $10X + 20Y = 200$

(ii)



(iii) Slope of budget line = $\frac{P_x}{P_y} = -\frac{10}{20} = -\frac{1}{2}$

(iv) Cost of $8X + 6Y = 8(10) + 6(20)$

$$8X + 6y = 80 + 120$$

$$= ₹ 200$$

Cost of $8X + 6Y$ is ₹ 200 and income of the consumer is also 200, therefore consumer can by this combination.

Q. 11. Distinguish between substitute and complementary goods.

Ans. Substitute Good: These are those goods which can be used in place of each other. For example, tea and coffee, Pepsi and Coke. In the case of these goods, due to increase in the price of one commodity, the demand for the other commodity also increases.

Complementary Goods: These are the goods which are always used together. For example, car and petrol, pen and refill. In the case of these goods, an increase in the price of one commodity also leads to a decrease in the demand for the other commodity.

6 MARKS QUESTIONS

Q. 1. Explain the three properties of indifference curves.

Ans. Three properties of indifference curves are as follows :

1. **Slopes downward from left to right** : To consume more of one good the consumer must give up some quantity of the other good so that satisfaction remains at the same level.
2. **Convex towards the origin** : MRS declines continuously due to the operation of the law of diminishing marginal utility.
3. **Higher indifference curves represents higher utility** : Higher indifference curve represent large bundle of goods. Which means more utility because of monotonic preference.

Q. 2. Explain the conditions of consumer's equilibrium using indifference curve analysis. Use diagram.

Ans. There are two conditions for consumer's equilibrium.

(i) $MRS = P_x/P_y$ $MRS_{xy} = \frac{P_x}{P_y}$

(ii) MRS is continuously falling.

Explanation

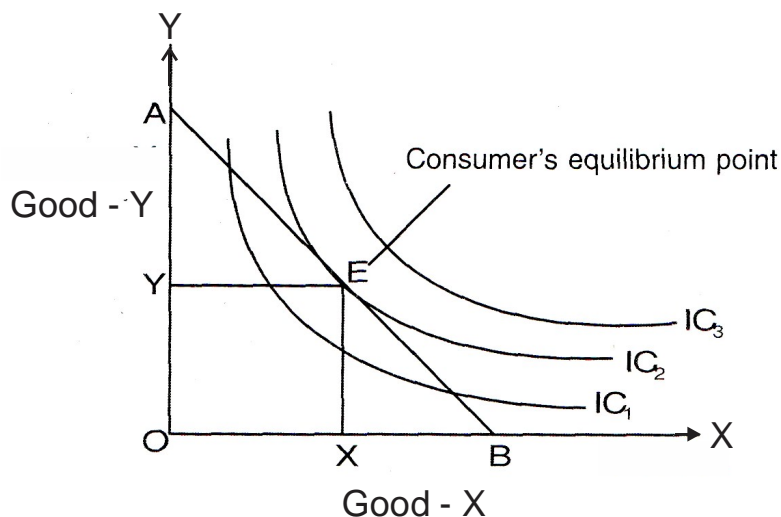
Suppose there are two goods X and Y the first condition of consumer's equilibrium is MRS must be equal to the ratio of prices of two goods $\frac{P_x}{P_y}$

If $MRS_{xy} > P_x/P_y$, It means consumer values X more than what market

values and willing to give more price than market price, he will purchase more of X this cause fall in MRS_{xy} and it will continue upto that when $MRS_{xy} = P_x/P_y$.

If $MRS_{xy} < \frac{P_x}{P_y}$. It means consumer values X less than what market values. Consumer is willing to give less price than market price and he will purchase less of X, by this MRS_{xy} will increase and it will continue till $MRS_{xy} = \frac{P_x}{P_y}$.

(ii) MRS_{xy} is continuously falling unless the equality between the MRS_{xy} and P_x/P_y will not be reached.



Consumer is in equilibrium at point E. OX of X and OY of Y is optimum bundle of both goods.

Q. 3. Why does demand curve slope downwards?

Ans. Following is the cause why demand curve slope downward –

(i) **Law of Diminishing Marginal Utility** : According to this law, as consumption of the commodity increases, marginal utility of successive unit goes on diminishing to a consumer. Accordingly, for every additional unit, consumer is willing to pay less and less price.

Q. 4. Explain the effect of change in Income of the consumer on the demand for a good.

Ans. **Normal Goods** : In the situations when the income increases consumer will increase the demand of Normal goods and if the

Income decreases consumer will decrease the demand of normal good, because in normal goods, income effect is positive.

Inferior Goods : In the situations when the Income decreases consumer will increase the demand of inferior goods and if the income increases a consumer will decrease the demand of inferior good because in inferior goods, income effect is negative.

Q. 5. A consumer consumes only two goods X and Y both priced at Rs. 3 per unit. If the consumer chooses a combination of these two goods with Marginal Rate of Substitution equal to 3, is he consumer in equilibrium? Give reason. What will a rational consumer do in this situation? Explain.

Ans. Given $P_x = 3$, $P_y = 3$ and $MRS = 3$, A consumer is said to be in equilibrium when

$$MRS_{xy} = \frac{P_x}{P_y}$$

Substituting values we find that

$$3 \neq \frac{3}{3}$$

$$\text{i.e., } MRS_{xy} > \frac{P_x}{P_y}$$

Therefore consumer is not in equilibrium. $MRS_{xy} > \frac{P_x}{P_y}$ means that consume is willing to pay more for one more unit of x as compared to what market demands. The consumer will buy more and more of x. As a result MRS will fall due to the law of Diminishing Marginal Utility. This will continue till $MRS_{xy} = \frac{P_x}{P_y}$ and consumer is in equilibrium again.

Q. 6. A consumer consumes only two good x and y whose prices are Rs. 4 and Rs. 5 per unit respectively. If the consumer chooses a combination of the two goods with marginal utility of X equal to 5 and that of Y equal to 4, is the consumer in equilibrium? Give reason. What will a rational consumer do in this situation? Use utility analysis

Ans. Given $P_x = 4$, $P_y = 5$ and $MU_x = 5$, $MU_y = 4$, and consumer will be in equilibrium when

$$\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$$

Substituting values, we find that

$$\frac{5}{4} > \frac{4}{5} \text{ or } \frac{MU_x}{P_x} > \frac{MU_y}{P_y}$$

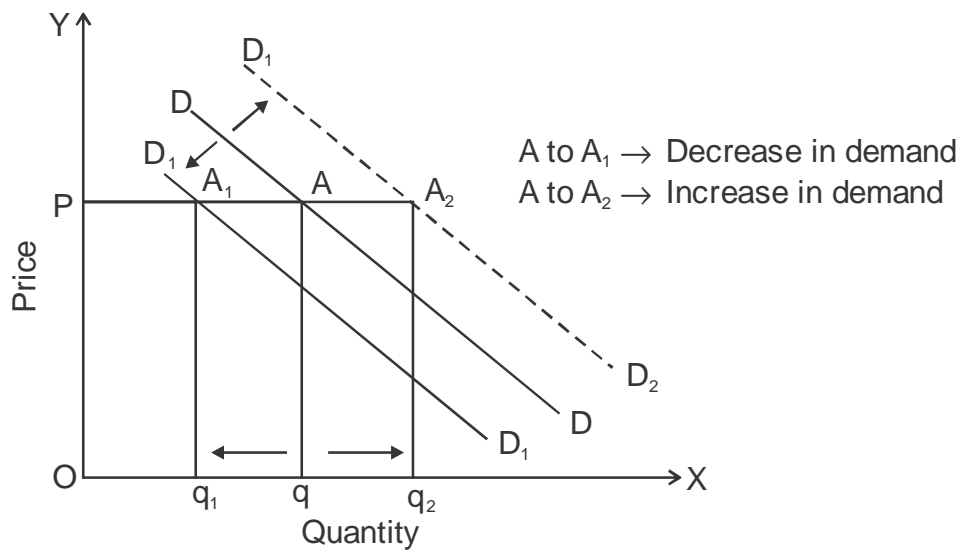
Since per rupee MU_x , is higher than per rupee MU_y , consumer is not in equilibrium.

The consumer will buy more of x and less of y, As a result MU_x will fall and MU_y will rise. The reaction will continue till $\frac{MU_x}{P_x} = \frac{MU_y}{P_y}$ are equal and consumer is in equilibrium again.

Q. 7. Differentiate between change in quantity demanded (or movement along the demand curve) and change in demand (or shift in the demand curve).

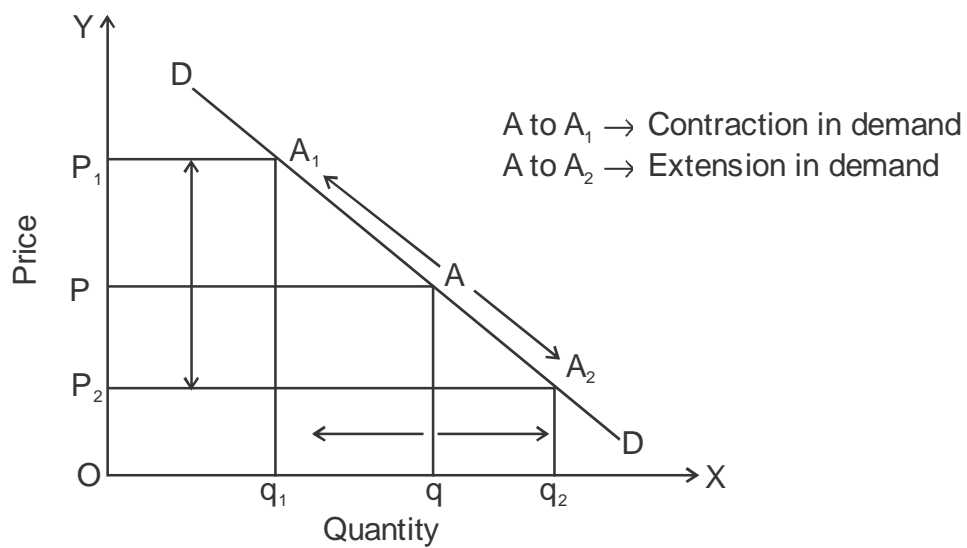
Ans. Change in quantity demanded:

- (i) It refers to change in quantity demanded due to change in own price of a commodity while other factors being remaining constant.
- (ii) Due to this consumer moves along downward or upward along the same demand curve.
- (iii) It occurs due to change in own price of a commodity.
- (iv) Diagram:



Change in demand:

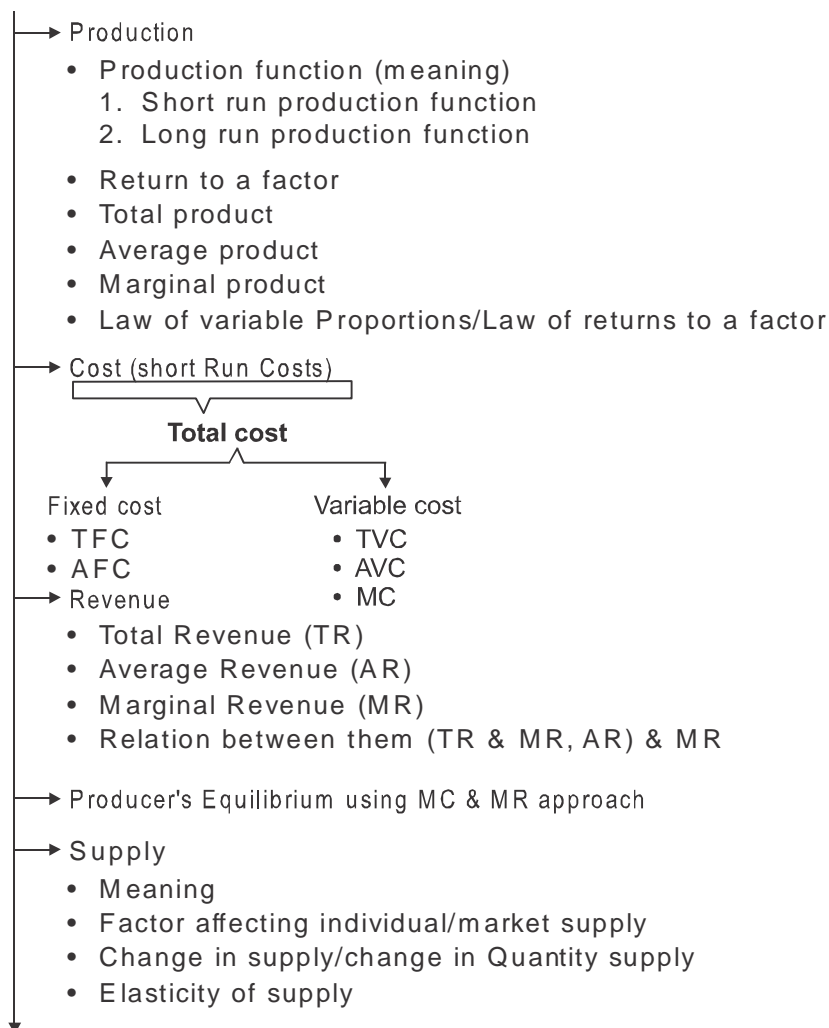
- (i) It refers to change in demand due to change in the other factors determining the demand of a commodity while own price of a commodity being remaining constant.
- (ii) Due to this demand curve shifts rightward or leftward.
- (iii) It occurs due to change in the prices of related goods, change in the income level of a consumer, change in the number of consumers, etc.
- (iv) Diagram:



UNIT III

PRODUCER BEHAVIOUR & SUPPLY

CONCEPTS



Points to Remember

- ❑ **Production Function** : It shows the functional relation between physical inputs and physical output of a good. It can be expressed

as $Q = f(f_1, f_2, f_3 \dots f_n)$. Where Q = Physical output of a good; $f_1, f_2, f_3, \dots, f_n$ = Physical inputs. Technology remains constant

❑ **Types of Production Function :**

There are two types of Production Function.

1. **Short-run Production Function :** In this production function one factor of production is variable and all others are fixed. So, law of return to a factor is applied. It is also called variable proportion type production function.

We may write this short run production function as: $q = f(L, \bar{K})$

Where L is labour \bar{K} is fixed capital and q is maximum output that can be produced

2. **Long-run Production Function :** In this production function all the factors of production are variable. So, law of returns to scale is applied. It is also called constant proportion type production function.

We may write this as long run production function as: $q = f\{L, K\}$ where, L is labour K is capital and q is the maximum product that can be produced.

- ❑ **Total product:** Total product refers to total amount of a good which is produced by a firm by using a given unit of variable factor in a given period of time.
- ❑ **Average product:** Average product is the per unit output of variable factor (labour) employed.

$$AP = \frac{TP}{\text{Units of Variable input}}$$

- ❑ **Marginal product:** Marginal product is the change in total product resulting from employing one additional unit of variable input.

$$MP = \frac{\Delta TP}{\Delta L} \text{ or } MP_n = TP_n - TP_{n-1}$$

❑ **Relation between Total and Marginal Product**

1. As long as marginal product rises, total product increases at increasing rate. Till point M in Fig. 3.1.

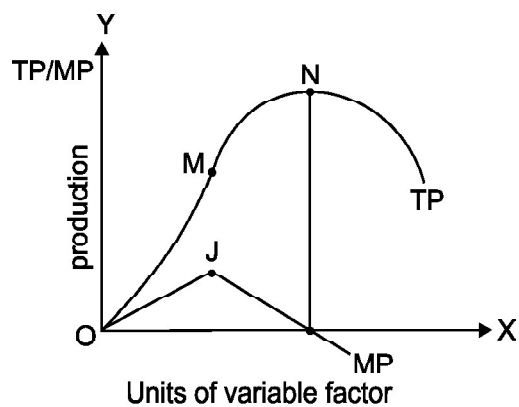


Fig. 3.1

2. When marginal product starts falling but remains positive, total product rises at diminishing rate. Point M to N
3. When $MP = 0$, TP is maximum at point N.
4. When marginal product becomes negative, then total product starts falling after point N.

❑ **Relation between MP and AP (in Fig. 3.2)**

1. When $MP > AP$, AP rises between point O to K.
2. When $MP = AP$, AP is maximum and constant at point K.
3. When $MP < AP$, AP falls after point K.

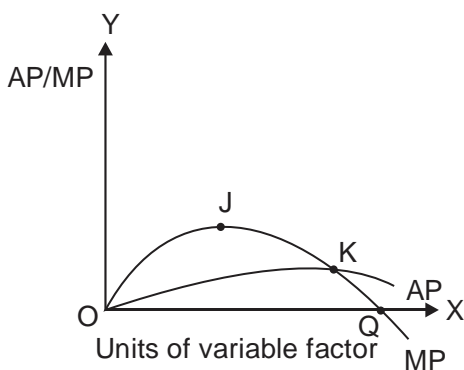
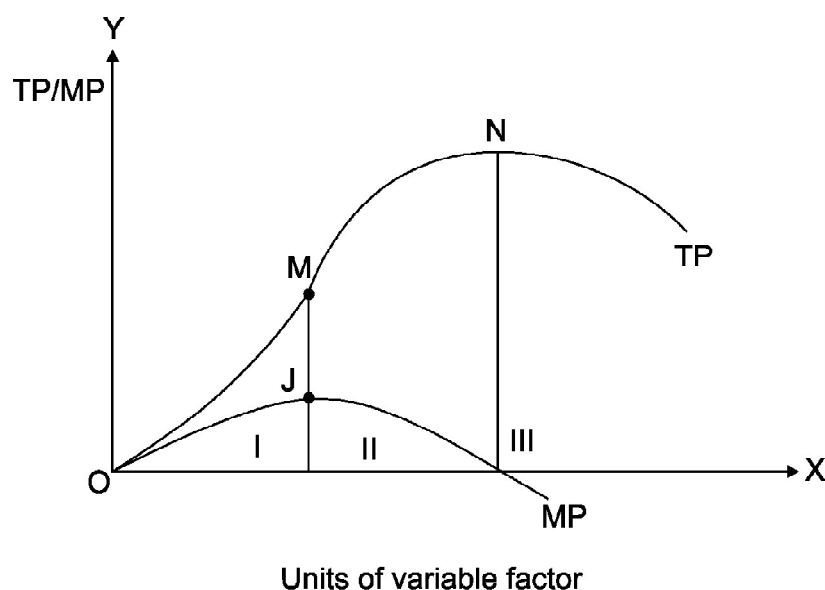


Fig. 3.2

- ❑ **Returns to a factor** : In a short period when additional unit of variable factor are employed with fixed factors, then returns to a factor operates. Returns to a factor shows the changes in total product of a good when only the quantity of one input is increased, while other inputs kept constant.
- ❑ **Law of variable proportion** : The law states that as we increase the quantity of only one variable input, keeping other inputs fixed, the total product increases at increasing rate in the beginning, then increases at decreasing rate and finally TP falls. According to this law, change in TP and MP are classify into three phases. (Fig. 3.4)

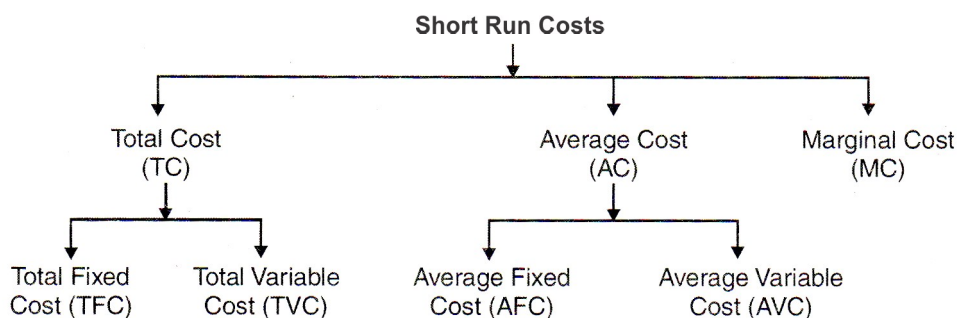


Units of variable factor
Fig. 3.4

- ❑ **Phase I : TP Increases at increasing rate** : In the initial phase as more and more units of variable factor are employed with fixed factor total physical product increases at increasing rate, MP increases. Point O to M & point O to J Respectively.
- ❑ **Phase II : TP increases at decreasing rate** : As more and more units of variable factors are employed with fixed factors then total product increases at diminishing rate, MP decreases but remains positive point MN point JQ respectively. At the end of this phase TP maximum and MP becomes zero at point N and Q respectively.
- ❑ **Phase III : TP falls** : As more and more units of variable

factors are employed with fixed factors, total production starts decreasing and marginal product becomes negative after point N and point Q respectively.

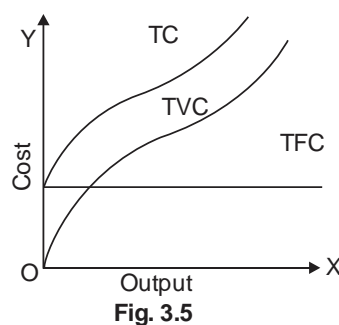
- ❑ **Cost** : It is the sum of direct (explicit cost) and indirect cost (implicit cost), including Normal profit.
- ❑ **Cost** : Explicit cost + implicit cost + Normal Profit.
- ❑ **Explicit Cost** : Actual money expenditure incurred by a firm on the purchase and hiring the factor inputs for the production is called explicit cost. For example-payment of wages, rent, interest, purchases of raw materials etc.
- ❑ **Implicit cost** is the estimated cost of self owned resources of the production used in production process, by the producer or estimated value of inputs supplied by owner itself. For example estimate rent of self owned Building, Estimated interest on self supplied money by the owner.



- ❑ **Total cost** refers to total expenditure incurred on factor inputs and non factor input by a firm on production of a given quantity of output.
- ❑ **Total cost** is the sum of total fixed cost and total variable cost as shown in Fig. 3.5.

$$TC = TFC + TVC \quad \text{or} \quad TC = AC \times Q$$

(Fig. 3.5)



- ❑ **Total fixed costs** is the cost which remains constant at all levels of output. It is not zero even at zero output level. Therefore, TFC curve is parallel to X-axis as shown in Fig. 3.5.

$$TFC = TC - TVC \quad \text{or} \quad TFC = AFC \times Q$$

- ❑ **Total variable cost** is the cost which vary with the quantity of output produced. It is zero at zero level of output. TVC curve is parallel to TC curve as shown in Fig. 3.5.

$$TVC = TC - TFC \quad \text{or} \quad TVC = AVC \times Q.$$

- ❑ **Average cost** is per unit cost of production of a commodity. It is the sum of average fixed cost and average variable cost as shown in Fig. 3.6

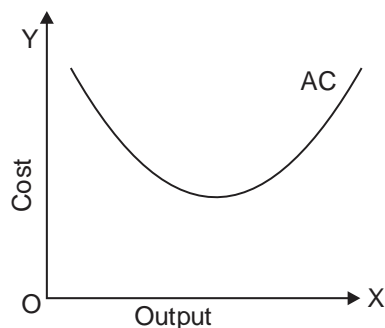


Fig. 3.6

$$AC = \frac{TC}{Q} \quad \text{or} \quad AC = AFC + AVC$$

- ❑ **Average fixed cost** is per unit fixed cost of production of a commodity. AFC goes on decreasing as the level of output increase. But it never touches X axis. Shape is rectangular hyperbola as shown AFC in Fig. 3.7.

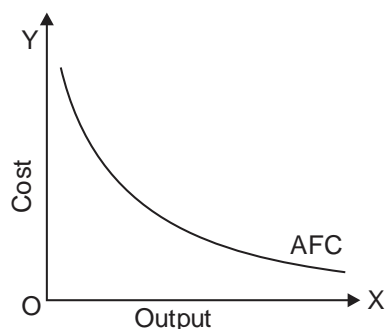


Fig. 3.7

$$AFC = \frac{TFC}{Q} \quad \text{or} \quad AFC = AC - AVC$$

- ❑ **Average variable cost** is per unit variable cost of production of a commodity.

$$AVC = \frac{TVC}{Q} \quad \text{or} \quad AVC = AC - AFC$$

- ❑ **Marginal Cost** : It refers to change in TC, due to an additional unit of a commodity is produced. $MC = \frac{\Delta TC}{\Delta Q}$ or $MC_n = TC_n - TC_{n-1}$
But under short run, it is calculated from TVC. Fig. 3.8

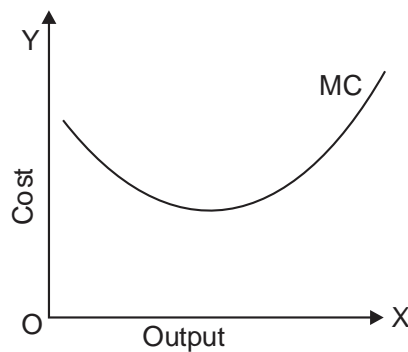


Fig. 3.8

$$MC_n = TVC_n - TVC_{n-1} \quad \text{or} \quad MC = \frac{\Delta TVC}{\Delta Q}$$

Relation Between Short-Term Costs (as shown in Fig. 3.9)

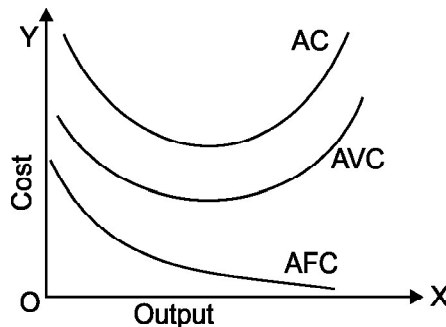


Fig. 3.8

- ❑ Total cost curve and total variable cost curve remains parallel to each other. The vertical distance between these two curves is equal to total fixed cost as shown by TC and TVC in Fig. 3.5

- ❑ TFC curve remains parallel to X-axis and TVC curve remains parallel to TC curve as shown by TFC, TVC and TC in Fig. 3.5
- ❑ With increase in level of output, the vertical distance between AFC curve and AC curve goes on increasing. On contrary the vertical distance between AC curve and AVC curve goes on decreasing because their difference is AFC which keep decreasing with increase in output but these two curves never intersect because average fixed cost is never zero.
- ❑ **Relation between MC and AVC. (Fig. 3.10)**

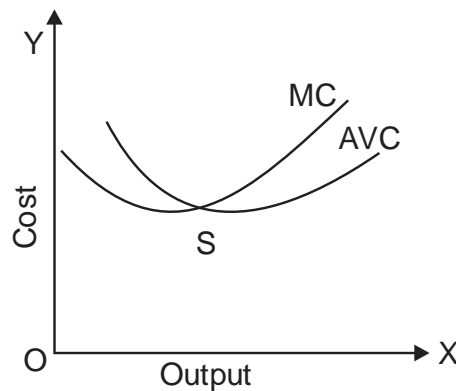


Fig. 3.10

- ❑ When $MC < AVC$, AVC falls till point S.
- ❑ When $MC = AVC$, AVC is minimum and constant at point S.
- ❑ When $MC > AVC$, AVC rises after point S.
- ❑ **Relation between MC and ATC (Fig. 3.11)**
 - ❑ When $MC < ATC$, ATC falls till point T.
 - ❑ When $MC = ATC$, ATC is minimum and Constant at point T.
 - ❑ When $MC > ATC$, ATC rises after point T.

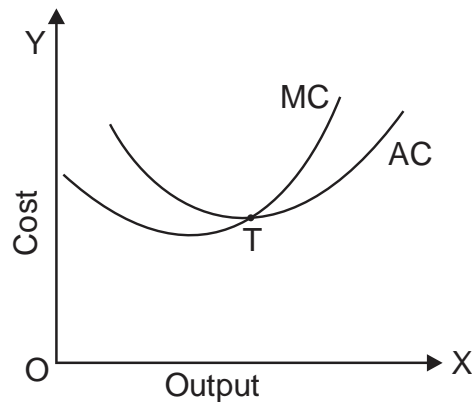


Fig. 3.11

- ❑ **Revenue:** Money received from the sale of product is called revenue.
- ❑ **Total Revenue:** Total revenue is the total amount of money received by a firm from the sale of given units of a commodity at a market price.

$$TR = AR \times Q \quad \text{or} \quad TR = \sum MR$$

$$TR = \text{Price} \times \text{Quantity Sold.}$$

$$\text{Price} = AR$$

- ❑ **Average Revenue:** Per unit revenue received from the sale of given units of a commodity is called average revenue. Average revenue is equal to price. Per unit price of a commodity is also called AR.

$$AR = \frac{TR}{Q} \quad \text{or} \quad \frac{P \times Q}{Q} = P = \text{Price}$$

- ❑ **Marginal revenue:** Marginal revenue is net addition to total revenue when one additional unit of output is sold.

$$MR = \frac{\Delta TR}{\Delta Q} \quad \text{or} \quad MR_n = TR_n - TR_{n-1}$$

- ❑ **Relation between TR, AR and MR when more quantity is sold at the same price i.e., under perfect competition.**

- (a) Average revenue and marginal revenue remains constant at all levels of output and AR and MR curves are parallel to x-axis. $AR = MR$. Fig. 3.12.

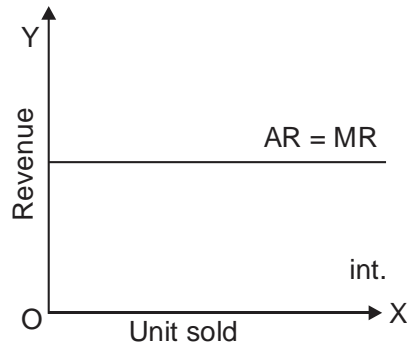


Fig. 3.12

- (b) **Shape of TR Curve Under PC:** Total revenue increases at constant rate as MR remains constant and TR curve is positively sloped straight line passing through the origin. Curve shown in Fig. 3.13 TR is 45° line.

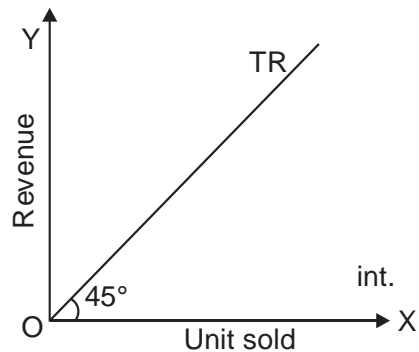


Fig. 3.13

❑ **General Relation between AR and MR (Fig. 3.14)**

- ❑ When $MR > AR$, AR rises point O to K.
- ❑ When $MR = AR$, AR is constant and maximum at point K
- ❑ When $MR < AR$, AR falls after point K.

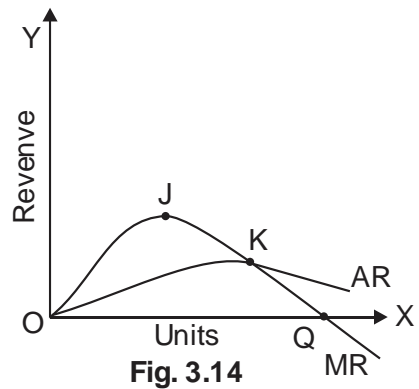


Fig. 3.14

- ❑ **Concept of Producer's Equilibrium** : It refers the stage of level of output where producer is getting maximum profit or suffering minimum losses and he has no incentive to increase or decrease the level of output.
- (A) **MR and MC Approach** : Conditions of producer equilibrium according to this approach are (Fig. 3.15):
 - (a) $MC = MR$ at point E
 - (b) MC curve should cut the MR curve from below at the point of equilibrium as shown at point E in Fig. 3.15.

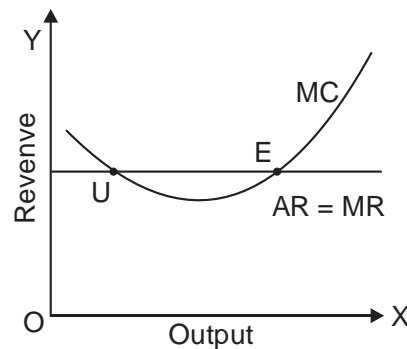


Fig. 3.15

Or

MC should be more than MR after the equilibrium point, with increase in output that is point E. Point U does not fulfill this condition therefore equilibrium be at E point.

- ❑ **Supply** : Refers to the amount of the commodity that a firm or seller is willing to offer or ready to sell at a certain price, over a given period of time.
- ❑ **Factors affecting supply of a commodity** :
 - ❑ Price of the commodity.
 - ❑ Prices of other related goods.
 - ❑ Level of Technology.
 - ❑ Prices of inputs.

- ❑ No. of firms.
- ❑ Government policy regarding Taxation and subsidies.
- ❑ Goals of the firm.
- ❑ **Individual Supply Schedule** : Refers to the schedule which shows various quantities of a commodity that an individual firm is willing and able to offer for sale at various prices during a given period of time as shown in table 3.1. below

Table 3.1

P in ₹	Supply units
10	30
20	50
30	70

- ❑ **Market supply Schedule** : Refers to the schedule which shows the sum total of various quantities supplied of a commodity by all sellers or all firms in the market at various prices during a given period of time as shown in table 3.2 below table 3.2.

Table 3.2

Price	Firm A	Firm B	Firm C	Market supply A+B+C = Mass
10	30	20	10	60
20	50	40	20	110
30	70	60	30	160
40	90	80	40	210

- ❑ **Stock** : Refers to the total quantity of a particular commodity available with the firm at a particular point of time.
- ❑ **Supply Schedule** : Refers to a tabular presentation which shows various quantities of a commodity that a producer is willing to supply at different prices, during a given period of time as shown in table 3.1.

- ❑ **Supply curve** : Refers to the graphical representation of supply schedule which represents various quantities of a commodity that a producer is willing to supply at different prices during given period of time.
- ❑ Slope of supply curve = $\Delta P/\Delta Q$

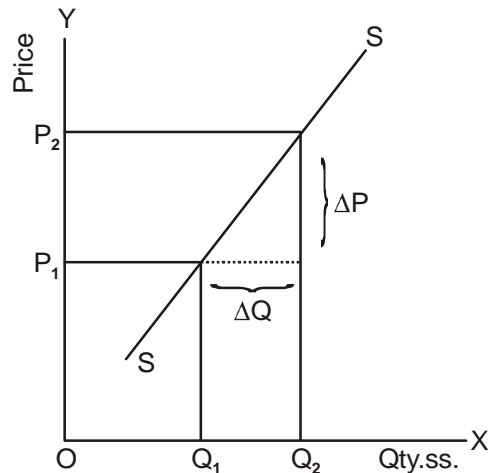


Fig. 3.17

- ❑ **Law of Supply** : States the direct relationship between price and quantity of supply of a commodity, keeping other factors constant.
- ❑ **Price Elasticity of Supply** : It refers to the degree of responsiveness of quantity supplied of a commodity with reference to a change in price of the commodity. It is always positive due to direct relationship between price and quantity supplied.

Price Elasticity of Supply (E_s)

$$= \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

- ❑ **Methods for measuring price elasticity of supply :**

Percentage Method

$$E_s = \frac{\% \text{ change in a quantity supplied}}{\% \text{ change in price}}$$

$$\text{Or } E_s = \frac{\Delta Q}{\Delta P} \times \frac{P}{Q}$$

Change in Quantity supplied Vs change in supply

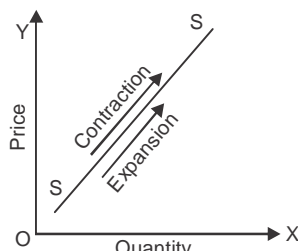
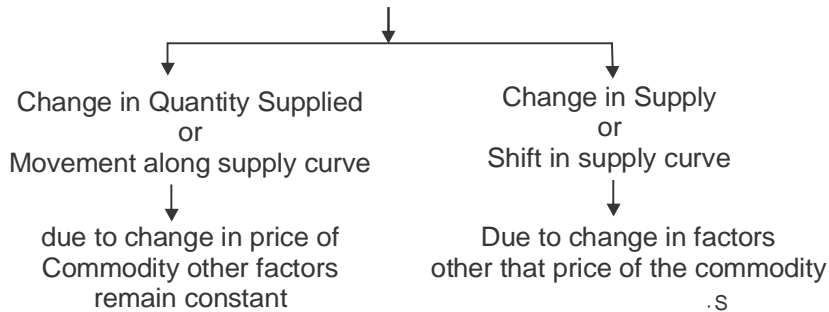


Fig. 3.18

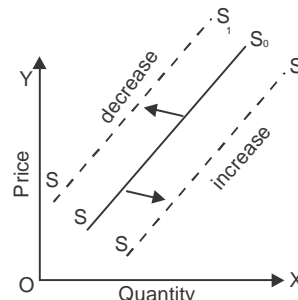
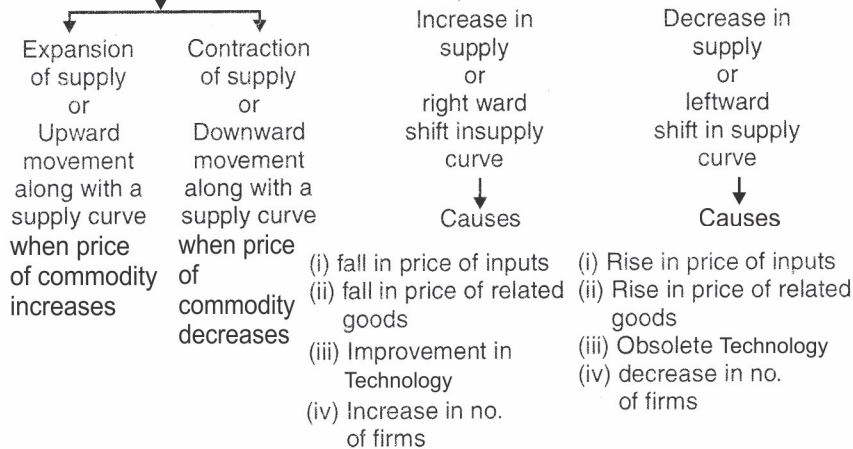


Fig. 3.19



QUESTIONS

SELECT RESPONSE TYPE QUESTIONS (1 MARK)

- The cause of upward movement along a supply curve is

(a) Decrease in Price	(b) Increase in Income
(c) Decrease in Income	(d) Increase in Price

2. When Total Revenue is maximum, marginal Revenue is :-
 - (a) Minimum
 - (b) Maximum
 - (c) Zero
 - (d) Constant
3. When percentage change in Price is equal to percentage change in supply :
 - (a) $E_s > 1$
 - (b) $E_s = 1$
 - (c) $E_s < 1$
 - (d) $E_s = 0$
4. The behaviour of Average Revenue when Total Revenue increases at constant rate is
 - (a) Constant
 - (b) Increasing
 - (c) Decreasing
 - (d) Zero
5. The Behaviour of Total Product when Marginal Product is zero is :
 - (a) Minimum
 - (b) Maximum
 - (c) Constant
 - (d) Zero
6. Which cost curve is parallel to x-axis :
 - (a) AFC
 - (b) TVC
 - (c) TFC
 - (d) TC
7. If supply curve is parallel to Y-axis :
 - (a) $E_s = 0$
 - (b) $E_s = \infty$
 - (c) $E_s = 1$
 - (d) $E_s > 1$
8. When per unit price remains constant
 - (a) $AR > MR$
 - (b) $AR < MR$
 - (c) $AR = MR$
 - (d) TR is constant
9. When Total Product is falling then
 - (a) MP is maximum
 - (b) MP = zero
 - (c) MP becomes negative
 - (d) MP is falling
10. When Average Product is maximum then
 - (a) $MP > AP$
 - (b) $MP = AP$
 - (c) $MP < AP$
 - (d) MP is also maximum

11. In Phase II (Diminishing Return to a factor) of law of variable proportion, total product:
 - (a) Increase at an increasing rate
 - (b) Increases at diminishing rate
 - (c) Falls
 - (d) Becomes negative
12. Define Total Physical Product (TPP)
13. If the Total Product (TP) is maximum, Marginal Product (MP) will be _____?
14. The total product (TP) for the first 4 units of variable factor is given below. Choose the alternatives which shows stage of Increasing Return to a factor;

(a) 20, 45, 75, 110	(b) 20, 45, 70, 95
(c) 20, 40, 60, 80	(d) 20, 35, 45, 50

COMPETENCY BASED QUESTIONS (1 MARK)

15. Define Production Function.
16. What will be the likely behaviour of marginal product, when total product increases at diminishing rate?
17. In which period all factors of production are variable?
18. State any two factor inputs used in production process.
19. Which of the following is the general shape of AP curve?

(a) 'U' Shape	(b) 'S' shape
(c) Inverse 'U' shape	(d) Inverse 'S' shape
20. The Marginal product curve cuts the average product curve from _____ at its _____ point.

SELECT RESPONSE TYPE QUESTIONS (1 MARK)

21. Choose the correct match
 - (a) Increasing return to a factor: TP increases at increasing rate
 - (b) Diminishing return to a factor: TP decreases
 - (c) Negative Return to a factor: TP falls

22. Match the following & choose the correct option.
- | | | | |
|-----|------------------------------|-------|--------------|
| I | MP negative | (i) | TP decreases |
| II | MP zero | (ii) | TP maximum |
| III | MP falls but remain positive | (iii) | TP increases |
- (a) I → (i), II → (ii), III → (iii) (b) I → (i), II → (iii), III → (ii)
 (c) I → (iii), II → (ii), III → (i) (d) I → (ii), II → (iii), III → (i)
23. Which of the following costs can never be zero?
- (a) Total variable cost (b) Marginal cost
 (c) Average variable cost (d) Average Fixed cost
24. The average cost of 4 units of output is ₹ 40. The total fixed cost at 5 units of output is ₹ 50. Which will be total variable cost:
- (a) 210 (b) 110
 (c) 90 (d) 160
25. Name the cost which does not change with change in output.
26. Fill in the blanks:
 Cost = Explicit cost + _____ + _____
27. Give two examples of variable cost
28. Which of the following is the shape of TFC curve
- (a) 'U' shape (b) Inverse 'U' shape
 (c) 'S' shape (d) Straight line parallel to x-axis
29. With the increase of output, AFC continuously _____.
30. Choose the correct match:
- (a) $TC \Rightarrow \frac{\Delta TVC}{\Delta Q}$
 (b) $MC \Rightarrow AC \times Q$
 (c) $AVC \Rightarrow TVC / Q$
 (d) $AFC \Rightarrow TFC \times Q$
31. Which of the following is correct:
- (a) $MC = TC - TVC$ (b) $TC = TFC + TVC$

- (c) $MC = TC_{n+1} - TVC_n$ (d) $TFC = AFC \div Q$
32. Which of the following cost is included in marginal cost?
- (a) Fixed cost
(b) Variable cost
(c) Both fixed and variable cost (d) None of the above
33. The total revenue (TR) at 4 units of level of output is ₹ 100. Marginal Revenue (MR) at 5 units of level of output is ₹ 15. What will be Average Revenue (AR) at 5 units of level of output: (in Rupees)
- (a) 23 (b) 25
(c) 27 (d) 29
34. If TR = Total Revenue, Q = Quantity of Output, Δ = change, n = number of units of commodity, then MR (Marginal Revenue) equals
- (a) $\frac{\Delta TR}{\Delta Q}$ only (b) $TR_n - TR_{n-1}$ only
(c) Both (a) and (b) (d) $AR \times Q$
35. In which market $AR = MR$
- (a) perfect competition (b) Monopolistic competition
(c) Monopoly (d) Both (b) and (c)
36. A firm can sell more units of a good only by reducing the price of a commodity. Marginal Revenue of this firm:
- (a) Will be more than Average Revenue
(b) Will be equal to Average Revenue
(c) Will be less than Average Revenue
(d) Will be negative
37. Match the following & choose the correct option:
- I. Marginal Revenue MR (i) $TR_n - TR_{n-1}$
II. Average Revenue (ii) $\frac{TR}{Q}$

$$(iii) \frac{\Delta TR}{\Delta Q}$$

- (a) I → Both (i) & (ii), II → (iii)
(b) I → (i), II → Both (ii) & (iii)
(c) I → Both (i) & (iii), II → (ii)
(d) I → (iii), II → Both (i) & (ii)
38. A firm can sell more and more quantity of a commodity at a given price. In such case firm's marginal Revenue will be _____ Average Revenue. (Equal to / Greater than / Less than)
39. Average Revenue is always equal to:
(a) Price (b) Marginal Revenue
(c) Average cost (d) None of these
40. What will be the shape of AR curve of a firm, which can sell any quantity of a commodity at a given price?
41. What will be the shape of MR curve of a firm, which can sell more quantity of a commodity only by lowering the price?
42. What will be the likely behaviour of AR when TR increases at constant rate after selling an additional unit of a good.
43. AR (Average Revenue) at 5 units of output is ₹ 100. TR at 6 units of output is ₹ 560. The value of MR (Marginal Revenue) at 6 units of output will be: (in ₹)
(a) 60 (b) 460
(c) 660 (d) 1160
44. Choose the correct match:
(a) TR maximum ⇒ MR maximum
(b) TR increases at diminishing rate ⇒ MR increases
(c) TR increases at constant rate ⇒ MR constant
45. Choose the correct match:
(a) MR > AR ⇒ AR decreases

- (b) $MR < AR \Rightarrow AR$ increases
- (c) $MR = AR \Rightarrow AR$ remain constant
46. Define Producer Equilibrium.
47. Fill in the blanks:
Two conditions of producer equilibrium are (i) $MR = MC$
(ii) ____? ____
48. Which of the following is correct in case of $TR = TC$
- (a) Normal Profit (b) Abnormal Profit
- (c) Loss (d) None of the above
49. In case of Break Even Point, Which of the following is correct:
- (a) $TR = TC$ (b) $AR = MC$
- (c) $MR = AC$ (d) $MR = MC$
50. Which of the following is the necessary condition of producer's equilibrium:
- (a) $MR = MC$ (b) After equilibrium $MR < MC$
- (c) $MR > MC$ (d) Both (a) and (b)
51. At the point of producer equilibrium:
- (a) $MR = MC$ (b) $MR \geq MC$
- (c) $MR = \leq MC$ (d) None of the above
52. At a price of ₹ 20, a publisher of book is expected to sell 9,000 copies. If the book is offered for sale at a price of ₹ 15, then the publisher can expect to sell
- (a) less than 9,000 copies.
- (b) 9,000 copies.
- (c) more than 9,000 copies.
- (d) It is impossible to predict the effect of a lower price on sales.
53. If shoes manufacturer is producing shoes faster than people want to buy them,
- (a) there is an excess supply and price can be expected to

decrease.

- (b) there is an excess supply and price can be expected to increase.
 - (c) there is an excess demand and price can be expected to decrease.
 - (d) there is an excess demand and price can be expected to increase.
54. Car manufactures use many commodities in their production process. If prices of those commodities increase, then we should expect downward movement along supply curve True/False.
55. Study the following schedule

Price	Quantity
2	20
3	30
4	50
5	90

Is the above schedule that of demand or supply function and why?

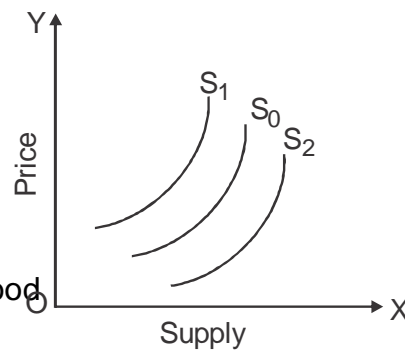
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56. Which of the following will NOT shift the market supply curve of good X?
- (a) A change in the cost of inputs used to produce good X.
 - (b) A change in the technology used to produce X.
 - (c) A change in the number of sellers of good X.
 - (d) A change in the price of good X.
57. Which of the following is/are determinant of the supply of good X?
- (a) own price of the commodity and number of firms in the industry
 - (b) government policies and state of Technology
 - (c) price of related goods

- (d) All of the above are determinants of the supply of good X.
58. A “decrease in supply” is, graphically, represented by:
- (a) A leftward shift in the supply curve.
 - (b) A rightward shift in the supply curve.
 - (c) A movement up and to the right along a supply curve.
 - (d) A movement down and to the left along a supply curve.
59. The supply of a good refers to:
- (a) Stock available for sale
 - (b) Total stock in the warehouse
 - (c) Actual Production of the good
 - (d) Various Quantities of the good offered for sale at various price at a point of time
60. If sellers expect the price of a good to rise in the future, the result is
- (a) an increase in supply today
 - (b) a decrease in quantity supplied today
 - (c) an decrease in demand today
 - (d) and increase in quantity supplied today
61. fill up the blanks by appropriate word given in bracket
- Quantity supplied refers to (various quantities/specific quantity/) of a
- commodity a firm is ready to sell at (specific price/different prices) of the commodity at a point of time.
62. supply schedule is a table showing –
- (a) various quantities of a commodity offered for sale at a specific price at a point of time.
 - (b) specific quantity of a commodity offered for sale at different possible prices at a point of time.
 - (c) specific quantity of a commodity offered for sale at a specific price at a point of time.

- (d) various quantities of a commodity offered for sale at different possible prices at a point of time.
63. The supply of ice cream rises from 100 units to 500 units due to rise in price of ice cream from ₹ 2 per unit to ₹ 5 per unit.
This change leads to
- (a) Extension in supply (b) contraction in supply
(c) increase in supply (d) decrease in supply
64. Due to increase in GST the supply of Air conditions decrease from 20 units to 10 units at same price this situation leads to –
- (a) Extension in supply (b) contraction in supply
(c) increase in supply (d) decrease in supply
65. Fill in the blank
The supply curve of coffee shifted to the leftward direction when price of the substitute good
(tea) (decrease/increase)
66. In case of extension of supply; we move
- (a) from lower point to upper point on same supply curve
(b) To rightward shift on the another supply curve
(c) To leftward shift on the another supply curve
(d) from a upper point to lower point on same supply curve
67. choose the wrong statement
- (a) Market supply schedule is the supply schedule of the industry as a whole.
(b) Because tomato is a perishable commodity, supply of tomato is less elastic than the supply of furniture.
(c) Price Elasticity of supply is the ratio between percentage change in quantity supplied and percentage change in profit of a firm ...

- (d) law of supply states that there is positive relationship between price and supply of a commodity. Keeping other factors constant.
68. Read the following statement carefully. write TRUE or FALSE with reason "Supply of a commodity never changes unless it's own price changes"
69. movement along supply curve is
- (a) 1 change in supply (b) change in quantity supplied
(c) a and b both (d) none of the above
70. Producer is not at equilibrium when $MC > MR$ because.
- (a) Profits can be increased by producing more
(b) Profit is less than cost
(c) Both (a) and (b)
(d) None of these
71. For achieving equilibrium output.
- (a) MC curve should not cut MR curve from above
(b) MC curve should cut MR curve from below
(c) MC curve should not cut MR curve at all
(d) MC curve should be tangent to MR curve
72. The supply curve of a given good is given as S_A . On the basis of this diagram, answer the following questions.
- (i) Shift from S_0 to S_1 is termed as
- (a) Contraction in supply
(b) Expansion in supply
(c) Decrease in supply
(d) Increase in supply
- (ii) Shift from S_0 to S_2 is caused by
- (a) Decrease in price of given good



- (b) Use of obsolete technology
 - (c) Decrease in price of inputs
 - (d) Increase in tax by government
- (iii) Technological up gradation in the good will lead to:
- (a) Downward movement along S_0
 - (b) Shift from S_0 to S_1
 - (c) Shift from S_0 to S_2
 - (d) Upward movement along S_0

Answers

1. (d); 2. (c); 3. (b); 4. (a); 5. (b); 6. (c); 7. (a); 8. (c); 9. (c); 10. (b).
11. (b)
12. Total Physical Product refers to total no. of units of a good produced by a firm in a given period of time by using a given unit of variable factor.
13. Zero 14. (a)
15. The function showing relationship between physical inputs and physical output of a good is called productionn function.
16. Marginal product will decrease but remain positive
17. Long Run 18. (a) Labour (b) Capital
19. (c) 20. above, maximum
21. (a) 22. (a)
23. (d) 24. (b)
25. Total fixed cost
26. Implicit cost, Normal Profit
27. Expenditure on casual labour and Raw material
28. (d) 29. decreases
30. (c) 31. (b)
32. (b) 33. (a)
34. (c) 35. (a)

36. (c) 37. (c)
 38. Equal to 39. (a)
 40. AR curve will be a straight line parallel to x axis
 41. MR curve will be downward sloping.
 42. AR will remain constant
 43. (a)
 44. (c)
 45. (c)
 46. Producer Equilibrium refers the stage of level of output where producer attains maximum profit and he has no incentive to increase or decrease the level of output
 47. After equilibrium $MR < MC$
 48. (a) 49. (a)
 50. (d) 51. (a)
 52. (c) 53. (a)
 54. (false)
 55. This schedule is supply function because increase in price leads to increase in quantity
 56. (d) 57. (d)
 58. (a) 59. (d)
 60. (b)
 61. specific quantity, specific price
 62. (d) 63. (a)
 64. (d) 65. increase
 66. (a) 67. (c)
 68. False, supply can change due to factors other than own price of the concerned commodity such as technology and government's policies.
 69. (b)
 70. (c)
 71. (b)
 72. (i) (c), (ii) (c), (iii) (c)

CONSTRUCTED RESPONSE QUESTIONS (3-4 MARKS)

1. State the relationship between average product and marginal product.
2. Explain the law of diminishing returns to a factor? State the reason for the same.
3. Briefly explain the causes of increasing returns to a factor with the help of marginal product.
4. Explain the likely behaviour of total product. When only the units of a variable factor is increased and keeping all other factor fixed. Use numerical example.
5. Complete the following table :

<i>Units of Variable input</i>	<i>TP (Units)</i>	<i>AP (Units)</i>	<i>MP (Units)</i>
1	–	–	20
2	–	–	26
3	66	–	–
4	–	19	–
5	–	–	4

6. Identify the three phases in the law of variable proportion from following information :

<i>Units of Variable Input</i>	<i>Total Products (Units)</i>
0	0
1	4
2	14
3	22
4	28
5	32
6	34
7	34
8	32

7. Whether following statements are true or false. Give reasons.
 - (a) Diminishing returns to a factor is applicable only when average

product starts falling.

(b) When marginal product falls. Average product falls.

8. Distinguish between total fixed cost and total variable cost?
9. Explain with the help of a diagram the relationship between average cost, average variable cost and marginal cost?
10. Why is short run average cost curve 'U' shaped?
11. Whether following statements are true or false give reasons:
 - (a) Average cost starts increasing when marginal cost starts increasing.
 - (b) AC and AVC curves do not intersect each other.
12. Whether following statements are true or false give reasons.
 - (a) Marginal cost changes at a rate faster than average cost.
 - (b) As output increases, the difference between AC and AVC decreases.
13. If the total fixed cost of a firm is Rs. 24, Complete the following table :

Output (Units)	AVC (Rs.)	TVC (Rs)	MC (Rs)	TC (Rs)
1	50	—	—	—
2	40	—	—	—
3	45	—	—	—

14. Complete the following table :

Output	AVC	TC	MC
1	—	60	—
2	18	—	20
3	—	—	—

4	20	120	18
5	22	—	—

15. What changes will take place in total revenue when
- Marginal revenue is falling but is positive
 - Marginal revenue is zero
 - Marginal revenue is negative
16. Define marginal revenue. Explain the relationship between average and marginal revenue when price is constant at all levels of output.
17. Draw in a single diagram the average revenue and marginal revenue curves of a firm which can sell any quantity of the good at a lower price. Explain with diagram.
18. Complete the following table :

Output	Price (Rs.)	MR (Rs.)	TR (Rs.)
1	—	—	10
2	—	4	—
3	—	—	15
4	—	(-) ³	—

19. Whether following statements are true or false give reasons.
- AR curve always remain above MR curve.
 - When AR falls, MR falls faster than AR.
20. What changes should take place in total revenue (TR) so that :
- Marginal Revenue is positive and constant.
 - Marginal revenue is positive and falling.
21. Complete the following table:

Output (Units)	AR (Rs.)	MR (Rs)	TR (Rs)
1	10	10	10
2	—	8	—
3	8	—	—

4	—	0	—
5	—	—	20

22. What do you mean by producer's equilibrium? State and briefly explain the conditions of producer's equilibrium with Marginal Revenue and Marginal Cost approach. Use diagram/schedule.

OR

Explain producers equilibrium with the help of a numerical example using marginal revenue and marginal cost approach.

OR

Why is the equality between marginal cost and marginal revenue necessary for a firm to be in equilibrium? Is it sufficient to be in equilibrium? Explain.

23. Distinguish between 'Change in Supply' and 'change in quantity supplied' with the help of diagram?
24. Differentiate between 'contraction in supply' and 'decrease in supply'?
25. How does change in price of inputs affect the supply of a good?
26. How does change in price of related goods affect the supply of given goods?
27. What is a supply schedule? Explain how does change in technology of producing a good affect the supply of that good.
28. When the price of commodity rises from 10 to 11 per unit, its quantity supplied rises by 100 units. If its price elasticity of supply is 2. Then find out its quantity supplied at increased price.
29. Commodities A and B have equal price elasticity of supply. The supply of A rises from 400 units to 500 units due to a 20% rise in its price. Calculate the percentage fall in supply of B if its price falls by 8%.

30. State three reasons for leftward/rightward shift in supply curve?

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

1. Explain diagrammatically the effect on total output when units of one factor is increased and all other inputs are held constant.
2. State whether the following statement are true or false give reason.
 - (a) Total product is the area under the marginal product curve.
 - (b) Total product always increases whether there is increasing returns or Diminishing return to a factor.
 - (c) Average product falls only when marginal product is less than average product.
3. State whether the following statements are true or false:
 - (a) For the first unit of output $MC = AVC$.
 - (b) As soon as marginal cost rises, average variable cost also starts rising.
 - (c) Average variable cost can fall even when marginal cost is rising.
4. State whether the following statements are true or false. Give reasons:
 - (a) Average cost curve cuts AVC at its minimum level.
 - (b) Total cost curve and total variable cost curve are parallel to each other.
 - (c) When marginal cost rises, average cost also rises.
5. State whether the following statements are true or false. Give reasons:
 - (a) When MR falls, AR falls
 - (b) When marginal revenue is constant and not equal to zero, then total revenue will also be constant.
 - (c) When total revenue is constant average revenue will also be constant.

6. On the basis of following information, identify level of output at which producer will be in equilibrium using MR-MC approach and also give reasons :

Output (Units) :	1	2	3	4	5	6
AR (Rs.)	7	7	7	7	7	7
TC (Rs.)	8	15	21	26	33	41

7. What is producer's equilibrium? Explain the condition of producer's equilibrium through the 'marginal cost and marginal revenue' approach. Use diagram.
8. What will be the impact of the following on the supply curve of wheat?
 (a) Increase in price of pesticides, fertilizers and HYV seeds.
 (b) Increase in price of tomato as it can also be grown on the land where wheat is grown?
9. State and explain law of supply with the help of a schedule and diagram?
10. How do the following influence supply of a good. Use diagram:
 (a) Taxes on production (b) Technological progress
 (c) Fall in price of other goods.

CONSTRUCTED RESPONSE QUESTIONS (3-4 MARKS)

SOLUTION

13.

<i>Units of Variable input</i>	<i>TP (Units)</i>	<i>AP (Units)</i>	<i>MP (Units)</i>
0	0	0	–
1	20	20	20
2	46	23	26
3	66	22	20
4	76	19	10
5	80	16	4

14.

Units of Variable Input	TP (Units)	MP (Units)	
0	0	0	First Phase (Increasing returns to a factor)
1	4	4	
2	14	10	
3	22	8	Second Phase (Diminishing returns to a factor)
4	28	6	
5	32	4	
6	34	2	
7	34	0	
8	32	-2	(Negative return to a factor) Third Phase

15.

Output (Units)	AVC (Rs.)	TFC	TVC (Rs)	MC (Rs)	TC
1	50	24	50	50	74
2	40	24	80	30	104
3	45	24	135	55	159

19.

Output	Price (Rs.)	MR (Rs.)	TR (Rs.)
1	10	10	10
2	7	4	14
3	5	1	15
4	3	(-3)	12

20.
$$Es = \frac{\% \text{ change in Quantity}}{\% \text{ change in Price}}$$

$$2 = \frac{\% \text{ change in Quantity}}{10\%} \left\{ \because \% \text{ change in Price} = \frac{1}{10} \times 100 \right\}$$

$$20\% = \% \text{ change in Quantity}$$

20% of $Q_0 = 100$

$$Q_0 = \frac{100}{20\%}$$

$$Q_0 = 500$$

New Quantity Supplied $Q_1 = 500 + 100 = 600$ units

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

SOLUTION

6.

Output	AR (Rs.)	TR (Rs.)	TC (Rs.)	MC (Rs.)	MR (Rs.)
1	7	7	8	8	7
2	7	14	15	7	7
3	7	21	21	6	7
4	7	28	26	5	7
5	7	35	33	7	7
6	7	42	41	8	7

The producer will be in equilibrium at 5th units of output because here all conditions of producer's equilibrium are satisfied i.e., (i) $MR = MC$ and (ii) $MC > MR$ after $MR = MC$ level of output.

Exam. Oriented Questions with Answer

VERY SHORT ANSWER QUESTION (1 MARK)

Q. 1. Define production function.

Ans. The function showing relationship between physical inputs and physical output is called production function.

Q. 2. State the changes in marginal product when total product increases at decreasing rate.

Ans. When total product increases at increasing rate, marginal product increases but remains positive. When total product increases at decreasing rate, marginal product decreases but remains positive.

Q. 3. What is meant by return to a factor?

Ans. When only one factor is increased keeping other factors constant, the resultant increase in output is called return to a factor.

Q. 4. What is meant by Average Physical Product (APP) of a factor input?

Ans. APP is the output per unit of a variable factor i.e. $APP = TPP/L$.

Q. 5. Define cost.

Ans. Cost refers to the sum of explicit cost, Implicit cost and Normal profit.

Q. 6. Why is the relationship between MC and AVC similar to the relationship between MC and AC?

Ans. Because MC is not affected by fixed cost.

Q.7. Define Marginal Cost.

Ans. Marginal cost refers to change in total cost due to additional unit of a commodity is produced.

Q. 8. What will be the behaviour of AR when MR is zero?

Ans. When $MR = 0$, TR will be constant and if TR is constant, AR will fall as output is increased.

Q. 9. What is break even point?

Ans. The point where $TR = TC$ or $AR = AC$ is called break even point. It is level of output where firm earns no profit nor incur loss.

Q.10. Define Market Supply.

Ans. Market Supply refers to the sum total of quantity supplied of a commodity by all sellers or all firms in the market at a certain price and in a given period of time.

CONSTRUCTED RESPONSE QUESTIONS

3–4 MARKS QUESTIONS

Q. 1. Explain the likely behaviour of total product under the phase of increasing return to a factor with the help of numerical example.

Ans. Increasing return to a factor is the first phase of the Law of return to a factor. When more and more units of a variable factor is combined with fixed factor up to a certain level total physical product increases with increasing rate.

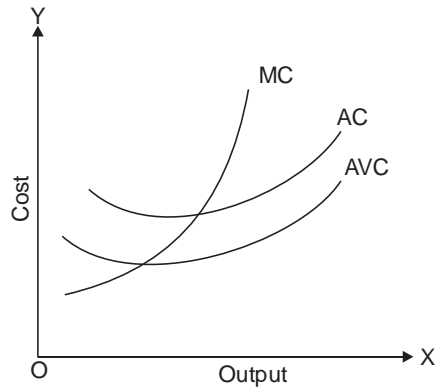
Machine	Unit of Labour	Total Physical Product
1	1	10
1	2	24
1	3	42

Q. 2. With the help of example distinguish between total fixed cost and total variable cost.

Ans.	Total fixed cost	Total Variable Cost
1.	Fixed cost remains constant at each level of output i.e., it does not change with change in level of output.	1. Variable cost changes with the changes in level of output, it increases or decrease as the output changes.
2.	It can not be zero when output is zero.	2. It is zero when output is zero.
3.	Its curve is parallel to x-axis.	3. It curve is parallel to the curve of total cost.
4.	Example : Rent, wages of permanent staff.	4. Example : cost of raw material, wages of casual labourer.

Q. 3. Draw average cost, average variable cost and marginal cost curves on a single diagram and explain their relations.

Ans.



For evaluating curves these points should be kept in mind :

1. MC cuts AC and AVC at their lowest points at point G and F respectively
2. As output increases, the difference between AC and AVC decreases as shown by AC and AVC curve in figure.
3. Lowest point of AC is right to the lowest point of AVC as point G is at right side than point F.

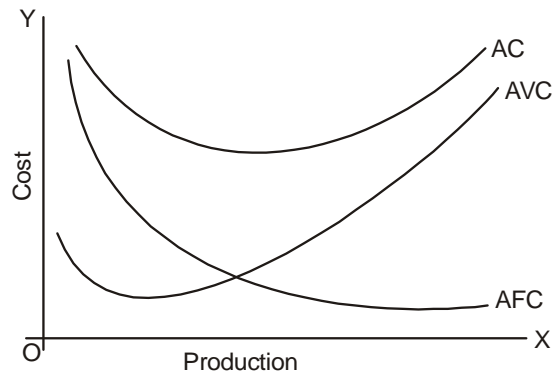
Relation between AC, AVC and MC

When $MC < AC/AVC$, AC/AVC decreases

$MC = AC/AVC$, AC/AVC constant

$MC > AC/AVC$, AC/AVC increases

Q. 4. Draw average cost, average variable cost and average fixed cost curves on a single diagram and explain their relation.



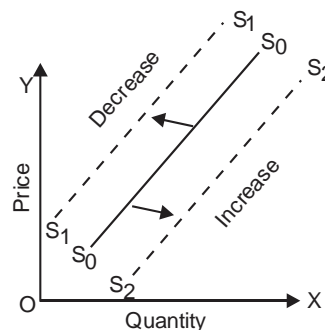
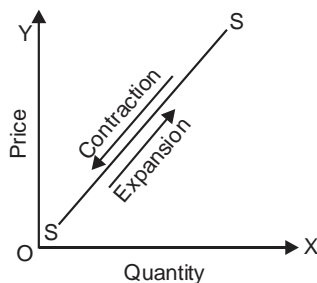
1. AC is the vertical summation of AVC and AFC.
2. The difference between AC and AVC falls as output increases but the difference of AC and AFC increase.
3. As output increases AC and AVC tends to be closer but their curves do not intersect each other because AFC always remains more than zero.

Q. 5. Explain the relation between average revenue and marginal revenue when a firm can sell an additional unit or a good by lowering the price.

Ans. 1. AR and MR both decrease but MR decrease at a faster rate than AR.
2. MR become zero and negative but AR can never be zero.

Q. 6. Distinguish between 'change in quantity supplied' and 'change in supply'.

Ans. <i>Change in Quantity Supplied</i>	<i>Change in Supply</i>
1. It refers to the change in supply due to change in price of the good	1. It refers to the change in supply due to the change in the determinants of supply other than price.
2. Determinants of supply other than price remains unchanged.	2. Price of the good remains unchanged.
3. Law of supply apply.	3. Law of supply does not apply.
4. There is upward and downward movement along the supply curve in this situation.	4. Supply curve shifts to leftward or rightward under this situation.



Q. 7. Explain how does change in price of input affect the supply of a good.

Ans. **Increase in price of Input :** Increase in price of input is a cause of decrease in the supply of a good because the production cost of a good will increase due to increase in price of input. It will reduce the profit. So producer will decrease the supply of the good.

Decrease in the price of input : Decrease in price of input is a cause of increase in supply because when the price of input decreases the production cost of a good also decreases. Decreases in cost increase the profit margin. It motivates producer to increase the supply of the good.

Q. 8. Explain how changes in prices of other products influence the supply of a given product.

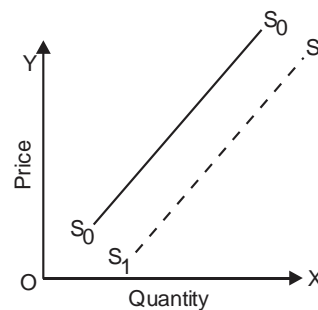
Ans. The supply of a good is inversely influenced with the change in price of other product which can be explained as follows :

A. **Rise in Price of Other product :** When there is a rise in the price of other product the production of these products becomes more profitable due to unchanged cost in comparison of the production of given product. As a result the producer will produce more quantity of other product so the supply of given good will decrease.

B. **Fall in the price of Other Product :** When there is a fall in the price of other product the production of these products becomes less profitable due to unchanged cost in comparison of the production of given product. As a result the producer will produce less quantity of other product so the factors of production shift for the production of given good. It causes an increase in supply of given good.

Q. 9. Explain how technological advancement brings a positive impact in the supply of a given product.

Ans. Technology advancement reduces per unit cost and increases the productivity of given factors of production. Due to these reasons production of given product becomes more profitable and thus supply of given product



increases as shown in Fig. Supply curve shifts rightward from S_0S_0 to S_1S_1 .

Q. 10. What is the behaviour of average fixed cost as output is increased? Why is it so?

Ans. AFC falls continuously as output is increased. It is because,

$$AFC = \frac{TFC}{Q}$$
 TFC remains unchanged even when output is increased.

Q. 11. An individual is both the owner and the manager of a shop taken on rent. Identify implicit cost and explicit cost from this information. Explain.

Ans. Implicit cost : Estimated salary of the owner. Because the owner would have earned this salary if he had worked with a firm not owned by him.

Explicit cost : Rent paid. Because it is actual money expenditure on input.

Q. 12. What is a supply schedule? What is the effect on the supply of a good when Government gives a subsidy on the production of that good? Explain.

Ans. A supply schedule is a schedule that shows the quantity supplied of a commodity at different prices during a given period of time.

When govt. gives a subsidy on the production of a commodity then production cost decreases and producer gets more profit on the same price of the commodity. As a result supply of that commodity increases.

Q. 13. A producer borrows money and opens a shop. The shop premise is owned by him. Identify implicit cost and Explicit cost on the basis of this information. Explain.

Ans. Producer open his shop by borrowing money and he has to pay interest for it. So payment of interest is explicit cost.

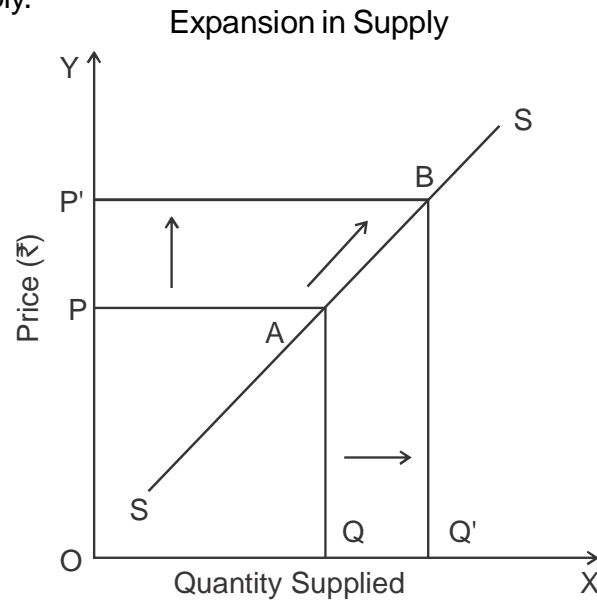
Producer provides his own service and open his shop on his own premise. For this he has not to pay any amount. So imputed salary for the services provided by producer and imputed rent of shop are implicit cost.

Q.14. Examine the effect of

- (i) Rise in own price of good X
- (ii) Rise in tax rate on good X on the supply curve. Use diagrams:

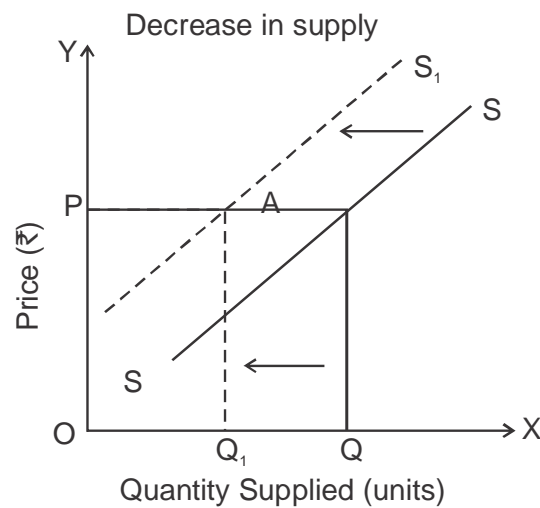
Ans. (i) Rise in own price of good X:

Rise in own price of good X will lead to a rise in the quantity supplied, other factors remaining constant. It will lead to upward movement along same supply curve. It is known as expansion in supply.



- (ii) Rise in tax rate on good x:

Rise in tax rate increases cost of production and reduces the profit margin. As a result supply falls at the same price & leads to leftward shift in supply curve from SS to S'S'. It is known as decrease in supply.



Q.15. Differentiate between contraction in supply and decrease in supply with the help of diagram.

Basis	Contraction in supply	Decrease in supply												
Meaning	when the quantity supplied falls due to decrease in price, keeping other factors constant, it is called contraction in supply.	It refers to a fall in the supply of a good caused due to any factor other than the own price of good												
Tabular presentation	<table border="1"> <thead> <tr> <th>Price (₹)</th> <th>supply (units)</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>100</td> </tr> <tr> <td>8</td> <td>80</td> </tr> </tbody> </table>	Price (₹)	supply (units)	10	100	8	80	<table border="1"> <thead> <tr> <th>Price (₹)</th> <th>Supply (units)</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>150</td> </tr> <tr> <td>15</td> <td>100</td> </tr> </tbody> </table>	Price (₹)	Supply (units)	15	150	15	100
Price (₹)	supply (units)													
10	100													
8	80													
Price (₹)	Supply (units)													
15	150													
15	100													
Effect on supply curve	Downward movement along same supply curve	Left ward shift in supply curve												
Δ in SS curve	The producer will remain on the same supply curve mean supply curve remain same	The produce will jumplgo on to a new supply curve mean a new supply curve formed.												

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

Q. 1. Explain the law of variable proportion with the help of diagram/schedule.

OR

What is the likely behaviour of total product/marginal product when only one input is increased for increasing production? Keeping other factors constant? Use diagram/Schedule.

Ans. Law of variable proportion state the impact of change in unit of a variable factor on the physical output. Keeping other factors constant When more and more unit of a variable factor combined with fixed factor then total product increases at increasing rate in the beginning, Then increases at decreasing rate and finally it starts falling.

Phase I (Increasing Return to a factor): TP increase at an increasing rate

Phase II (Diminishing Return to a factor) : TP increases at diminishing rate

Phase III (Negative Returns to a factor) : TP falls

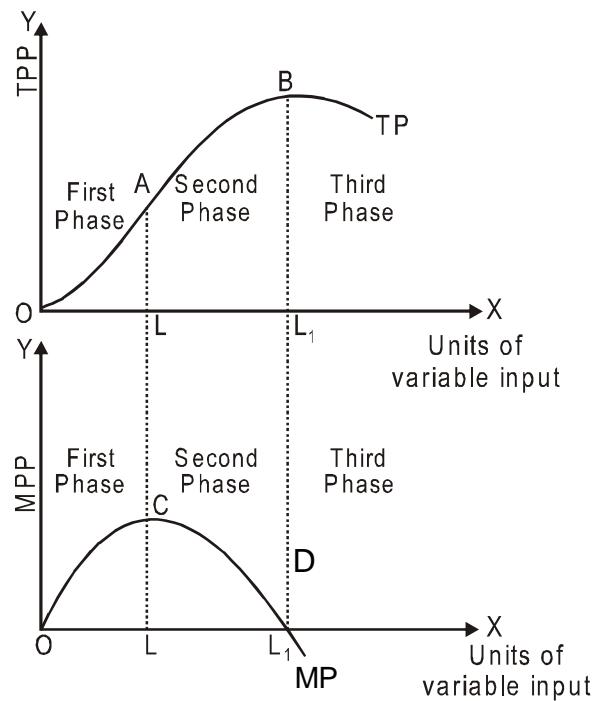
Behaviour of MP

Phase I MP increases and becomes maximum.

Phase II MP decreases and becomes zero.

Phase III MP becomes negative

<i>Machine</i>	<i>Unit of Labour</i>	<i>TP (Unit)</i>	<i>MP (Unit)</i>
1	1	3	3
1	2	7	4
1	3	12	5
1	4	16	4
1	5	19	3
1	6	21	2
1	7	22	1
1	8	22	0
1	9	21	-1



First Phase : TP increases with increasing rate upto A point. MP also increase and becomes maximum at point C.

Second Phase : TP increases with diminishing rate and it is maximum at point B. MP start to decline and becomes zero at D point.

Third Phase : TP starts to decline and MPP becomes negative.

- ❑ **Important instruction** for giving the answer of above question.
- Do not use diagram for the explanation of this question if it is instructed to use schedule and do not use schedule if the explanation of this question asked with the help of diagram.
 - Do not explain the behaviour of marginal product with the help of schedule and diagram. If there is instruction to explain only the behaviour of total product.
 - Do not explain the behaviour of total product with help of schedule and diagram if there is instruction to explain only the behaviour of marginal product.

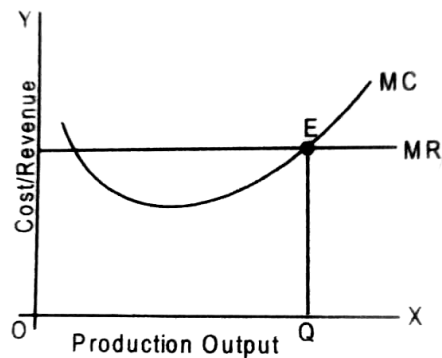
Q. 2. What is producer's equilibrium? Explain the conditions of producer's equilibrium through the 'marginal cost and marginal

revenue' approach. Use diagram/schedule.

Ans. Producer's equilibrium refers the stage of level of output where producer is attaining maximum profit or minimum loss. The conditions of producer's equilibrium through the marginal cost and marginal revenue approach are as follows.

1. Marginal cost should be equal to marginal revenue.
2. With the increase in output after equilibrium marginal cost should be greater than marginal revenue.

In perfect competition



Output (units)	Price (Rs.)	MR (Rs.)	MC (Rs.)
1	4	4	5
2	4	4	4
3	4	4	3
4	4	4	4
5	4	4	5

Explanation of Conditions

- (i) So long as MC is less than MR, it is profitable for the producer to go on producing more because it adds to its profits. He stops producing more when MC becomes equal to MR.

- (ii) When MC is greater than MR after equilibrium it means the profit will decline if producer will produce more units of the good.

In the figure, the producer attains equilibrium at E.

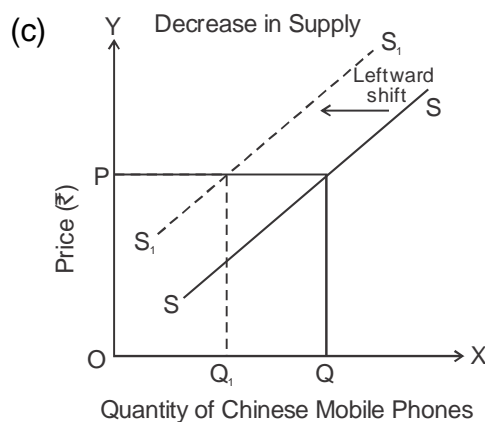
- Q.3.** Read the following case study carefully and answer the questions that follow:

During January 2020, coronavirus cases began to increase in China. Entire world is accuring china of pandemic because it had spread to many other countries. In early March 2020. Indian government announced country wide lockdown to control the spread of virous. As result, import of chinese mobile phones got affected in India.

- (a) What will be the effect of above case study on supply curve of chinese mobile phones in India. (Leftward shift in supply curve/ Downword Movement along same supply curve). Tick the correct answer. (1 Mark)
- (b) Choose the reason for the above effect on supply of chinese mobile phones. (change in its price/change in factors other than price) (1 Mark)
- (c) Show the above mentioned effect of point no. 01 on supply curve of chinese mobile phones diagrammatically? (1 Mark)

Ans. (a) Leftward shift in supply curve.

(b) Change in other factors affecting supply other than price.



Q.4. Read the following case study carefully and answer the following questions on the base of same.

Suppose person X is running a bakery shop at his home. He has invested ₹ 4,00,000 as capital and has also borrowed ₹ 2,00,000 from ABC bank at an interest rate of 8% p.a. He has also hired a manger at a monthly salary of ₹ 15,000/-. The imputed monthly rent of his bakery shop is ₹ 20,000/-.

- (a) Define implicit cost. (1 Mark)
- (b) Calculate annual implicit cost if imputed annual value of services of person X is ₹ 3,00,000. (1 Mark)
- (c) Calculate annual explicit cost? (1 Mark)
- (d) Complete the following formula.
Cost = Explicit cost + Implicit cost + _____ (1 Mark)

Ans. (a) Implicit costs are estimated (imputed) values of inputs supplied by the owner of the production unit himself.

(b) Calculation of Annual Implicit cost:

Annual Implicit cost = Imputed Interest on own capital + annual rental value of bakery shop + imputed annual value of services of owner.

Annual implicit cost = (₹ 4,00,000 × 8%) + (₹ 20,000 × 12) + 3,00,000

32,000 + 2,40,000 + 3,00,000 = 5,72,000/-

(c) **Annual Explicit cost**

Annual explicit cost = Interest on borrowing (₹ 2,00,000 × 8%) + annual salary of manager

= 16,000 + 1,80,000 ₹1,96000/-

(d) Cost = Explicit cost + Implicit cost + **Normal profit**

COMPETENCY BASED QUESTIONS

Q.5. Read the following statements:

Assertion (A) and Reason (R)

Choose one of the correct alternative given below:

Assertion (A): Percentage change in quantity supplied due to percentage change in price of a commodity is called price elasticity of supply.

Reason (R): Factors other than the price of the commodity are constant for measuring price elasticity of supply.

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. (1 Mark)

Answer: Option (a) is the correct answer.

Q.6. Read the following statements:

Assertion (A) and Reason (R) choose one of the correct alternative given below:

Assertion (A): Producer is in equilibrium when his/her profits are maximised Reason (R). When $MR = MC$: profits of the producer are maximised.

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. (1 Mark)

Answer: Option (c) is the correct answer.

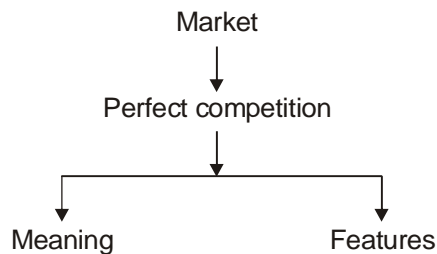
Explanation of Conditions

- (i) So long as MC is less than MR, it is profitable for the producer to go on producing more because it adds to its profits. He stops producing more when MC becomes equal to MR.
- (ii) When MC is greater than MR after equilibrium it means the profit will decline if producer will produce more units of the good.

In both figures, a producer attains equilibrium at E.

UNIT IV

PERFECT COMPETITION: Price Determination and simple application



Market– Market is a system through which type buyers and sellers of a commodity or service come in contact of each other for sale and purchase of the commodity or service on specific price.

Markets are differentiated on the basis of

1. Number of buyers and sellers
2. Nature of the product
3. Freedom to entry and exit
4. Price determination

Perfect competition

Perfect competition is that type of market in which there are very large number of buyers and sellers selling homogeneous products at the same price.

Features of perfect competition and their implications

1. Very large Number of Buyers and Sellers

Implication–The Number of sellers is so large that the share of each seller is insignificant in the total supply and individual seller cannot influence the market price.

Single buyer's share in total purchase is so insignificant because of their large numbers that an individual buyer cannot influence the market price.

No firm can effect/change the price

All firms are price taker

Industry is a price Maker

- 2. Homogeneous product** the product is identical in all respects like shape, size, quality, colour etc. Products can be easily substituted?

Implications Uniform price prevails in the market.

- 3. Freedom of Entry and Exit** of firms. Every seller has the freedom to enter or exit the industry. It ensures absence of abnormal profits and abnormal losses in the long run.

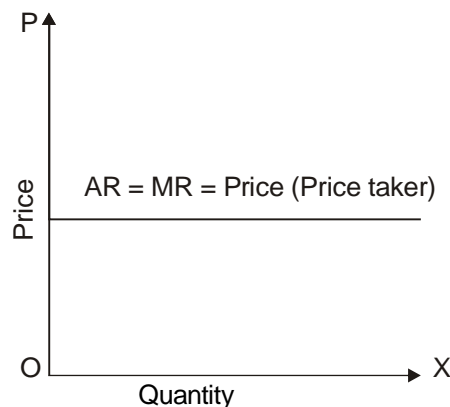
Implication—Freedom of entry firms are free to exit firms are free to stop production the entry continues till firm is earning the normal profit. The firms try to leave when they are facing losses.

- 4. Perfect knowledge among buyers and sellers.** Perfect knowledge means that both buyers and sellers about the market price have perfect knowledge.

Implications no firm is in a position to charge a different price and no buyer will pay a higher price. As a result a uniform price prevails in the market.

Demand (AR) curve is perfectly elastic and parallel to X-axis

Per unit price remains constant: AR, MR and per unit price curves coincide each other and parallel to X-axis.



1. Direction

In the following question a statement of assestion (A) is followed by a statement of Reason R.Mark the correct choice.

Assestion (A): There is no restrication on the entry and exit of the ferims in the perfect competitive market

Reason (R): The perfect competitive market is charatived by the form beeing a price taker and nov a price maket.

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

2. Match the following

Column I	Column II
(a) Price ceiling	(i) Market price of demand and supply
(b) Price floor	(ii) Create competition among buyres
(c) Excess demand	(iii) Interest of consumer
(d) Equilibrium Price	(iv) Interest of producer

Points to Remember

- Market is a system through which the buyers and sellers of a commodity or service comes in contact of one another for sale and purchase of the commodity or service on specific price.
- Markets are differentiated on the basis of :
 - (i) Number of buyers & Sellers
 - (ii) Nature of the product

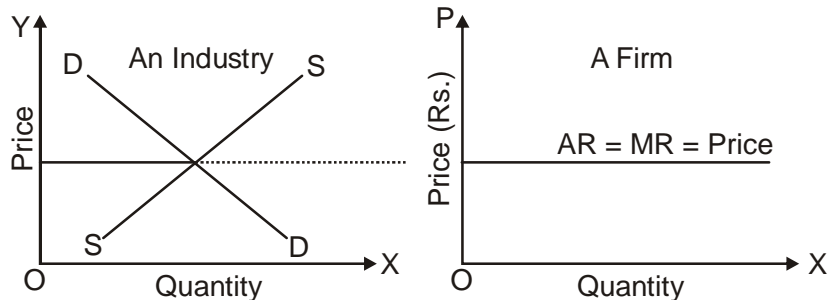
Types of Market

1. Perfect Competition
2. Monopoly
3. Monopolistic competition
4. Oligopoly

(Only Perfect Competition is in syllabus)

PERFECT COMPETITION

- ❑ Perfect competition is that type of market in which there are very large no. of buyers and sellers selling homogenous product at same price.
- ❑ Under perfect competition, per unit price remains constant therefore, average Revenue (AR), marginal revenue (MR) and per unit price curves coincide each other and becomes parallel to x-axis.

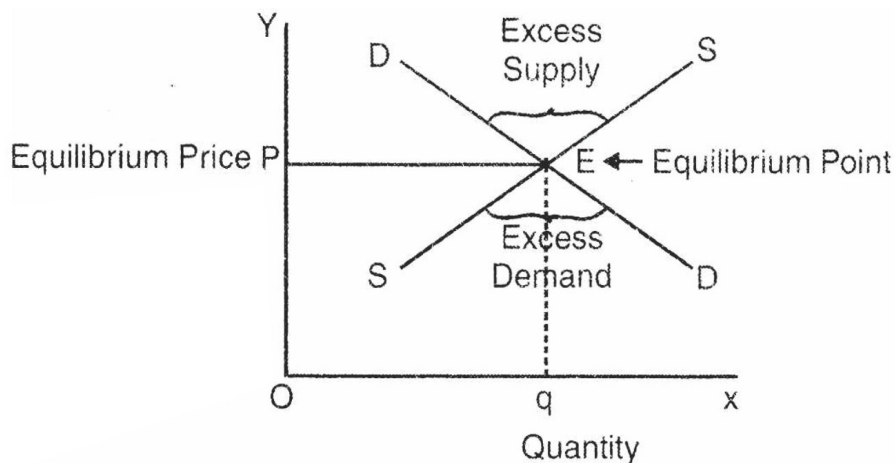


- ❑ Under perfect competition price is determined by the market forces of demand and supply in an industry. No individual firm or buyer can influence the price of the product. So industry is price maker and firm is price taker.

Features of Perfect Competition and their implication :

S.No.	Feature	Implication
1.	Very large number of buyers and sellers.	No firm can effect/change the price, all firms are price taker because insignificant share of firm/consumers in market supply/Demand.
2.	Homogeneous product	Uniform price prevails in the market
3.	Free entry and exit of firms in the market.	All firm earn normal profit in long run.
4.	Perfect knowledge of consumer	Uniform price prevails in market.

- ❑ **Equilibrium Price** : Refers to the price at which market demand and market supply of a commodity are equal.
- ❑ **Market equilibrium**: It is a state in which market demand is equal to market supply. There is no excess demand or excess supply in the market.



- ❑ **Price determination in perfect competition market :**
In perfect competition market price always remain at equilibrium level. Market demand and market supply decide the market price at a point where they intersect each other or become equal. Any

change in market demand or market supply or both change the equilibrium price.

The change in the Equilibrium price must be studied under following headings.

1. Shifts in Demand and Supply

Demand Shift (i) Rightward shift (ii) Leftward shift

Supply Shift (i) Rightward shift (ii) Leftward shift

2. Simultaneous Shift of Demand and Supply

The simultaneous shifts can happen in four possible ways:

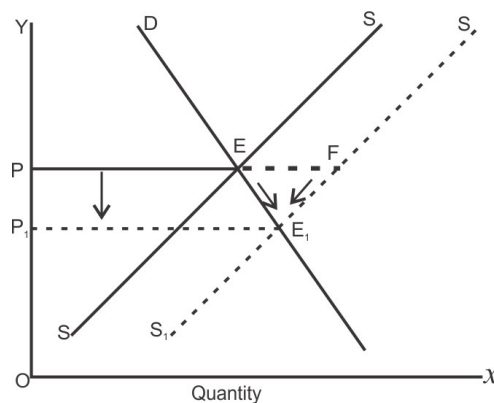
(i) Both supply and demand curves shift rightwards.

(ii) Both supply and demand curves shift Leftwards.

(iii) Supply curve shifts leftward and demand curve shifts rightward.

(iv) Supply curve shifts rightward and demand curve shifts leftward.

- Chain effect of the increase in supply on equilibrium (market) price and equilibrium quantity is shown here (rest cases you should understand with the help of your teacher)



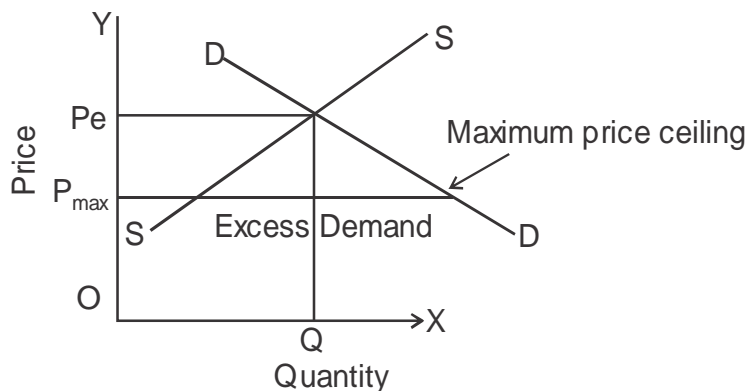
(i) Increase in supply :

1. Supply curve shifts rightward. From SS to SS_1
2. Situation of excess supply EF arises at given market price P .

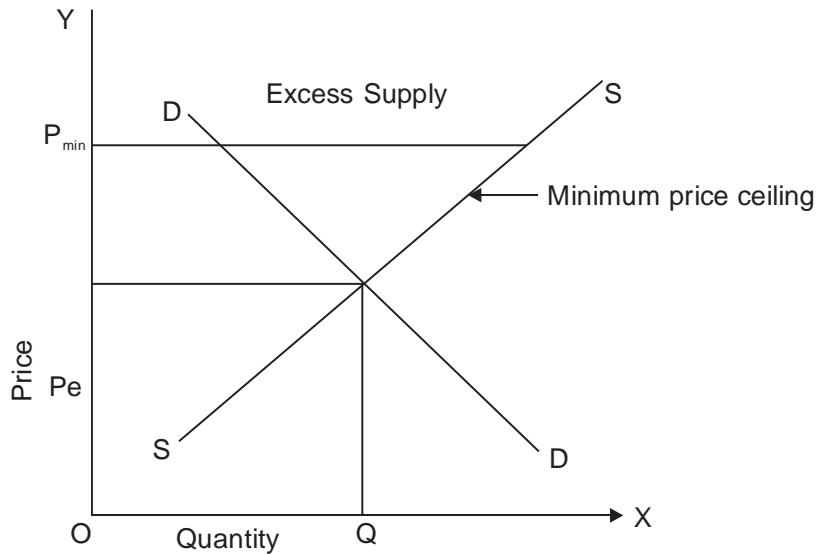
3. Competition among the sellers to sell their product will increase.
4. Sellers are willing to cut their price from P to P_1
5. Decrease in price results in extension in demand E to E_1 and \uparrow contraction in supply from $\downarrow F$ to E_1 till market reach equilibrium point i.e., E_1 where demand = supply.
6. Equilibrium price decreased from P to P_1 and equilibrium quantity increased from Q to Q_1 .

Application of Demand and Supply

- (a) **Maximum Price Ceiling** : Government imposes such a ceiling below the equilibrium price when it finds that the demand for necessary goods exceeds its supply. That is, when consumers are facing shortages and equilibrium price is too high. Government does it in the interest of consumers.



- (b) **Minimum Price Ceiling** : Government imposes lower limit on the price, which is higher than the equilibrium price to safe guard the interest of producers. The price is also called minimum support price.



SELECT RESPONSE TYPE QUESTIONS (1 MARK)

- A price at which a consumer is willing to buy and a seller is willing to sell the commodity is called:

(a) Minimum Price (b) Maximum Price
 (c) equilibrium price (d) None of the above
- Quantity of a commodity which is bought and sold at the equilibrium price is called?

(a) Maximum quantity (b) Minimum quantity
 (c) Both (a) and (b) (d) Equilibrium quantity
- At a given price, when demand for commodity is more than supply of the commodity then it is called excess demand. Here given price is :

(a) less than equilibrium price
 (b) more than equilibrium price
 (c) less than or equal to equilibrium price
 (d) More than or equal to equilibrium price

4. Price ceiling refers to :
- (a) Max. retail price
 - (b) Max. price the buyer is willing to pay
 - (c) Max. price at which seller is willing to sell
 - (d) Max. price the producer is legally to charge
5. Fixation of minimum wage below the equilibrium wage rate leads to :
- (a) Unemployment
 - (b) Over employment
 - (c) Neither (a) nor (b)
 - (d) Either (a) or (b)
6. Market equilibrium refers to a situation in which market price
- (a) is high enough to allow firms to earn a fair profit.
 - (b) is low enough for consumers to buy all that a fair profit.
 - (c) is at a level where there is neither a shortage nor a surplus.
 - (d) is just above the intersectio of the-market supply and edmend curves
7. An increase in the demand for a good will cause.
- (a) an increase in equilibrium price and quantity both.
 - (b) only increase in equilibrium price and no change in qunitty.
 - (c) an increase in equilibrium price and a decrease in equilibrium quantity.
 - (d) a decrease in equilibrium price and an increase in equilibrium quantity,
8. An increase in the supply of a good will cause
- (a) an increase in equilibrium price and decrease in equilibrium quantity.
 - (b) only increase in equiolibrum quantity and no change in price
 - (c) a decrease in equilibrium price and equilibrium quantity.
 - (d) decrease in equilibrium price and an increase in equilibrium quantity.

9. In which instance will both the equilibrium price and quantity rise?
- (a) When demand and supply increase, but the rise in demand exceeds the rise in supply.
 - (b) When demand and supply increase, but the rise in supply exceeds the rise in demand.
 - (c) When demand and supply decline, but decline in the demand exceeds the decline in supply.
 - (d) When demand and supply decline, but the decline in supply exceeds decline in the demand.
10. The equilibrium price for good X is ₹ 10. If government fixes ceiling price at ₹ 5, there is:
- (a) Excess demand
 - (b) surplus
 - (c) Excess supply
 - (d) Loss
11. A rise in supply and demand in equal proportion will result in:
- (a) Increase in equilibrium price and equilibrium quantity
 - (b) No change in equilibrium price and equilibrium quantity
 - (c) No change in equilibrium price and increase in equilibrium quantity
 - (d) Increase in equilibrium price and no change in equilibrium quantity
12. Suppose the equilibrium price of icecream is ₹ 10 and the equilibrium quantity is 60 units. If the price of icecream is ₹ 4:
- (a) The quantity demanded will be less than 60 units.
 - (b) The quantity supplied will be more than 60 units.
 - (c) There will be an excess demand for icecream.
 - (d) There will be an increase in demand.
13. Assume that consumers income and the number of sellers in the market for milk both falls. Based on this information, we can conclude with certainty that the equilibrium:
- (a) Price will decrease
 - (b) Price will increase
 - (c) Quantity will increase
 - (d) Quantity will decrease

14. When the minimum wage is set above the equilibrium market wage by government then-
- (a) there will be an excess demand for labor at the minimum wage
 - (b) the unemployment rate will fall
 - (c) the unemployment rate will rise
 - (d) the quality of the labor force will rise
15. Which one of the following does NOT occur in perfect competition?
- (a) Firms already in the industry have no advantage over potential new entrants.
 - (b) No single firm can exert a significant influence on the market price of the good.
 - (c) There are many buyers.
 - (d) There are significant restrictions on entry into the industry.
16. The market demand curve for a perfectly competitive industry is $Q_d = 12 - 2P$. The market supply curve is $Q_s = 3 + P$. The market will be in equilibrium if
- (a) $P = 6$ and $Q = 9$.
 - (b) $P = 5$ and $Q = 2$.
 - (c) $P = 4$ and $Q = 4$.
 - (d) $P = 3$ and $Q = 6$.
17. Which of the following is not a characteristic of a perfectly competitive market?
- (a) Large number of firms in the industry.
 - (b) Outputs of the firms are perfect substitutes for one another.
 - (c) Firms face downward-sloping demand curves.
 - (d) Resources are very mobile.
18. Under perfect competition, the firms earn normal profit in the long run because of:
- (a) No selling cost

- (b) Price Discrimination
- (c) Free entry and exit of firms
- (d) Uniform price

Use the information in the table below to answer the questions from 19 to 22.

Price (?)	Qty. Demanded	Qty. Supplied
10	1000	0
20	800	200
30	600	600
40	400	1000
50	200	1400

19. What is the market equilibrium price in this case?
20. What would happen in this market if the price were set to 40, Excess demand or Excess supply ?
21. What would happen in this market if the price were set to 20, Excess demand or Excess supply ?
22. What would happen if the price were set ?50 ?
 - (a) a surplus of 1600 units would exist and price would tend to fall.
 - (b) a surplus of 1200 units would exist and price would tend to rise.
 - (c) a surplus of 1200 units would exist and price would tend to fall.
 - (d) a shortage of 1200 units would exist and price would tend to rise.
23. Suppose that in the market for “cheese” (a normal good), the following occur simultaneously:
 - (i) consumer incomes increase and
 - (ii) the price of milk (an input to the production of cheese) increases. Based on above information Which of the following statements is TRUE?

- (a) The equilibrium price of cheese could either increase or decrease, but equilibrium quantity will definitely decrease.
 - (b) The equilibrium quantity of cheese could either increase or decrease, but equilibrium price will definitely decrease.
 - (c) The equilibrium price of cheese could either increase or decrease, but equilibrium quantity will definitely increase.
 - (d) The equilibrium quantity of cheese could either increase or decrease, but equilibrium price will definitely increase.
24. Market for a good is in equilibrium. There is an increase in demand for this good. The steps for this chain of Effects are given below-
- (1) Equilibrium quantity and equilibrium price rise.
 - (2) Rise in price.
 - (3) competition among buyers.
 - (4) demand start to falling and supply start Rising .
 - (5) shift demand curve rightward leading excess demand.
- The correct sequence of the above said steps is-
- (a) 1,2,3,4,5
 - (b) 2.5.4,1.3
 - (c) 5,3,2,4,1
 - (d) 2,3,1,5,4
25. filling the blank with appropriate word
Price ceilings are primarily targeted to help,(producers/ consumers) while price floors generally benefit (producers/ consumers)
26. If the market demand curve for a commodity is horizontal to x-axis then the market structure must be _____ fill in the blanks.
27. Under which of the following forms of market structure does a firm has no control over the price of its product_____ fill in the blank.
28. Suppose goods X and Y are substitutes goods. Which of the following is TRUE?
- (a) An increase in the price of X will result in a decrease in the equilibrium price of Y.

- (b) An decrease in the price of X will result in an increase in the equilibrium quantity of Y.
- (c) An increase in the price of X will result in an increase in the equilibrium quantity of Y.
- (d) both a and c correct

29. In the following question a statement of assertion (A) is followed by a statement of Reason R. Mark the correct choice.

Assertion (A): There is no restriction on the entry and exit of the firms in the perfect competitive market

Reason (R): The perfect competitive market is characterized by the firm being a price taker and not a price maker.

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

33. Mach the following

Column No. I

Column N . II

- | | |
|-----------------------|---------------------------------------|
| (a) Price ceiling | (i) market price of demand and supply |
| (b) Price floor | (ii) Create competition among buyres |
| (c) Excess demand | (iii) Interest of consumer |
| (d) Equilibrium Price | (iv) Interest of producer |
- (a) (a)-(i) , (b)-(ii), (c)-(iii), (d)-(iv)
 - (b) (a)-(iv) , (b)-(iii), (c)-(i), (d)-(ii)
 - (c) (a)-(i) , (b)-(iii), (c)-(ii), (d)-(iv)
 - (d) (a)-(iv) , (b)-(iii), (c)-(ii), (d)-(i)

34. Read the following statements:

Assertion (A) and Reason (R). Choose one of the correct alternative given below:

Assertion (A): Under perfect competition, industry is the price maker and firm is price taker.

Reason (R): Under Perfect competition a firm sells homogeneous products.

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. (1 Mark)

Answers

1. (c); 2. (d); 3. (a); 4. (d); 5. (c); 6. (c); 7. (a); 8. (d); 9. (a); 10. (a); 11. (c); 12. (c) 13. (d); 14. (c); 15. (d); 16. (d); 17. (c); 18. (c); 19. (30); 20. (Excess supply); 21. (Excess demand); 22. (c); 23. (d); 24. (c); 25. (consumer; producers); 26. (a); 27. (perfect competition); 28. (c); 32. (a); 33. (d); 34. (b).

Constructed Response Questions (3-4 Marks)

- 1. How is the demand curve under monopolistic competition different from demand curve of a firm under perfect competition?
- 2. How does 'Free entry and free exit feature of perfect competition market affect the profit of a firm.
- 3. In perfect competition $AR = MR$ Why?
- 4. Explain the implication of freedom of entry and exit to the firms under perfect competition.
- 5. To what extent, can a firm influence the price under:
 - (a) Perfect competition

6. Explain implication of 'homogeneous product' feature of perfect competition.
7. What will happen if the price prevailing in the market is above the equilibrium price.
8. Explain the concept of excess demand with the help of diagram.
9. Explain the determination of equilibrium price under perfect competition with the help of schedule.
10. Explain why is the equilibrium price determined only at the output level at which market demand and market supply are equal.
11. In which condition decrease in demand can not change the price of commodity?

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

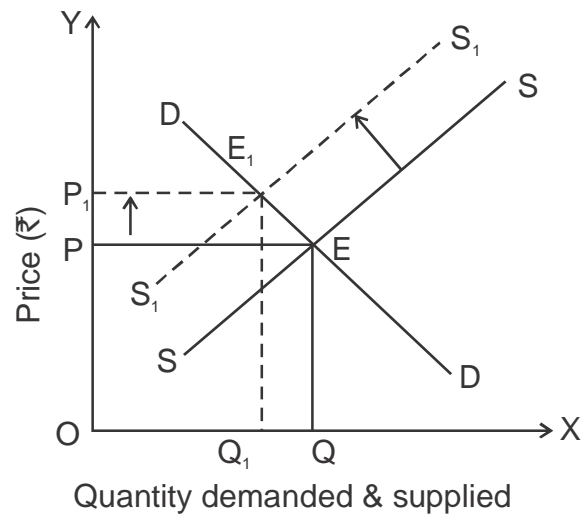
1. Market for a good is in equilibrium. There is 'increase' in supply of that good. Explain the chain of effects of this change. Use a numerical example.
2. Explain the term market equilibrium. Explain the series of changes that will take place if market price is higher than the equilibrium price.
3. How will a fall in the price of tea affect the equilibrium price of coffee (Substitute good of Tea)? Explain the chain of effects.
4. Explain the following features and their implication of perfect competition.
 - (i) Large number of firms or Sellers and Buyers.
 - (ii) Homogeneous Product.
5. With the help of a diagram explain the effect of 'decrease' in demand of a commodity on its equilibrium price and quantity.
6. There is simultaneous decrease in demand and supply of a commodity when it results in ((i) Decrease in Demand > Decrease in supply (ii) Decrease in Demand > Decrease in Supply. (iii) Decrease in Demand < Decrease in Supply).

- (i) no change in equilibrium price
- (ii) a fall in equilibrium price.

Give Diagram also.

7. Suppose under a competitive market equilibrium price is too high for an average consumer in case of essential items. Give suggestion to bring down the equilibrium price upto affordable level for a common man.
8. Suppose government reduces the rate of excise duty and raise subsidies. What is the likely impact of these on the market of a product. Explain with diagram.
9. In lockdown due to COVID-19 pandemic. Price of some good had increased drastically- THE HINDU use a diagram and economic theory to analyse the impact of the rise in price of some goods in the market.

Due to COVID-19. In lockdown. Supply of some goods has restricted in some areas. This supply will fall and the supply curve shifts leftwards from SS to S_1S_1 as shown in below.



At the prevailing market price (OP), there was an deficient supply. In this situation, buyers will reduce the demand of same goods. This process will continue till a new equilibrium price is reached at OP_1 , where the market supply is equal to market demand. OP_1 is higher than the old price therefore, the new equilibrium set at E_1 and New Price is P_1 & quantity is Q_1 .

10. Suppose the demand supply curves of a commodity X, in a perfectly competitive market are given as:

$$Q_d = 2200 - 3P \text{ and}$$

$$Q_s = 180 + 2P$$

Estimate the values of equilibrium price and equilibrium quantity of the commodity X. $P_e = 80$, $Q_e = 1960$

Exam. Oriented Questions with Answer

COMPETENCY BASED QUESTIONS (1 MARK)

Q. 1. Define equilibrium price.

Ans. Equilibrium price refers to that price which equates market demand for a commodity with its market supply.

Q. 2. Define perfect competition.

Ans. Perfect competition refers to a market situation in which (i) there are very large number of buyers and sellers (ii) products are homogeneous and (iii) there is free entry and exit of firms.

Q. 3. Define Price Ceiling.

Ans. Price Ceiling refers to the maximum price of a commodity lower than equilibrium price at which the seller can legally sell their product.

Q. 4. What is meant by excess demand for a product.

Ans. Excess demand refers to the situation in which market demand is more than market supply of a commodity at a given price.

CONSTRUCTED RESPONSE QUESTIONS (3-4 MARKS)

Q. 1. Explain the implication of large number of buyers in a perfectly competitive market.

Ans. The implication is that no single buyer is in a position to influence market price on its own because an individual buyer purchase negligible proportion of the total purchase of the good in the market.

Q. 2. Explain the implication of 'freedom of entry and exit of the firms' under perfect competition.

Ans. The firms enter the industry when they find that the existing firm earning super normal profits. Their entry raises output of the industry brings down the market price and thus reduce profits. The entry continue till profits are reduced to normal. On the other hand the firms start leaving industry when they are facing losses. This

reduces output of the industry raises market price and reduces losses. The exit continues till the losses are wiped out. Hence in the long run, firms earn only normal profit.

Q. 3. Explain the implication of 'perfect knowledge about market' under perfect competition.

Ans. Perfect knowledge means that both buyers and sellers are fully informed about the market price. Therefore no firm is in a position to charge different price and no buyer will pay a higher price. As a result uniform price prevails in the market.

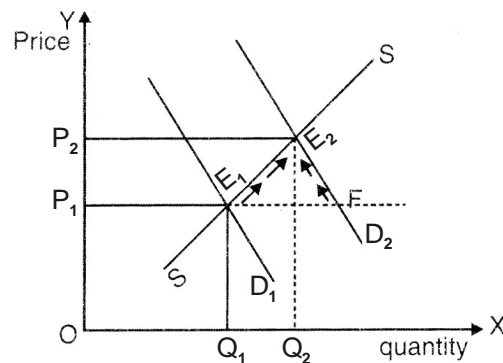
Q. 4. Why is a firm under perfect competition a price taker Explain in brief.

Ans. A firm under perfect competition is a price taker by the following reasons:

1. **Number of Firms** : The number of firms under perfect competition is so large that no individual firm by changing sale, can cause any meaningful change in the total market supply. Hence, market price remains unaffected.
2. **Homogeneous Product** : All firms in a perfectly competitive industry produce homogeneous product. Hence, price remains same.
3. **Perfect Knowledge** : All the buyers and sellers have perfect knowledge about market price so no firm charge a different price than market price. Hence a uniform price prevails in the market.

CONSTRUCTED RESPONSE QUESTIONS (6 MARKS)

Q. 1. Market for a good is in equilibrium. There is an 'increase' in demand for this good. Explain the chain of effects of this change. Use diagram.



Ans. (1) Increase in demand shifts the demand curve from D_1 to D_2 to the right.

(2) This leading to excess demand $E_1 F$ at the given price OP_1 .

Since the consumers will not be able to buy all they want to buy at this price, there will be competition among buyers leading rise in price.

(3) As price rises, demand starts falling (along D_2) and supply starts rising (along S) as shows by arrows in the diagram.

(4) These changes will continue till where quantity demanded = quantity supply

The quantity rises to OQ_2 and price to OP_2 .

Result — increase in equilibrium price and quantity both.

Q. 2. 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.

Ans. There are three possibilities :

1. If the relative (percentage) decrease in demand is greater than the decrease in supply, price will fall. The price will fall because of excess supply in the market.
2. If the relative (percentage) decrease in demand is less than the decrease in supply price will rise. The price will rise because of excess demand in the market.
3. If the relative (percentage) decrease in demand is equal to the decrease in supply price will remain unchanged.

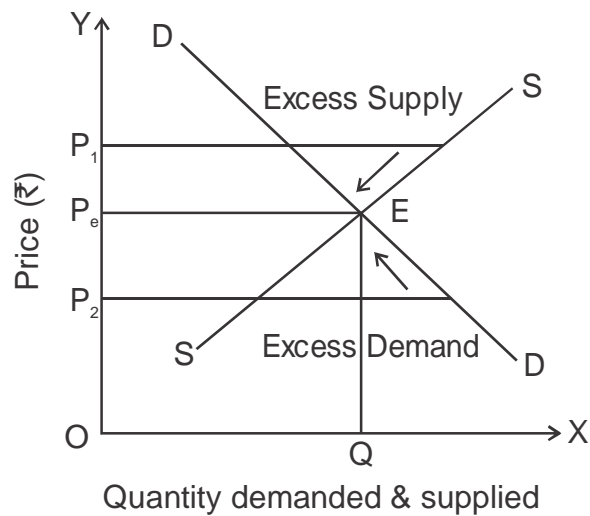
The price will remain unchanged because there is neither excess demand nor excess supply in the market.

Q. 3. Explain why the equilibrium price of commodity is determined at that level of output at which its demand equals its supply.

Ans. Suppose demand is greater than supply. Since the buyers will not be able to buy all what they want, there will be competition among the buyers. It will have an upward influence on the price. As a result demand will start falling and supply rising. It will go on till demand is equal to supply again. If demand is less than supply.

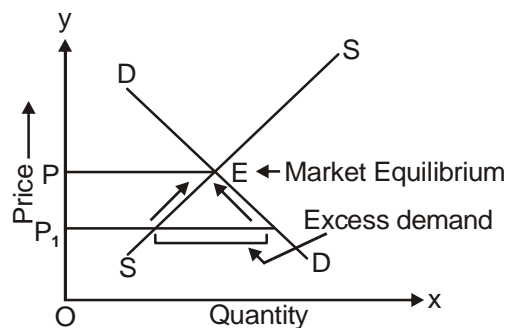
Since the sellers will not be able to sell all what they want, there will be competition among the sellers. It will have a downward influence on the price. As a result demand will start rising and supply falling. It will go on till demand is equal to supply again.

Hence, the equilibrium price of a commodity is determined at that level of output at which its demand equals its supply.



Q. 4. With the help of diagram, show the situation of excess demand. Explain in steps how excess demand reaches to equilibrium.

Ans.



Excess demand is a situation when price of a good is less than the equilibrium price. It leads to competition among buyers which push the price upwards which leads to contraction in market demand and expansion in market supply. Due to its price rise, excess demand is wiped out.

Q. 5. Define price floor. Explain the implications of price floor.

Ans. 'Price Floor' is the minimum price fixed by the government below which seller cannot sell their product.

Since this price is normally above equilibrium price, there is excess supply in the market. As the seller may not be able to sell all the he wants to sell, he may illegally attempt to sell the product at a price below the floor price. Most well known example of imposition of price floors are agricultural price support programme or MSP (Minimum Support Price) and minimum wage legislation.

Q. 6. Define price ceiling. Explain the implications of price ceiling.

Ans. 'Price ceiling' is the maximum price fixed by the government that sellers can legally charge for a product or a service.

Since this price is below equilibrium price, there is excess demand in the market. As the buyer may not be able to buy all that he wants to buy, he may illegally attempt to buy the product at a price above the ceiling price and it lead to black marketing'.

Most well known examples of imposition of price ceiling are dengue test and pricing of stent that is used in the heart surgery.

Q.7. If X and Y are substitute goods, how will increase in price of X will affect equilibrium state of Y. Explain with diagram.

Ans. **Hint:** (i) X and Y goods are substitute, so the Increase in price of X; will increase the demand of Y.

(ii) Equilibrium price of Y will increase

(iii) Equilibrium quantity fo Y will increase

(iv) Suitable diagram

PRACTICE PAPER-I (SOLVED)

CLASS : XI

SUBJECT : ECONOMICS

Time Allowed : 3 hours

Maximum Marks: 80

SECTION-A

1. What is scarcity? (1)
2. Personal investigation method is not suitable for marks (1)
 - (a) If field of Investigation is very large
 - (b) if field of Investigation is Limited
 - (c) if greater degree of originality of data is required
 - (d) if information is to be kept secret
3. If a family spends 50% of their income on food, then to present it in pie digram, how many degrees of angle is formed: (1)
 - (a) 96°
 - (b) 180°
 - (c) 120°
 - (d) 132°
4. Primary data can be collect from (1)
 - (a) its source of origin
 - (b) agency
 - (c) website
 - (d) NSSO / NSS
5. "collection of mary data is more economic than secondary data", (true /false) (1)
6. The title given to the vertical columns of a table is called: (1)
 - (a) Title
 - (b) Stubs
 - (c) Caption
 - (d) Both (b)
7. 'Census of India' collect data related to (1)
 - (a) Industry
 - (b) National Income
 - (c) Agriculture
 - (d) Demography
8. Choose the Appropriate word and fill in the blank. Imarks Tabulation :
cess of presenting in the form of a table. (cost/data) (1)
9. In India shoe size of most of the men is no. 7. Which measure of central
tendency represent it? (1)

- (a) Mean (b) Median
 (c) Mode (d) can not decide
10. If $\sum p_0 q_0 = 1360$, $\sum p_1 q_0 = 1900$, $\sum p_0 q_1 = 1344$, $\sum p_1 q_1 = 1880$
 Then the Laspeyre's index number is (1)
 (a) 0.71 (b) 1.39
 (c) 1.75 (d) None of these
11. State any three limitations of statistics (3)

Case study based

If we represent the following data in a pie-diagram. Then answer the following questions

Items	% expenditure
Labour	27.2%
Bricks	12.9%
Steel	15.4%
Cement	15.5%
Timber	12.5%
Super -on	16.1%

12. (i) What will be the degree of angle for representing expenditure on steel
 (ii) What will be the degree of angle for representing expenditure on Cement and Bricks
 (iii) What will be the degree of angle for representing expenditure on Labour plus Supervision
13. Explain difference between the primary data and the secondary data (4)
14. From the following data construct index of industrial production (4)

Industry	Output 2010 (q_0)	Units 2022 (q_1)	Weights W
Mineral	125	190	35
Chemical	80	140	40
Electrical	170	272	10
Clothes	220	308	15

15. Differentiate between Bar diagram and Histogram (4)
16. In a beauty contest, three judges accorded following ranks to 10 participants (6)

Judge I	1	G	5	1	0	3	2	4	9	7	8
Judge II	3	5	8	4	7	1	0	2	1	6	9
Judge III	6	4	9	8	1	2	3	1	0	5	7

Find out by Spearman's rank difference method which pair of judge has a common taste in respect of beauty.

17. What are the steps to construct consumer price index (CPI) (6)

SECTION-B

18. Define opportunity cost. (1)
19. Define Producer Equilibrium (1)
20. Match items of column I with items of column II and select the correct answer. (1)

- A. Indifference curve (i) set of indifference curves
- B. slope of budget line (ii) represents those combinations which Provides same level of satisfaction

C. marginal rate of substitution (iii) $-P_x/P_y$

D. Indifference map (iv) $-\Delta y/\Delta x$

- (a) A- (ii), B-(ii), C-(i), D-(i)
- (b) A- (iii), B-(i), C-(ii), D-(iv)
- (c) A- (ii), B-(ii), C-(i), D-(iv)
- (d) A- (iii), B-(ii), C-(iv), D-(i)

21. Match items of column I with items of column II and select the correct answer (1)

Column I

Column II

- A. decrease in demand (i) downward movement along the demand curve,
- B. extension in demand (ii) rightward shift in demand curve,
- C. increase in demand (iii) leftward shift in demand curve,
- D. contraction in demand (iv) Upward movement along the demand curve.

- (a) A- (ii),B-(ii),C-(i), D-(i)
 (b) A- (iii),B-(i),C-(ii), D-(iv)
 (c) A- (ii),B-(ii),C-(i), D-(iv)
 (d) none of these
22. Which of the following central problem of an economy deals with selection of category of people who will ultimately consume the goods? **(1)**
 (a) What to produce
 (b) how to produce
 (c) For whom to produce
 (d) When to produce
23. Price elasticity of demand of a commodity is - 2.5. Price of commodity increased by 20 percent. What will be the change in quantity demanded? **(1)**
 (a) Decrease by 50 units
 (b) increase by 50 units
 (c) Decrease by 8 percent
 (d) decrease by 50 percent
24. What is the value of marginal utility at the point of satiety: **(1)**
 (a) Maximum (b) Minimum
 (c) Zero (d) Negative
25. Due to increase in GST the supply of Air conditions decrease from 20 to 10 units same price this situation leads to **(1)**
 (a) Expansion in supply
 (b) contraction in supply
 (c) increase in supply
 (d) decrease in supply
26. Producer is not at equilibrium when $MC > MR$ because. **(1)**
 (a) Profits can be increased by producing more
 (b) Profit is less than cost
 (c) Both (a) and (b)
 (d) None of the
27. Which of the following is the necessary condition of producer's equilibrium: **(1)**

- (a) $MR = MC$
- (b) After equilibrium $MR < MC$
- (c) $MR > MC$
- (d) Both (a) and (b)

28. Study the following and answer the questions. (3)

Case study based questions

Just as individuals face scarcity of resources, the resources of an economy as a whole are always limited in comparison to what the people in the economy collectively want to have. The scarce resources have alternative usages and every society has to decide on how much of each of the resource to use in the production of different goods and services. In other words, every society has to determine how to allocate its scarce resources to different goods and services:

An allocation of the scarce resource of the economy gives rise to a particular combination of different goods and services. Given the total amount of resources, it is possible to allocate the resources in many different ways and, thereby achieving different mixes of all possible goods and services. The collection of all possible combinations of the goods and services that can be produced from a given amount of resources and a given stock of technological knowledge is called the production possibility set of the economy.

- (i) What is the proper meaning of the term “individual.”
 - (a) A single person
 - (b) A firm
 - (c) an institute or organisation
 - (d) a decision making unit
- (ii) Scarcity refers to limitation of in relation to for a commodity.
 - (a) Demand, Supply
 - (b) Supply, Demand
 - (c) wants, resources
 - (d) none of these
- (iii) ‘every society has to decide on how much of each of the resources use in the production of different goods and services’. This is a central problem of
 - (a) What to produce
 - (b) How to produce
 - (c) For whom to produce
 - (d) None of these

29. “Supply of a commodity has positive relation with its own price changes”
Explain (3)

30. Distinguish between expansion of demand and increase in demand with the help of diagram. **(4)**
31. Explain the behavior of TP and MP in the short run use suitable diagram. **(4)**
32. Complete the following table (XXX are not to be filled) **(4)**

Output	TV	TC	MC	AFC	AVC
0	12
1	27
2	10

33. With the help of diagram, explain the effect of following changes on the demand of a commodity. **(6)**
- (a) A change in the income of its buyer.
- (b) A change in price of complementary good.
34. Explain the following their implications with the help of a suitable diagram **(6)**
- (a) "Price Floor" (b) "price ceiling."

ANSWERS

1. It refers to a situation in which supply of any good, service or resource is limited in relation to its demand.
2. (a) If field of Investigation is very large
3. (b) 180°
4. (a) its source of origin
5. false
6. (c) Caption
7. (d) Demography
8. data
9. (c) Mode
10. (b) 1.39
11. Statistics has some limitations, these are

- (1) Statistics does not study individuals : Study of an individual is not a part of subject matter of statistics. Statistics studies the aggregate of facts only.
 - (2) Statistics deals with quantitative facts only : Statistics are numerically expressed. Statistics does not study qualitative aspects. It can be used to measure quantitative data only.
 - (3) Statistical results are only on an average : Unlike the laws of natural sciences, statistical observations are not error free. These are not always valid under all conditions.
 - (4) Only experts can make the best possible use of Statistics : Statistics can be used by experts only. It requires special knowledge to use statistical tools otherwise results may be wrong.
 - (5) Uniformity and Homogeneity of Data : It is essential that data must have the quality of uniformity and homogeneity to make data comparable (any Three)
12. (i) Angle of 55.44 degree
(ii) Angle of 103.68 degree
(iii) Angle of 155.88 degree
13. primary data.
- (1) The data collected by the investigator for his own purpose for the first time are called primary data.
 - (2) These are original as these are collected from the source of origin.
 - (3) These are costlier in terms of time, money and efforts involved.
 - (4) **Example** : Investigator makes a list of marks obtained by students in economics of class XI by interrogating them.

Secondary Data

- (1) Data which are already in existence and which have been collected for some other purposes are called secondary data.
- (2) These are not original as these are already in existence. These can be obtained from published or from any other sources.
- (3) These are less costlier in terms of time, money and efforts involved.

- (4) Example : Investigator collects the marks obtained by class teacher in economics of class XI from his school records like award list, result register etc.

14. Paasche's index number

Hint

$$P_{01} = \frac{\sum q_1 p_1}{\sum q_0 p_1} \times 100$$

Ans. = 160.2

15. Comparison of Bar diagram and Histogram

- A histogram looks similar to a bar diagram. But there are more differences than similarities between the two that may appear at the first impression.
- Moreover, in histogram no space is left in between two rectangles, but in a bar diagram some space must be left between consecutive rectangles.
- Although the bars have the same width, the width of a bar is unimportant for the purpose of comparison. The width in a histogram is as important as its height.
- We can have a bar diagram both for discrete and continuous variables, but histogram is drawn only for a continuous variable. Histogram also gives value of mode of the frequency distribution graphically.

16. (Ans. rs I & II = -0.21; rs II & III = -0.29)

17. The steps to construct consumer price index are as follows :

1. **Selection of the Consumer Class :**
2. First of all, it should be determined, for whom CPI is to calculate i.e., for industrial labour, farmers, govt employee etc.
3. **Information about the Family Budget :** After the selection of consumers class, information about their family budget should be collected i.e., what they consume, how much they consumers, prices of the concerned goods and services etc.
4. **Choice of Base Year :** After this, base year selection should be done. It should be a normal year without much ups and downs.

5. **Information about Prices** : The data regarding retail prices of selected goods and services should be collected from the concerned area, where the selected consumer group lines and makes the purchases.
 6. **Weightage** : Selected items should be given weights according to their relative importance.
 7. **Selection of Method** : At the end, it should be decided that aggregative expenditure method should be used or family budget method should be used to measure CPI
18. Opportunity cost of a given resource can be defined as the value of the next best use to which that resource could be put.
 19. Concept of Producer's Equilibrium : It refers the stage of level of output where producer is getting maximum profit or suffering minimum losses and he has no incentive to increase or decrease the level of output.
 20. (a) A- (ii), B-(iii), C-(iv), D-(i)
 21. (d) none of these
 22. (c) For whom to produce
 23. (d) decrease by 50 percent
 24. (c) Zero
 25. (d) decrease in supply
 26. (c) Both (a) and (b)
 27. (d) Both (a) and (b)
 28. (i) (d) a decision making unit
(ii) (b) Supply, Demand
(iii) (a) What to produce
 29. correct explanation of positive relation of supply with price if price increases the quantity of supply will increase and vice versa with figure
 30. When demand increase at given price due to the change in other factor. It is called increase in demand. On the other hand when other things remain constant and demand increase by decrease in the price of a commodity then, it is called increase in quantity demanded. (Make a suitable diagram)

31. Relation between Total and Marginal Product
1. As long as marginal product rises, total product increases at increasing rate.
 2. When marginal product starts falling but remains positive, total product rises at diminishing rate.
 3. When $MP = 0$, TP is maximum.
 4. When marginal product becomes negative, then total product starts falling. (Make suitable diagram)

32.

Output	TVC	TC	MC	AFC	AVC
0	XXX	12	XXX	XXX	XXX
1	15	27	15	12	15
2	22	37	10	6	11

33. In 33 A the explanation required
- On Increase in Income of the Buyer
- (i) Effect on demand for normal goods
 - (ii) Effect on demand for inferior goods
- On decrease in Income of the Buyer
- (i) Effect on demand for normal goods
 - (ii) Effect on demand for inferior goods
- In 33 (b) the explanation required
- (i) An increase in price of complementary good.
 - (ii) A decrease in price of complementary good.
34. (a) **Maximum Price Ceiling** : Government imposes such a ceiling below the equilibrium price when it finds that the demand for necessary goods exceeds its supply. That is, when consumers are facing shortages and equilibrium price is too high. Government does it in the interest of consumers. (Make suitable diagram)
- (b) **Minimum Price Ceiling** : Government imposes lower limit on the price, which is higher than the equilibrium price to safe guard the interest of producers. The price is also called minimum support price. (Make suitable diagram)

Class : XI
SUBJECT ECONOMICS (030)

Time Allowed: 3 hours

Maximum Marks : 80

General Instructions:

This question paper contains two parts:

1. Part A- Statistics for Economics (40 marks)
2. Part B- Microeconomics (40 marks)
3. Marks for questions are indicated against each question.
4. Question No 1-10 and Question No. 28-29 (including Case Based Questions)
5. Question No 11-12 and Question No. 30-32 and 4 marks question are to be answered in 70-80 words each.
6. Question No. 13-15 and Question No. 30.32 are 4 marks questions and are to be answered in 80-100 words each.
7. Questions No. 16-17 and Question No. 33.34 are 6 marks questions and are to be answered in 100-150 words each.
8. Answered should be brief and to the point and the above words limit be adhered to as for as possible.

Sections -A (Statistics for Economics)

1. The person who produces goods & services to known as-
(a) Service Provider (b) Producer
(c) Consumer (d) Service Holder
2. An economic problem arises due to-
(a) Human want are unlimited
(b) Resources have alternative sue
(c) Resources are Scarce (d) All of these
3. The value exactly at the middle of a class-interval is called-
(a) Class value (b) Mid-value
(c) Class limit (d) Class frequency

4. Read the following statements carefully:
- Statement 1: The difference between upper limit and lower limit of a class is known as magnitude of a class interval.
- Statement 2: An inclusive series is that series which includes all frequencies of a class.
- In the light of the given statements, choose the correct alternative:
- (a) Statement 1 is true and statement 2 is false.
 (b) Statement 1 is false and statement 2 is true.
 (c) Both statement 1 and 2 are true.
 (d) both statement 1 and 2 are false.
5. Diagrammatic representation of the cumulative frequency distribution is called:
- (a) Ogive (b) Histogram
 (c) Frequency Polygon (d) Bar-diagram

OR

- Read the following statements carefully:
- Statement 1: Median can be located graphically by ogive.
- Statement 2: Mode can be located graphically by Bar diagram.
- In the light of the given statements, choose the correct alternative:
- (a) Statement 1 is true and statement 2 is false.
 (b) Statement 1 is false and statement 2 is true.
 (c) Both statement 1 and 2 are true.
 (d) both statement 1 and 2 are false.
6. The relationship between mean, median and mode is:
- (a) $Z = 3M + 2\bar{X}$ (b) $Z = 3M - 2\bar{X}$
 (c) $\bar{X} = 2M - 2Z$ (d) $\bar{X} = \frac{M - 3Z}{2}$

OR

- The item which divides a series into two equal.
- (a) Decile (b) Percentile
 (c) Median (d) Quartile

7. The value of coefficient of correlation between two variable will be:
- (a) $-1 \leq r < 0$ (b) $1 \leq r \leq 2$
(c) $0 \leq r < 1$ (b) $- \leq r \leq 1$
8. The average for constructing an index number is:
- (a) Arithmetic Mean (b) Geometric Mean
(c) Harmonic Mean (d) None of these
9. In the following questions (9-10), a statement of Assertion (A) is following by a statement of Reason (R), choose the correct alternative among those given below:
- (a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, and Reason (R) is not correct explanation Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.
10. (a) Assertion (A): Index numbers are used to show economic and social progress of a country.
(b) Reason (R): The government determines its monetary and fiscal policies with the help of index numbers.
(c) Assertion (A) When two variables move in the opposite direction, it is called negative correlation.
(d) Reason (R): Price and Demand are positively related to each other.
11. Explain the three limitations of statistics.
12. Draw a 'More than' ogive with the help of following data:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of Students	6	10	11	12	8	6	4	3

OR

Convert the following inclusive series into exclusive series.

Marks	Frequency
19-24	8
15-29	9
30-34	13
35-39	17
40-44	6

Note: Only for Visually Impaired Students in lieu of Question No.12

Write the process of converting inclusive series into exclusive series.

13. What is meant by secondary data? Mention any three sources of secondary data. 4
14. Define the median and state its three merits. 4
- 15.

Marks	0-10	10-20	20-30	30-40	40-50
Number of Students	40	48	80	72	8

OR

Find the missing frequencies in the following distribution if $M = 28$ and $N = 50$.

Marks	Frequency
0-10	5
10-20	8
20-30	F_1
30-40	16
40-50	F_2

16. Find the coefficient of rank correlation between the marks obtained in sub Mathematics and Statistics by 6 students of a class.

Marks in Mathematics	14	19	7	18	14	11
Number of Students	4	17	15	9	17	13

17. Explain the any four advantage of index numbers.

OR

Calculate the consumer price index by using family budget (weighted price relative) method for the following data:

Items	Price in Rs.		Quantity (in kg)
	2012	2022	
A	10	15	15
B	7	11	20
C	15	20	10
D	30	40	5
E	12	15	6
F	8	12	3
G	6	10	1

Sections -B (Introduction Microeconomics)

18. Economic problem arises due to:
- High population of a country.
 - Resources have alternative use
 - Competition among buyers
 - Producer want maximum pro
19. When marginal Utility is negative, total utility _____.
- Total utility increase at decreasing rate.
 - Total utility becomes zero.
 - Total utility starts diminishing.
 - Total utility becomes negative.
20. The value of marginal utility is always _____.
- Zero
 - Decreasing
 - Increasing
 - Constant
21. Read the following statement and choose one of the correct alternatives:
- Assertion (A): An indifference curve is convex to the origin.
 - Reason (R): Marginal rate of substitution (MRS) tends to decline as we move along the curve, left to right.

Alternatives:

- 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 correct explanation of Assertion (A).
- (c) Assertion (A) is true, but Reason (R) false.
- (d) Assertion (A) is false, but Reason (R) is true.

22. Match items of column I with items of column II and select the correct alternative:

Column - I	Column - II
(a) Increase in demand	(i) Leftward shift in demand curve
(b) Decrease in demand	(ii) Downward movement along the demand curve
(c) Extension of demand	(iii) Rightward shift in demand curve
(d) Contraction of demand	(iv) Upward movement along the demand curve
(a) a-i, b- iv, c-iii, d-ii	(b) a-iii, b-i, c-ii, d-iv
(c) a-iv, b-iii, c-iv, d-i	(d) a-iii, b-ii, c-i, d-iv

23. The demand for normal good _____ with an increase in income.

- (a) Decreases
- (b) Increases
- (c) Remains constant
- (d) Either increases or decreases

OR

The slope of demand curve is:

- (a) Positive
- (b) Constant
- (c) Negative
- (d) Zero

24. Due to increase in indirect tax the supply of television decrease from 15 units to 10 at same price this situation leads to:

- (a) Extension in supply
- (b) Contraction in supply
- (c) Increase in supply
- (d) Decrease in supply

25. Read the following statement and choose one of the correct alternatives:

Assertion (A): Slope of supply curve is upward from left to right.

Reason (R): There is a negative relationship between price and quantity supplied.

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 correct explanation of Assertion (A).
 - (c) Assertion (A) is true, but Reason (R) false.
 - (d) Assertion (A) is false, but Reason (R) is true.
26. Read the following statement are carefully:
Statement 1: Average fixed cost (AFC) curve is rectangular hyperbola.
Statement 2: Average variable cost (AVC) curve is inverse 'U' shaped.
In the light of the given statements, choose the correct alternative:
- (a) Statement 1: is true and Statement 2 is false.
 - (b) Statement 1: is false and Statement 2 is true.
 - (c) Both Statement 1 and 2 are true.
 - (d) Both Statement 1 and 2 are false.
27. Which of the following is the shape of Total Fixed Cost (TFC) curve:
- (a) 'S' shape
 - (b) Straight line parallel to X-axis
 - (c) 'U' shape
 - (d) Inverse 'U' shape
28. Explain the central problem of 'What to produce'.
29. Explain how does increase in price of input affect the supply of a commodity.

OR

Distinguish between 'change in supply' and 'change in quantity supplied'.

30. When price of a good falls from ₹10 to ₹6 per unit, its demand rises by 40% its price elasticity of demand.
31. Explain the law of variable proportion with the help of schedule.
32. Explain the conditions of producer's equilibrium through the 'Marginal Revenue Marginal Cost' approach.

OR

What the help of example distinguish between Total Fixed Cost (TFC) and Total Cost (TVC).

33. Explain any four factors that affect price elasticity of demand.

OR

Income of an individual is ₹60 which he spends on the purchase of two commodities, commodity-X and commodity-Y. If price of commodity-X and commodity-Y are ₹4 and ₹5 respectively, then answer the following questions:

- (i) How much of commodity-X can be purchase if he spends his entire income on commodity-X.
 - (ii) How much of commodity-Y can be purchase if he buys only 5 units of X- commodity.
 - (iii) Write down the equation of the Budget line.
34. Read the following passage carefully and answer the given question:
- Perfect competition is a benchmark, or 'ideal type'. Perfect competition is theoretically the opposite of monopoly, in which a single company supplies a good or service and that company can change an arbitrary price because consumers have no choice. In perfect to stay in industry.
- (i) Under perfect competition why a firm can't charge arbitrary price?
 - (ii) Under perfect competition which type of profit earned by a firm in the long run?
 - (iii) Is perfect competition a piratical market condition?

Answers Practice Paper 2

1. (b) 2. (d) 3. (b) 4. (c) 5. (a) Or (a)
 6. (b) Or (c) 7. (d) 8. (b) 9. (a)
 10. (c) 15. $\bar{X} = 25.86$ or $F_1 = 15, F_2 = 6$
 16. $R_k = 0.13$
 17. Consumer price index = $\frac{\sum RW}{\sum W} = \frac{98098.2}{692} = 141.76$
 18. (b) 19. (c) 20. (b) 21. (a) 22. (b)
 23. (b) Or (c) 24. (d) 25. (c) 26. (a)
 27. (b) 28. Theory Based 29. Theory Based
 30. $E_d = -1$ Unitary Elastic 31. Theory Based
 32. Theory Based
 33. (i) $4x + 5y = 60$ $y = 0, 4x + 5(0) = 60$
 (ii) $x = 5; 4(5) + 5(y) = 60; y = \frac{60 - 20}{5} = 8$
 (iii) $4x + 5y = 60$
 34. (i) Consumer have more options in perfect competition
 (ii) In long Run firms earn only normal profit because of Free Entry & Exit Feature e.g them it.
 (iii) No, this is imaginary

Class : XI
SUBJECT ECONOMICS (030)

Time Allowed: 3 hours

Maximum Marks : 80

General Instructions:

This question paper contains two parts:

1. *Part A- Statistics for Economics (40 marks)*
2. *Part B- Microeconomics (40 marks)*
3. *Marks for questions are indicated against each question.*
4. *Question No 1-10 and Question No. 28-29 (including Case Based Questions*
5. *Question No 11-12 and Question No. 30-32 and 4 marks question are to be answered in 70-80 words each.*
6. *Question No. 13-15 and Question No. 30.32 are 4 marks questions and are to be answered in 80-100 words each.*
7. *Questions No. 16-17 and Question No. 33.34 are 6 marks questions and are to be answered in 100-150 words each.*
8. *Answered should be brief and to the point and the above words limit be adhered to as far as possible.*

Sections -A (Statistics for Economics)

1. Which of the following is not one of the limitations of statistics?
 - (a) Statistics study numerical fact only.
 - (b) Statistical results are true only as average.
 - (c) Homogeneity of data is not required
 - (d) Statistics study aggregates only.
2. In plural sense, which of the following is not a characteristic of statistics?
 - (a) Aggregate of facts
 - (b) Only expressed in numbers
 - (c) Effected by multiplicity of causes

- (d) Only expressed in words
3. Formula for finding mid-value is:
- (a) $l_1 + l_2$ (b) $\frac{l_1 + l_2}{2}$
- (c) $l_2 - l_1$ (d) $\frac{l_2 - l_1}{2}$
4. Read the following statement and choose one of the correct alternatives:
 Assertion (A): In classification, data are classified on the basis of similarities and dissimilarities.
 Reason (R): Main objective of classification is to present data in a form that appears to be brief and simple.
- 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 correct explanation of Assertion (A).
 (c) Assertion (A) is true, but Reason (R) false.
 (d) Assertion (A) is false, but Reason (R) is true.
5. Read the following statement are carefully:
- Statement 1: In exclusive series, the upper limit of one class interval is the lower limit of the next class interval.
- Statement 2: In exclusive series, value of the upper limit of a class interval is not included in that class, rather it is included in the next class interval.
- In the light of the given statements, choose the correct alternative:
- Alternative:
- (a) Statement 1: is true and Statement 2 is false.
 (b) Statement 1: is false and Statement 2 is true.
 (c) Both Statement 1 and 2 are true.
 (d) Both Statement 1 and 2 are false.

6. Consumer price index is calculated by -

$$(a) \quad P_{01} = \frac{\sum P_1 q_0}{\sum P_0 q_0} \times 100 \quad (b) \quad P_{01} = \frac{\sum RW}{\sum W} \times 100$$

$$(c) \quad P_{01} = \sqrt{\frac{\sum P_1 q_0}{\sum P_0 q_0} \times \frac{\sum P_1 q_1}{\sum P_0 q_1}} \times 100$$

$$(d) \quad P_{01} = \frac{\sum P_1 q}{\sum P_0 q_1} \times 100$$

OR

Graphs are always drawn with reference to _____.

- (a) Origin (b) Scale
(c) x-axis (d) y-axis

7. Sum of deviation about mean is:

- (a) Minimum
(b) Maximum
(c) Zero
(d) One

OR

Which of the following is not a measure of Central Tendency?

- (a) Mean (b) Correlation
(c) Median (d) Mode

8. Maximum value of Rank Correlation coefficient is:

- (a) 0 (b) 0.5
(c) -1 (d) +1

9. Which Quartile is called Median?

- (a) Q_3 (b) Q_2
(c) Q_1 (d) None of these

10. Read the following statement and choose one of the correct alternatives:

Assertion (A): Fisher's index is considered as the ideal index.

Reason (R): Fisher's index takes into consideration the price and quantities of both the base and current year.

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 correct explanation of Assertion (A).
- (c) Assertion (A) is true, but Reason (R) false.
- (d) Assertion (A) is false, but Reason (R) is true.

11. Explain the three main function of the statistics. 3

12. Construct a histogram with the help of following data:

Duration (In hours)	0-10	10-20	20-30	30-40	40-50	50-60
Number of lamps	4	5	8	10	6	2

Construct a less than cumulative frequency curve (ogive) with the help of following data:

Mark	0-10	10-20	20-30	30-40	40-50	50-60
Number of Students	7	10	21	50	8	4

Note: For blind students in lieu of questions No. 12

Write any three difference between Histogram and Bar digram.

13. What are the qualities of a good questionnaire? (Any four) 4

14. What is meant by measures of central tendency? What are the qualities of good mean? (Any three) 4

15. With the help of the following data calculate mode. 4

Wages	0-20	20-40	40-60	60-80	80-100
Number of Workers	2	5	7	5	2

OR

The arithmetic mean of the 20 students in economics paper is 70 marks. But while calculating the marks of two students were read as 36 & 56 instead of 63 & 65. Find the correct arithmetic mean. (4)

16. Calculate the Karl Pearson's correlation coefficient for the following data: 4

X	1	2	3	4	5	6	7	8
Y	2	4	6	8	10	12	14	16

17. Calculate consumer price index. 6

Items	Quantity in Base year	Price in Base Year	Price in Current Year
A	10	24	30
B	02	16	20
C	04	12	18
D	08	5	18
E	10	4	6.25
F	80	1	1.50
G	20	2	2.50
H	02	20	25

OR

Explain the main problems in the construction of index numbers. (Any four)

18. Which of these is Normative Economics.
- (a) 21.9 percent population of India is below poverty line.
 - (b) Equal distribution of income will make India poverty free.
 - (c) Increase in FDI has increased the GDP of India
 - (d) Higher welfare spending by government increases the Aggregate Demand.
19. What is the value of Total Utility at the point of zero level of Marginal Utility?
- (a) Zero
 - (b) Minimum
 - (c) Maximum
 - (d) Negative
20. Which of the following is not a determinants of individual demand?
- (a) Distribution of Income
 - (b) Income of consumer
 - (c) Price of commodity
 - (d) Taste and preferences

21. Which cost curve is parallel to x-axis:
- (a) Average Fixed Cost (b) Total Variable Cost
(c) Total Fixed Cost (d) Total Cost
22. When Average Product is maximum then —
- (a) $MP = AP$ (b) $MP > AP$
(c) $MP < AP$ (d) None of these
23. Which of the following is correct in case of $TR=TC$ 1
- (a) Normal Profit (b) Abnormal Profit
(c) Loss (d) None of these
24. Read the following statements and choose one of the correct: 1
- Assertion (A): In second stage of law of variable proportions, total product increases at diminishing rate.
Reason (R): In second stage of law of variable proportions, marginal product is increasing.
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 correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) false.
(d) Assertion (A) is false, but Reason (R) is true.
25. Which of the following equations is correct? 1
- (a) $AR = \frac{TR}{Q}$ (b) $AR = TR \times Q$
(c) $AR = TR + Q$ (d) $AR = TR = MR$
26. Under which market, firm is price taker- 1
- (a) Monopoly (b) Monopolistic competition
(c) Perfect competition (d) Oligopoly

27. In the situation of market equilibrium? 1
- (a) Market Demand = Market Supply
 - (b) Market Demand > Market Supply
 - (c) Market Demand < Market Supply
 - (d) None of these

OR

Read the following statement are carefully:

Statement 1: Profit are normal when $TR = TC$

Statement 2: $AR = MC$ is a necessary condition or producer's equilibrium.

In the light of the given statements, choose the correct alternative:

Alternative:

- (a) Statement 1: is true and Statement 2 is false.
 - (b) Statement 1: is false and Statement 2 is true.
 - (c) Both Statement 1 and 2 are true.
 - (d) Both Statement 1 and 2 are false.
28. Distinguish between microeconomics and macroeconomics. 3
Give example.
29. Distinguish between extension in demand and increase in demand. 3

OR

What do you mean by budget line? What are the reason of change in Budget line?

30. When price is ₹5 per unit, demand for a commodity is 50 units. As the price falls to ₹4 per unit, demand expands to 75 units. Calculate price elasticity of demand. 4
31. Explain the relationship between total product (TP) and marginal product (MP). 4

OR

Why is average variable cost (AVC) curve is 'U' shaped?

32. Explain, how technological advancement affect the supply of a commodity? 4
32. Income of an individual is ₹100 which he spends on the purchase of two commodities, commodity-X and commodity-Y. If price of commodity-X and commodity-Y are ₹ 5 and ₹10 respectively then answer the following questions. 6
- (i) Write the equation of Budget Line.
- (ii) Write the slope of the Budget Line.
- (iii) Can a consumer buy the combination $4x + 8Y$? Give reason.

OR

- (i) Distinguish between normal goods and inferior goods.
- (ii) Why does two indifference curves not intersect each other.
34. After green revolution, rise in output of food grain is owing to the use of new technology. When there is an improvement in technology, the occurrence of the law of variable proportions is postponed for some time. It does not mean that law of variable proportions ceases to exist. It only means postponement of the law. The law is bound to set-in again once the effect of new technology is exhausted.
- For increasing agricultural production, Variable factors labour and capital can be increased to any extent, but being a fixed factor land cannot be increased. Thus when more and more units of variable factors like labour and capital are applied to a fixed factor, their marginal product starts decreasing and this law becomes operative.
- (i) What is the law of Variable proportions?
- (ii) Under what circumstances the postponement of the law of variable proportions is possible?

Answers Practice Paper — 3

- | | |
|---------------|----------------------------------|
| 1. (c) | 2. (d) |
| 3. (b) | 4. (a) |
| 5. (c) | 6. (a) OR (b) |
| 7. (c) OR (b) | 8. (d) |
| 9. (b) | 10. (a) |
| 15. ₹50 | 16. $r = + 1$ (Perfect Positive) |

17. $CPI = 130.75$

18. 19.

20. 21.

22. 23.

24. 25.

26. 27.

30. $Ed = -2.5$

33. (i) $5x + 10y = 100$

(ii) $\frac{-5}{10} = -\frac{1}{2}$

(iii) $4(5) + 8(10) = 100$

So consumer can buy this.

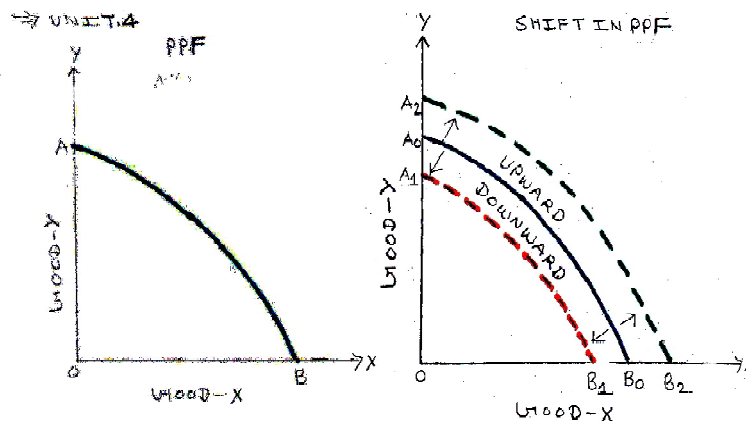
34. (i) According to this law. When the quantity of a variable factor is increased with a fixed factor, the marginal product of the variable factor initially increases after that it decreases and finally becomes negative.

(ii) Improvement in technology and discovery of substitute of the fixed factor.

Important Point to be Noted While Attempting XI Class Economics Paper

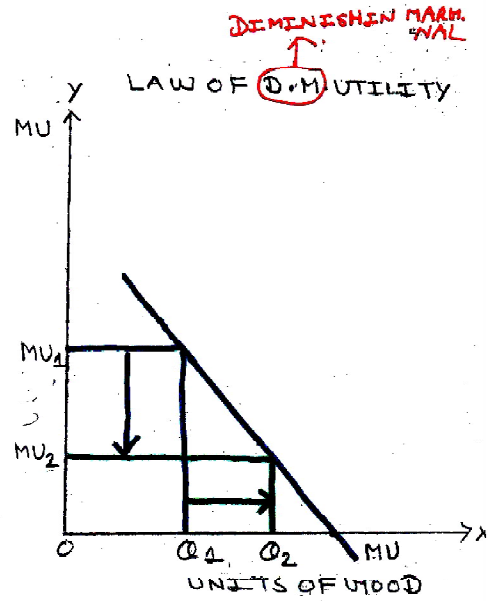
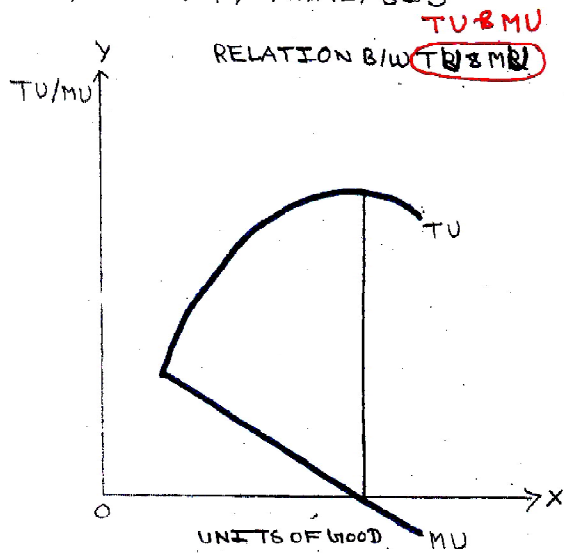
1. Answer all the questions serial wise. If don't know the answer of any question(s) then leave blank space as per your convenience for that questions(s) and answer those questions later.
2. Write answer of those questions first which you know completely after that answer those questions in which you have a doubt. Finally answer those questions which you don't know and while answering trying to connect your answer the given question.
3. Always write formulae at the time of solving numerical.
4. At the time of writing answers of the theoretical questions keep word limit in your mind. Also try to answer in points.
5. Write the answer of those questions in tabular form in which differences are asked.
6. At the time of writing answer of the long questions (6 Marks) make points and write them in bold after that give your answer giving explanation each and every point.
7. Draw diagram for those questions in which it is asked diagram. Draw diagram only by using pencil so that whenever you need to make some improvement/correction in this you can make necessary changes.

MICRO ECONOMICS CHAPTERWISE DIAGRAMS

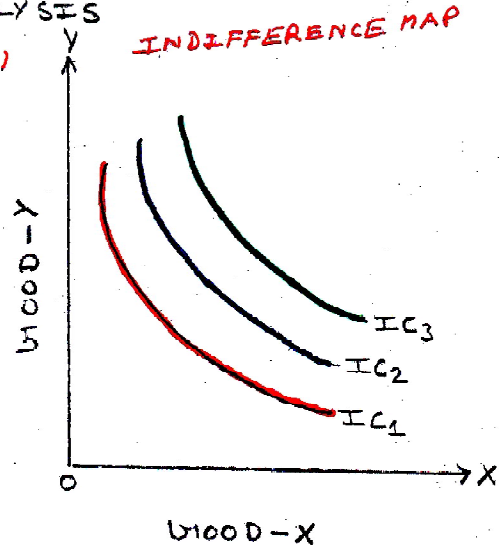
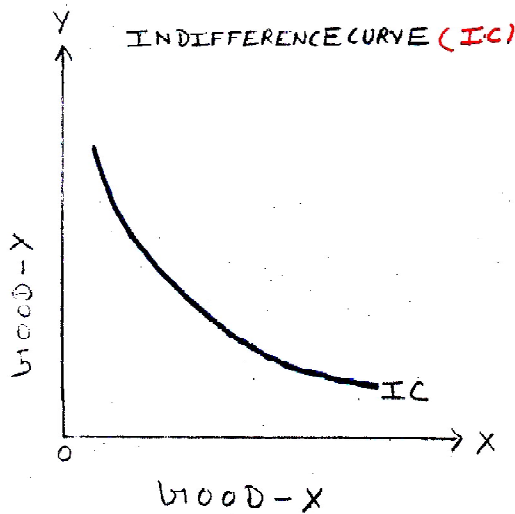


⇒ UNIT 5

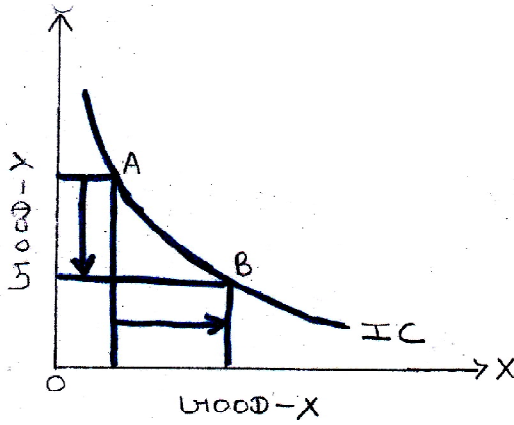
→ UTILITY ANALYSIS



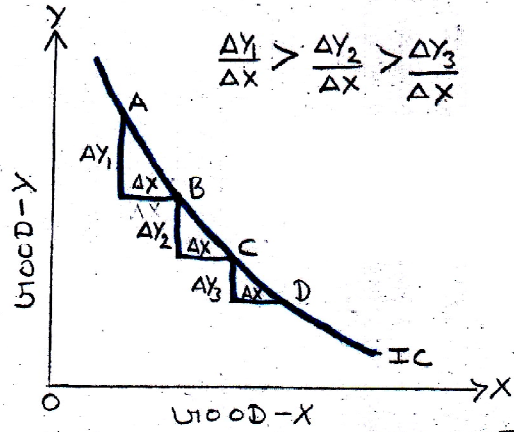
→ INDIFFERENCE CURVE ANALYSIS



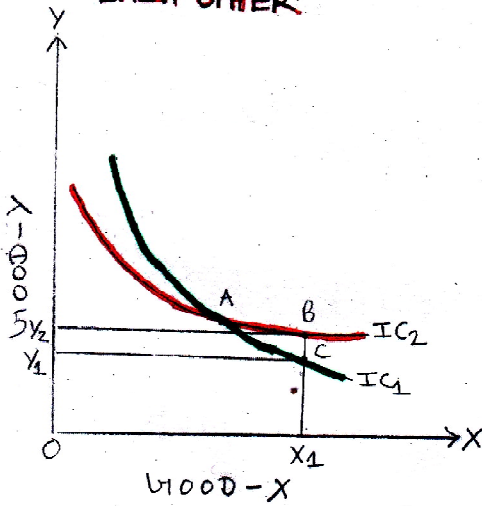
→ PROPERTIES OF ICs
DOWNWARD SLOPING CURVE



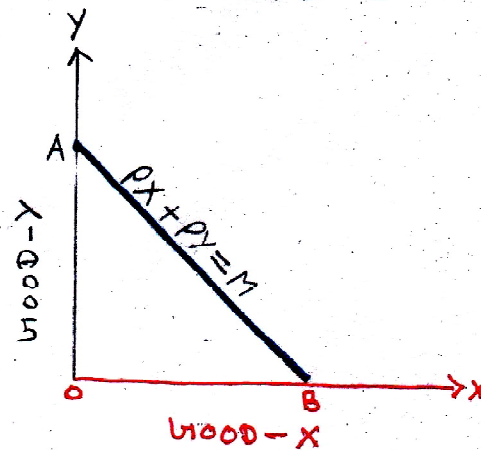
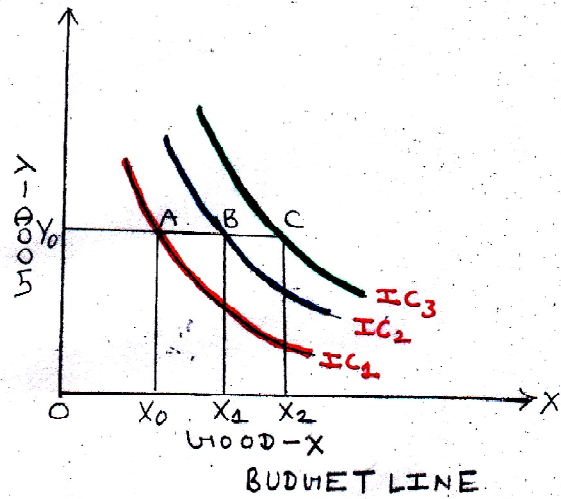
CONVEX TO THE ORIGIN



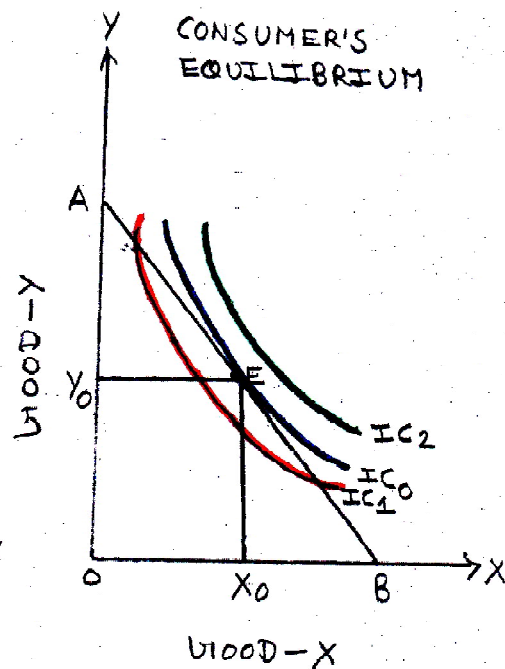
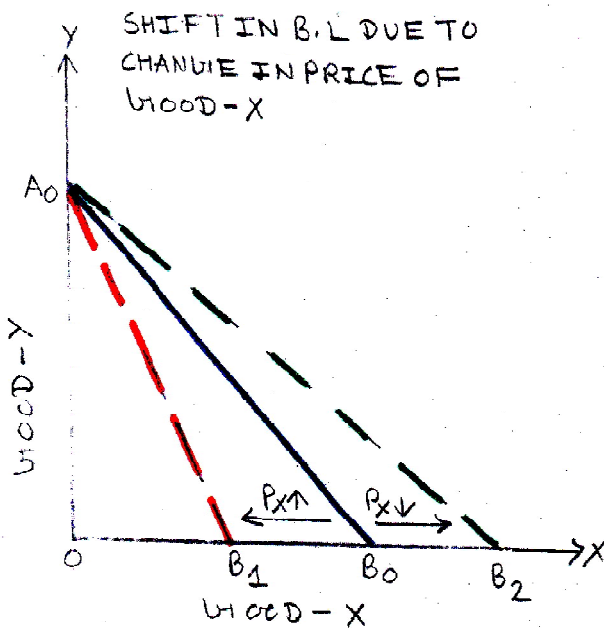
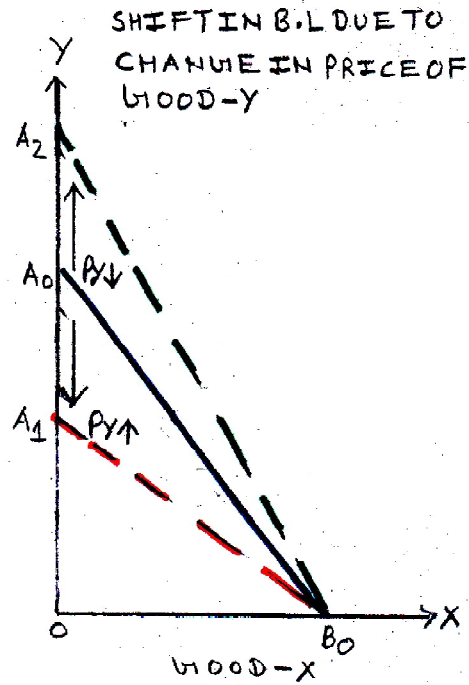
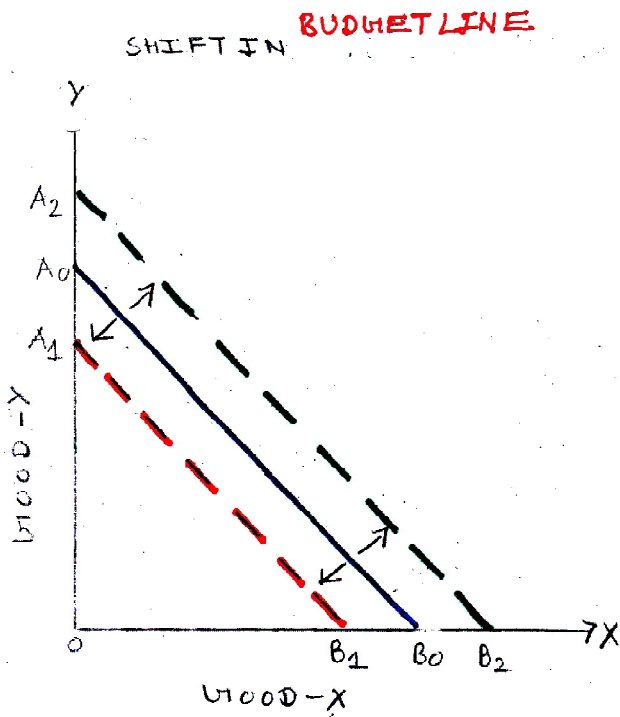
TWO IC CAN'T INTERSECT EACH OTHER



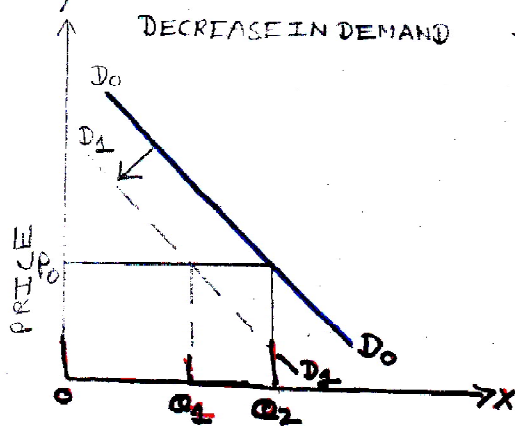
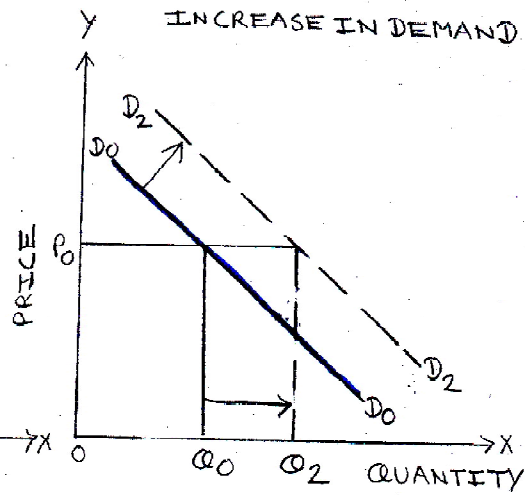
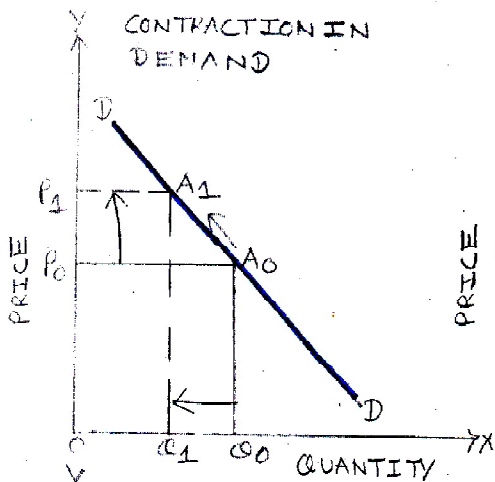
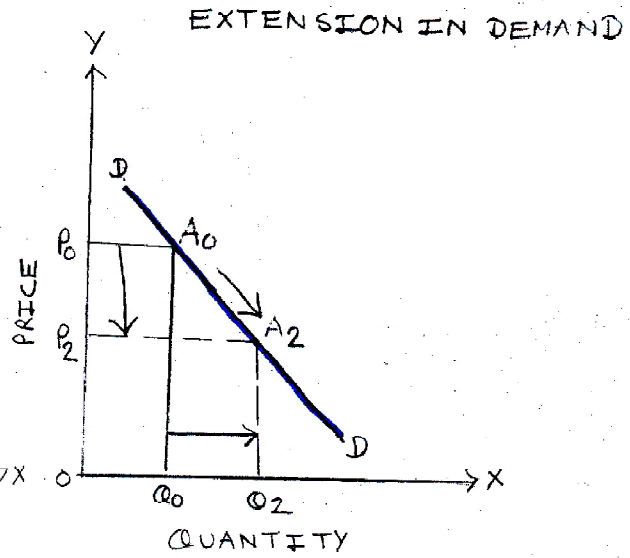
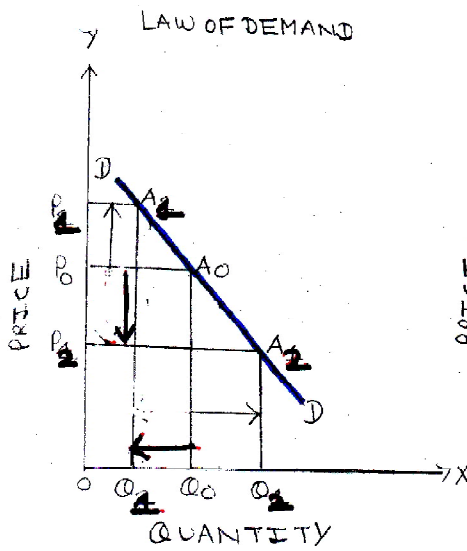
HIGHER IC SHOWS HIGHER LEVEL OF SATISFACTION



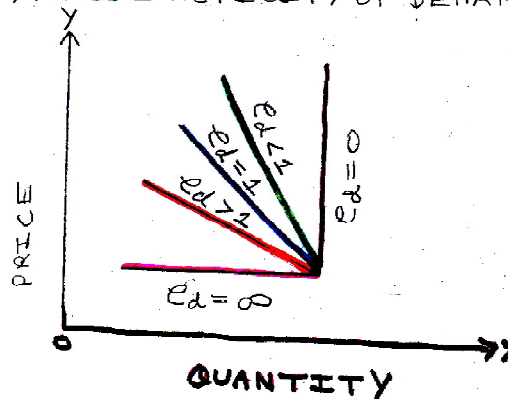
P-3



→ DEMAND

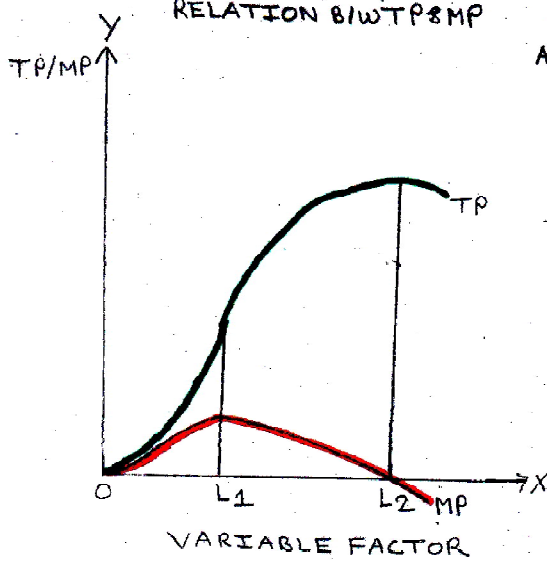


→ PRICE ELASTICITY OF DEMAND

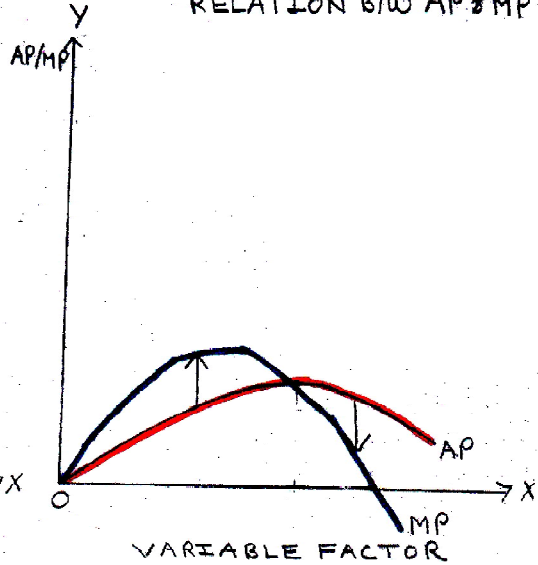


UNIT 6
 PRODUCTION

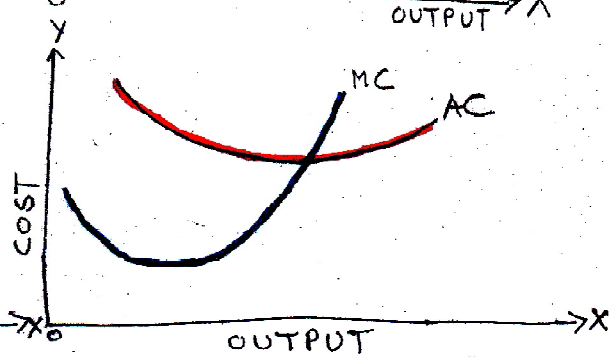
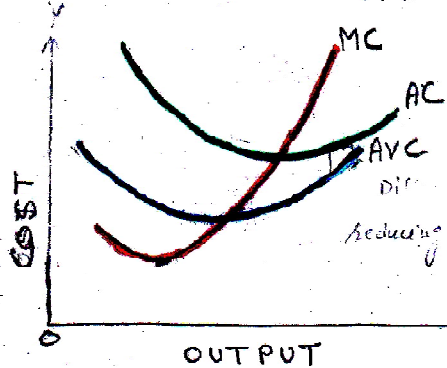
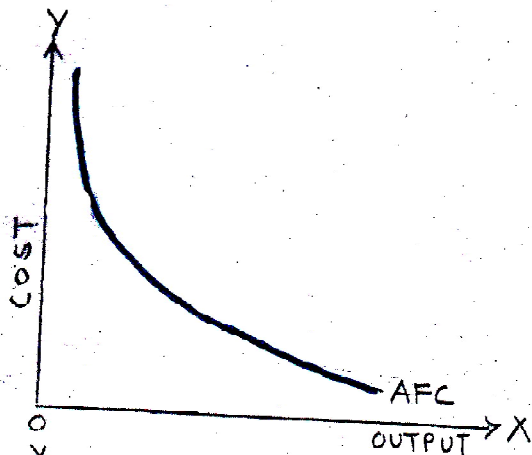
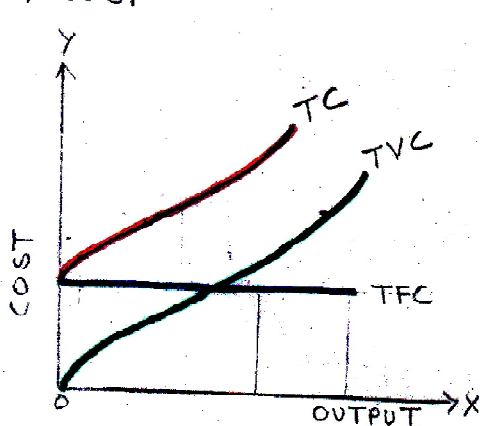
LAW OF VARIABLE PROPORTIONS
 OR
 RELATION B/W TP & MP



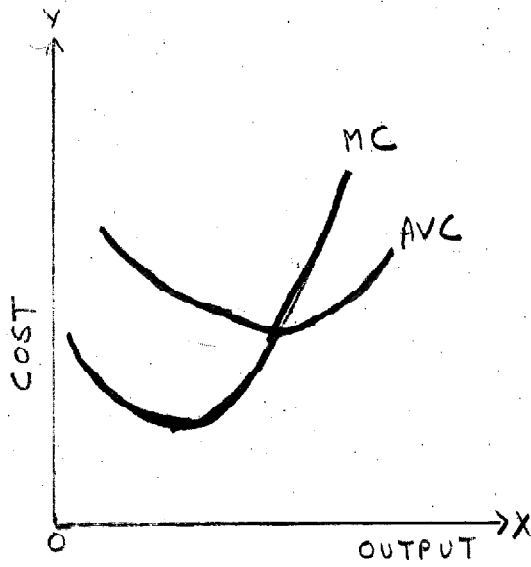
RELATION B/W AP & MP



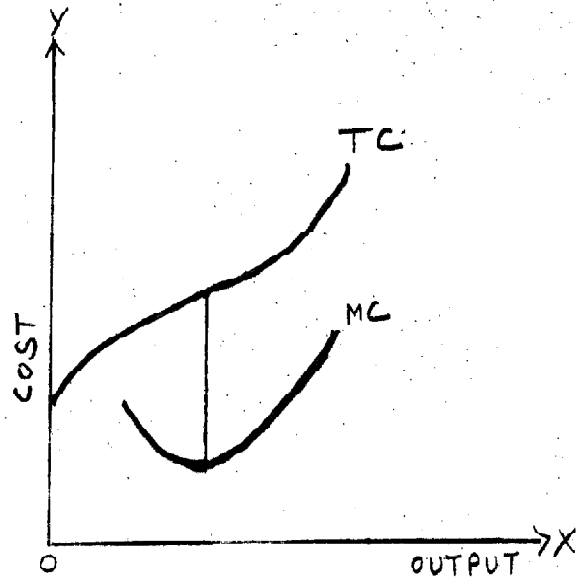
COST



RELATION B/W MC & AVC

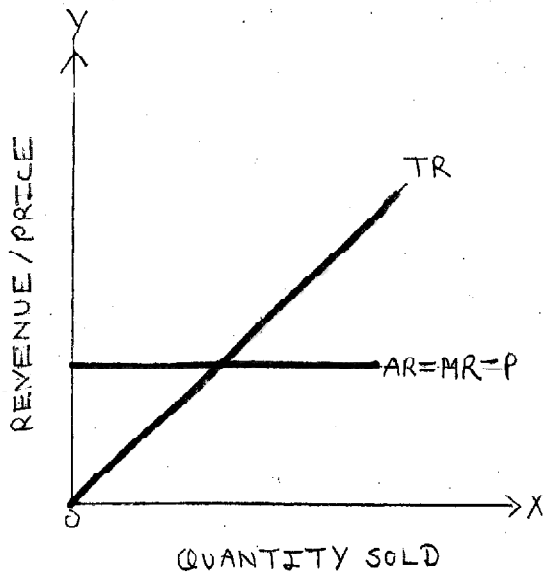


RELATION B/W TC & MC

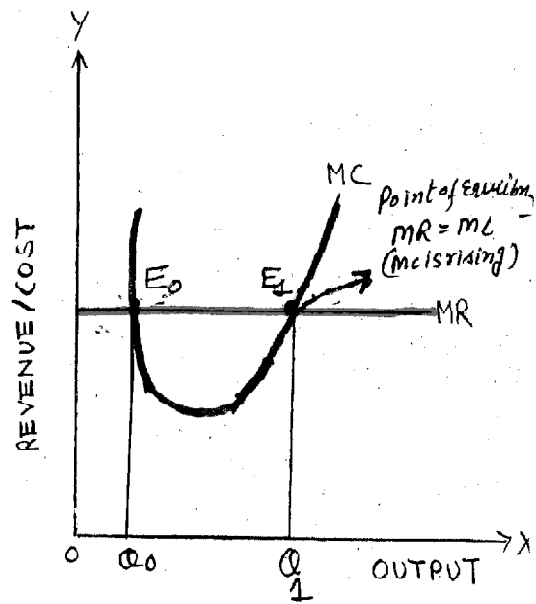


→ REVENUE

RELATION B/W TR, MR & AR

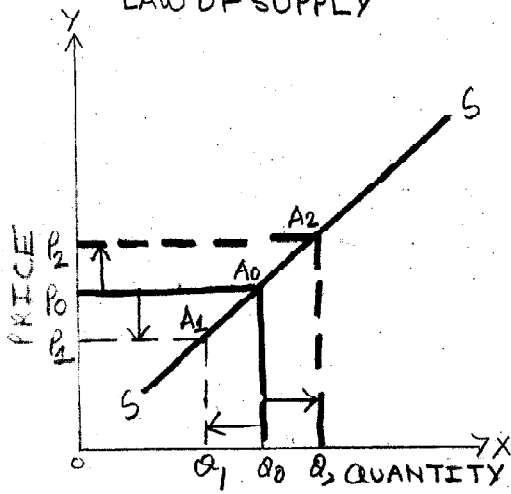


→ PRODUCER'S EQUILIBRIUM

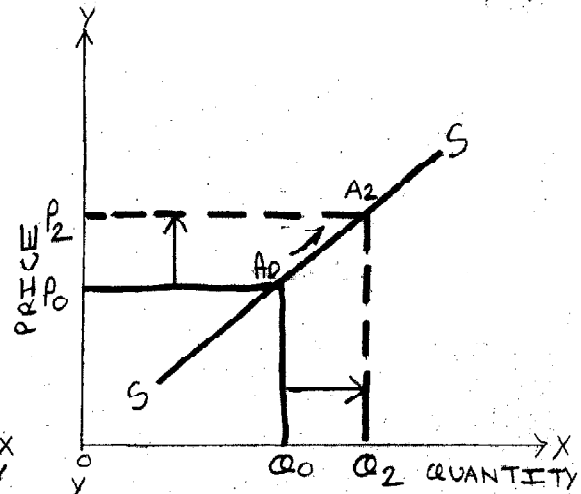


→ SUPPLY

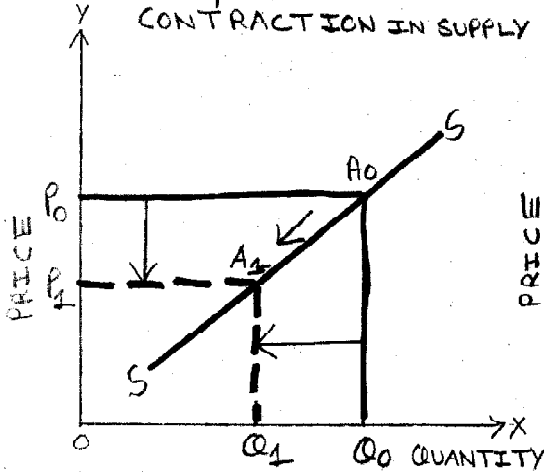
LAW OF SUPPLY



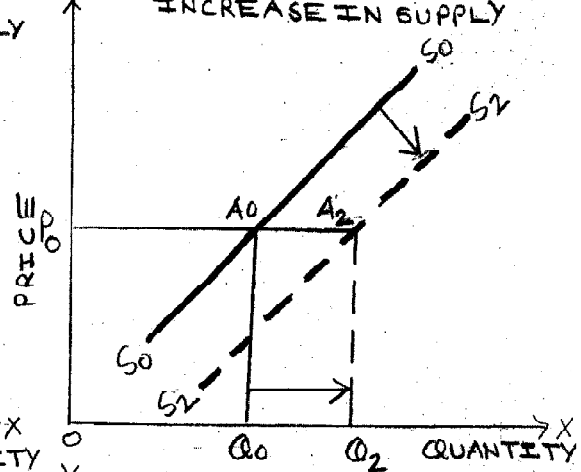
EXTENSION IN SUPPLY



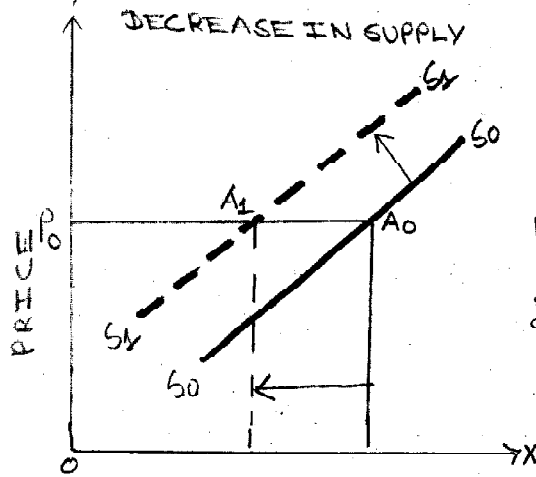
CONTRACTION IN SUPPLY



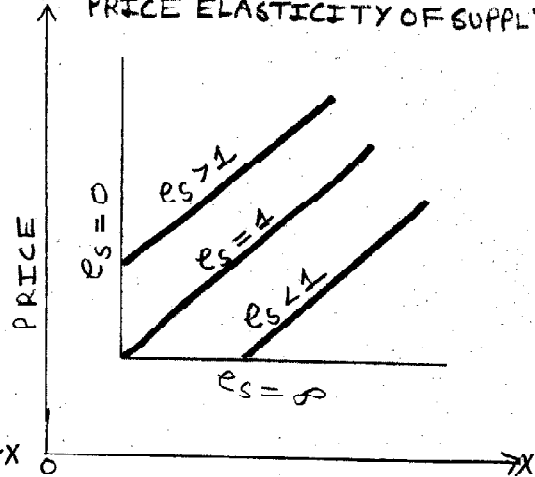
INCREASE IN SUPPLY



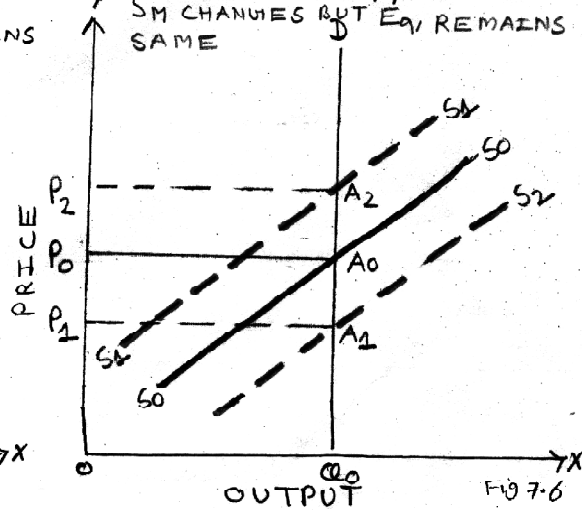
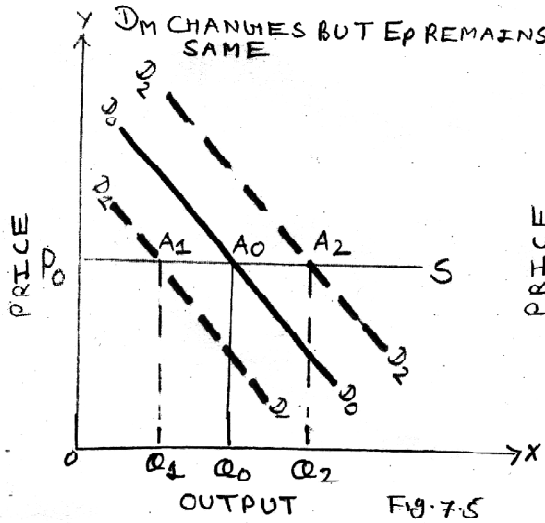
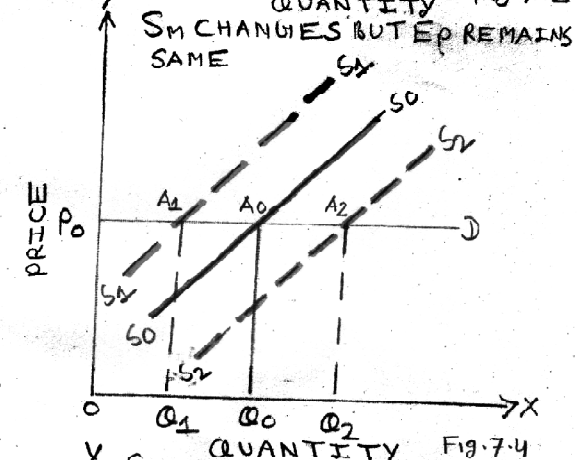
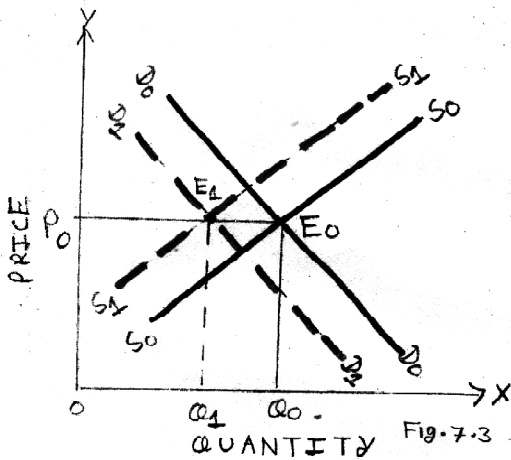
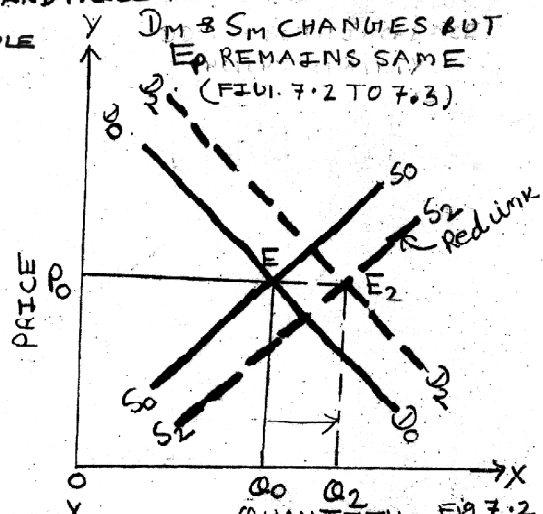
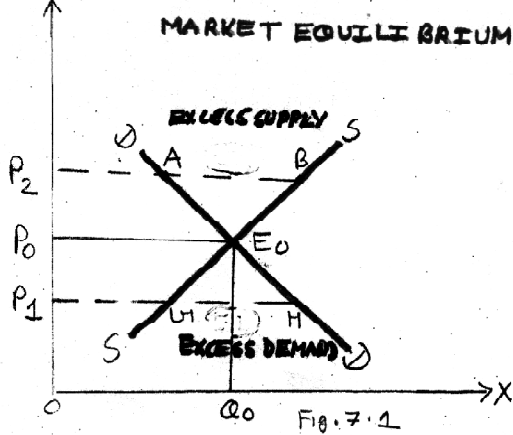
DECREASE IN SUPPLY



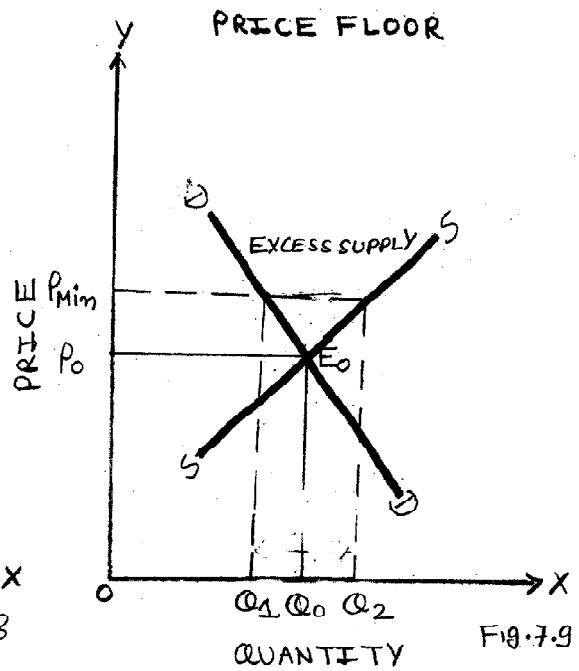
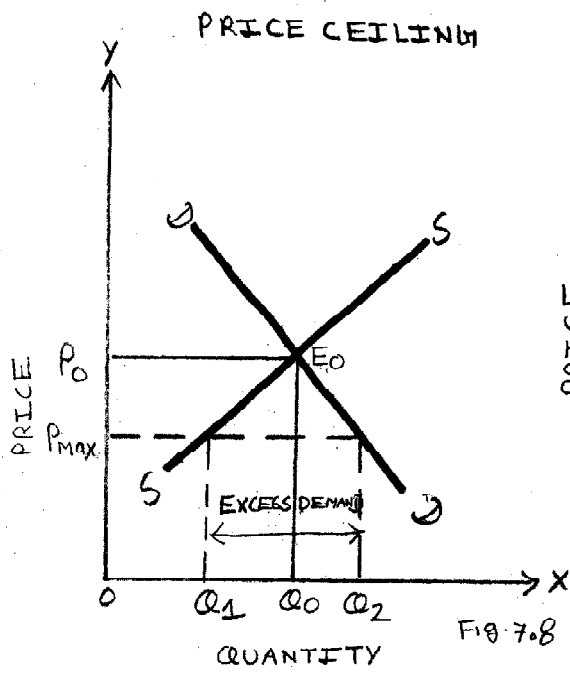
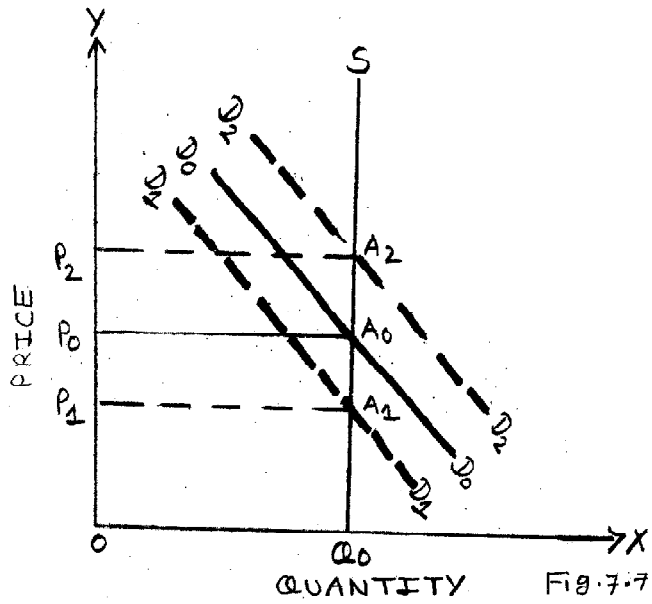
PRICE ELASTICITY OF SUPPLY



ALL WORDS IN BLACK INK
 UNIT 7. FORMS OF MARKET AND PRICE DETERMINATION UNDER
 PERFECT COMPETITION WITH SIMPLE APPLICATIONS



D_M CHANGES BUT E_{av} REMAINS SAME



PRICE DETERMINATION UNDER PERFECT COMPETITION

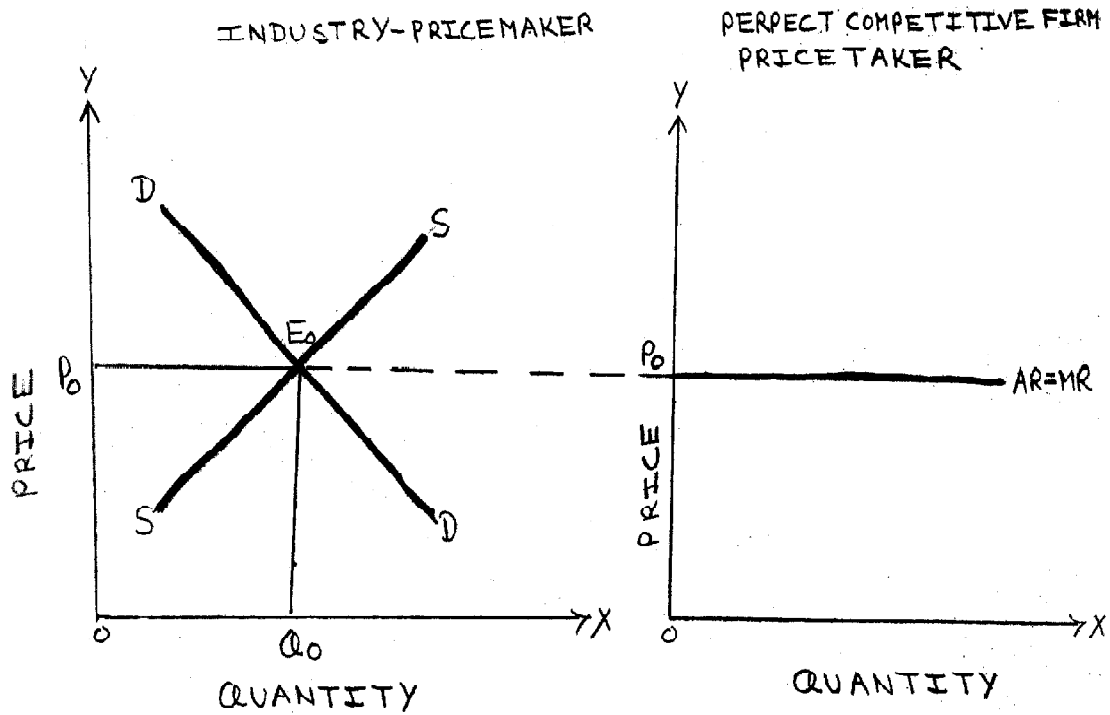


Fig. 7.10

• Formulae of Calculating Mean

Types of Series	Direct Method	Shortcut method	Step Deviation Methods
Individual	$\bar{X} = \frac{\sum X}{N}$	$\bar{X} = A + \frac{\sum dx}{N}$	$\bar{X} = A + \frac{\sum dx}{N} \times i$
Discrete	$\bar{X} = \frac{\sum fx}{N}$	$\bar{X} = A + \frac{\sum fd_x}{N}$ $dx = (X - A)$	$\bar{X} = A + \frac{\sum fd'_x}{N} \times i$ $d'_x = dx / i$
Continuous	$\bar{X} = \frac{\sum fm}{N}$ $m = \frac{l_1 + l_2}{2}$	$\bar{X} = A + \frac{\sum fdm}{N}$ $dm = (m - A)$	$\bar{X} = A + \frac{\sum fd'_m}{N} \times u$ $d'_m = dm / u$

- **Combined Mean** $\bar{X}_C = \frac{N_1\bar{X}_1 + N_2\bar{X}_2}{N_1 + N_2}$

- **Weighted Mean** $\bar{X}_W = \frac{\Sigma WX}{\Sigma W}$

- **Formulae of Calculating Median**

(a) Individual Series:

- Arrange the given data in ascending or descending order.

- If N = Odd Number, then use formula $m = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}}$ Item

- If N = Even Number, then use formula

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

(b) Discrete Series:

- Calculate cumulative frequency (C. F) of the given data with the help of frequency (F)

- Use formula, $M = \text{Size of } \left(\frac{N+1}{2}\right)^{\text{th}}$ Item

Where, $N = \Sigma F$

(c) Continuous Series:

- Calculate cumulative frequency (C. F) of the given data with the help of frequency (F)

- Determine median class by using formula, $M = \text{Size of } \left(\frac{N}{2}\right)^{\text{th}}$ Item Where, $N = \Sigma F$

- After determining median class use following formula

$$M = l_1 + \frac{\left(\frac{N}{2}\right) - C.F}{f} \times i$$

Where,

l_1 = Lower limit of the median class

CF = Cumulative frequency of the preceding class of the median class

f = Frequency of the median class

i = Class interval of the median class

• **Formulae of Calculating Mode (Mode can be calculated by using inspection and grouping method)**

(a) Individual Series:

- Use formula, Z = The item which has highest frequency

(b) Discrete Series:

- Check which item has highest frequency if the given table
- Use formula, Z = The items which has highest frequency

(c) Continuous Series:

- Determine modal class by identifying the class interval which has highest frequency.
- After determining modal class use following formula,

$$Z = l_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

Where,

l_1 = Lower limit of the modal class

f = Frequency of modal class

f = Frequency of pre modal class

f = Frequency of after modal class

i = Class interval of the modal class

⇒ **Correlation**

□ Karl Pearson's coefficient of correlation

$$r = \frac{\Sigma xy}{N\sigma_x \times \sigma_y}$$

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \times \Sigma y^2}}$$

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

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

Spearman's Rank Coefficient of Correlation

(i) When ranks are repeated: $r_k = 1 - \frac{6\Sigma D^2}{N^3 - N}$

(ii) When ranks are repeated:

$$r_k = 1 - \frac{6[\Sigma D^2 + \frac{1}{12}(m_1^3 - m_1) + \frac{1}{12}(m_2^3 - m_2) + \dots]}{N^3 - N}$$

Introduction to Index Numbers

(1) Simple Index Numbers

$$(i) \quad P_{01} = \frac{\Sigma P_1}{\Sigma P_0} \times 100$$

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

Consumer Price Index (CPI)

- (i) Aggregative Expenditure Method

$$CPI = \frac{\Sigma P_1 q_0}{\Sigma P_0 q_0} \times 100$$

- (ii) Family Budget Method

$$CPI = \frac{\Sigma RW}{\Sigma W}$$

Industrial Production Index

$$IIP_{01} = \frac{\Sigma q_1 W}{\Sigma W}$$