CMA

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THE INSTITUTE OF OST ACCOUNTANTS OF INDIA
(Statutory body under an Act of Parliament)

Behind every successful business decision, there is always a CMA

message from the
president

Dear Students,
Greetings,

"Education is what remains after one has forgotten everything he learned in school"-Albert Einstein.
In this connection it is said that the true purpose of 'Education' is to make minds not careers. Now, in this digital era, you can learn easily using the modern technology and distance is not at all a bar. Thus, I am sure that you are deriving the desired knowledge on various subjects covering the syllabus from the monthly publication of this E-bulletin. Never stop learning because life never stops teaching.

I must sincerely acknowledge the tips given by those learned professors who despite their own busy schedules have spared their timing for enhancing your knowledge. It is said that **"A Teacher takes a Hand, opens a Mind and Touches a Heart"**. Success is the sum of small efforts repeated day in and day out. It is you and you alone who can achieve success by keeping your dedication and determination intact. None, other than you can judge you better than yourself.

I believe that education is not received, it is achieved. I must appreciate the effort of the Director of Studies and his team for coming out with these monthly publications of the E-bulletins. I will be very happy with your further views and expectations about these publications.

"The aim of education is the knowledge not of facts but of values"- I firmly believe in that and I am sure that our students must contribute to the development of the Society and will be a true Ambassador of the profession and make their country proud.

Please look into the attached photographs of the successful students and be ready to participate in the forthcoming National Students Convocation in the years to come!

Enjoy your reading,

CMA Manas Kumar Thakur
President
The Institute of Cost Accountants of India

Be a CMA, be a Proud Indian

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message from the
chairman

"You are the greatest book that ever was or ever will be, the infinite depository of all that is. Until the inner teacher opens, all outside teaching is in vain"- Said by Swami Vivekananda.

I am very hopeful about the profession and what I feel that with your right knowledge you can make yourself happy as well as make the Country proud. In the National Students Convocation, 2017, many students' have received their certificates and awards and I have seen the right courage and needed zeal in them. They must be the torch bearer of the profession. All of you are having requisite knowledge and skill and only thing needed is to channelize them towards the right direction.

"When an idea exclusively occupies the mind, it is transformed into an actual physical or mental state", have faith on our predecessors and try to achieve to the best of your ability. Time is the most precious thing in the world so try to utilise it the most and in an efficient and planned way.

To succeed in your examination you need to read the publication released by the Institute very carefully and to derive the maximum benefit out of it. Mock Test Papers / MTPs are prepared by the Directorate of Studies and uploaded under student's section in the site of the Institute. Please see the uploaded questions papers and start solving the questions. The correct answers will be uploaded shortly and meantime if you start solving you may gauge your performance and your preparation for appearing the examination will be in the right direction.

I wish you all a very bright future,

CMA Pappa Rao Sunkara,
Chairman,
Training & Education Facilities (T& EF) Committee

Behind every successful business decision, there is always a CMA

contents

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KNOWLEDGE UPDATE

In this section of e-bulletin we shall have a series of discussion on each of these chapters to provide a meaningful assistance to the students in preparing themselves for the examination at the short end and equip them with sufficient knowledge to deal with real life complications at the long end.

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PAPER: 1, PART- I

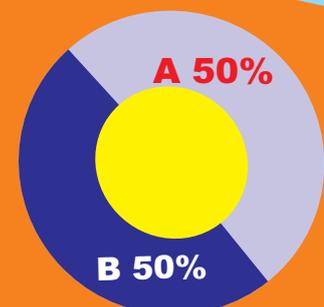## FUNDAMENTALS OF ECONOMICS & MANAGEMENT (FEM) - ECONOMICS

CMA Sucharita Chakraborty
Jt. Director, Studies
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studies.jd1@icmai.in

CMA

Your Preparation Quick Takes

Syllabus Structure

A Fundamentals of Economics **50%**
B Fundamentals of Management **50%**

A 50%

B 50%

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Learning Objectives:

In this issue, you'll learn about economies of scale **Economies of Scale means** the cost per unit of production decreases as volume of product increases. Cost per unit can reduce due to spread of fixed cost over a large number of units, obtaining discounts for bulk purchases of raw resources used in production, use of specialized labor that can lead to more efficiency.

You should also note that the benefit of economies of scale will not go on forever. Eventually, production will reach a point where cost per unit increases as production volume increases. This is called diseconomies of scale. Please read this concept very carefully. In future you have to apply this concept.

Introduction- Economies of scale *are the reduction in the per unit cost of production as the volume of production increases.*
As a company grows and production units increase, a company will have a better chance to decrease its costs. When more units of a good or a service can be produced on a larger scale with less input costs, economies of scale are said to be achieved.

Example *of Economies of Scale-* Supermarkets can benefit from economies of scale because they can buy food in bulk and get lower average costs. If you had a delivery of just 100 cartons of milk the average cost is quite high. The marginal cost of delivering 12000 cartons is quite low. Distributor has to pay only one driver, the fuel costs will be similar. He may need a bigger van, but the average cost of transporting 12,000 is going to be a lot less than transporting 100.

Thus, ***Economies of scale*** is a term that refers to the reduction of per-unit costs through an increase in production volume.

Why do economies of scale occur?

Economies of scale arise because of the inverse relationship between the quantity produced and per-unit fixed costs; i.e. the greater the quantity of a good produced, the lower the per-unit fixed cost because these costs are spread out over a larger number of goods.

Economies of scale can be classified into **two** main types: ***Internal*** – arising from within the company; and ***External*** – arising from extraneous factors such as industry size.

Economist Alfred Marshall first differentiated between internal and external economies of scale. Internal economies of scale are firm-specific, or caused internally, while external economies of scale occur based on larger changes outside of the firm.

Example of External Economies

A new highway reduces the transport cost of all the individual firms in the area.

The expansion of an industry (for example the motor car industry) creates additional demand for the industries that supply it with raw materials, intermediate products and machineries.

Example of Internal Economies

It is special to a particular firm and which gives it an advantage over other firms engaged in the industry. Eg favorable location, a secret process, skilled management.

Diseconomies of scale

The economies of large scale are not *available to an unlimited extent.* Although with expansion of size technical economies increase, there comes a time when diseconomies occur in other directions.

Diseconomies of scale is an economic concept referring to a situation in which economies of **scale** no longer functions for a firm. With this principle, rather than experiencing continued decreasing costs and increasing output, *a firm sees an increase in marginal costs when output is increased.*
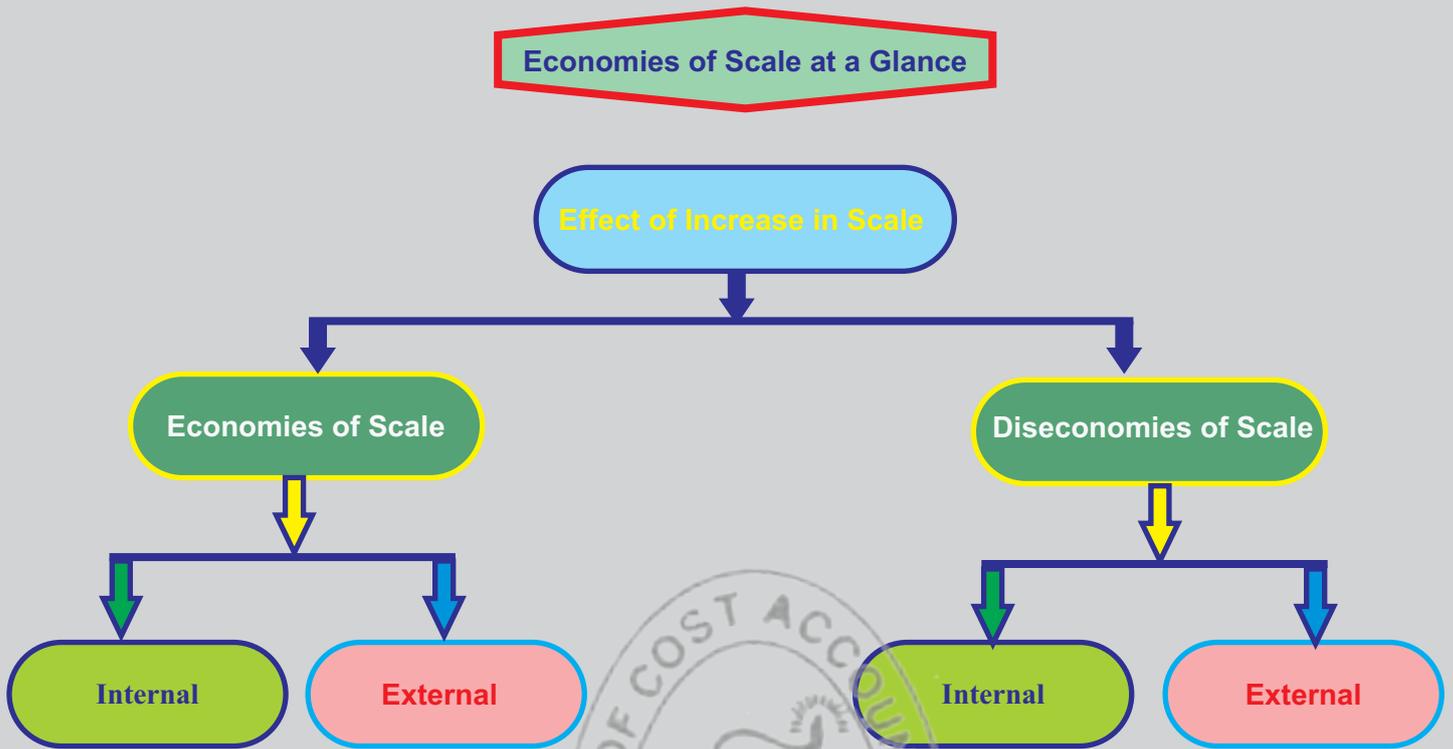*Diseconomies of scale* can occur for various of reasons, but the root cause usually comes from the difficulty of managing an increasingly large workforce.

Like economies, diseconomies are also of two types.

1. ***Internal*** Diseconomies
2. ***External*** Diseconomies

Internal diseconomies implies to all those factors which raise the cost of production of a particular firm when its output increases beyond the certain limit.

External diseconomies are not suffered by a single firm but by the firms operating in a given industry. These diseconomies arise due to much concentration and localization of industries beyond a certain stage. Eg,Localization leads to increased demand for transport and, therefore, transport costs rise. Similarly, as the industry expands, there is competition among firms for the factors of production and the raw-materials. This raises the prices of raw-materials and other factors of production. As a result of all these factors, external diseconomies become more powerful.

Economies of Scale at a Glance

Effect of Increase in Scale

Economies of Scale

Diseconomies of Scale

Internal

External

Internal

External
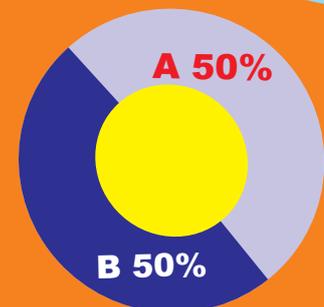
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FUNDAMENTALS OF ECONOMICS & MANAGEMENT (FEM) - MANAGEMENT

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CMA

Your Preparation Quick Takes

Syllabus Structure

A Fundamentals of Economics **50%**
B Fundamentals of Management **50%**

A 50%

B 50%

Behind every successful business decision, there is always a CMA

Learning Objectives:

- Students will demonstrate their knowledge of business and management principles
- Students will reveal effective written and oral communication
- Students will exhibit an awareness of the global environment in which businesses operate
- Students will display the ability to recognize when change is needed, adapt to change as it occurs, and lead change

We do hope that you are enjoying your tips given on the subject in the monthly issues of the E-bulletin on this particular subject. If you go through on a regular basis, you may find that almost all the areas are rightly covered and you may feel comfortable before the examination. Chapter wise and topic wise coverage will certainly help you.

Now we are discussing here about **'Controlling'**, which is another basic function within the management process and performed utmost carefully from President of an organization to Supervisor i.e. by all. Koontz and O'Donnell contend that "Managerial control implies the measurement of accomplishment against the standard, and the correction of deviations to assure attainment of objectives according to plans."

Kinds of Control

Three kinds of control systems are used by Modern organisations, namely-

(i) Historical (or) Feedback control
(ii) Concurrent control and
(iii) Predictive control

Techniques of Control

Managers use different methods and systems to exercise control of different levels. Now, we will touch upon some of the tools and mechanisms devised by managers and others, over the years to control specific aspects of activity and performance of an enterprise or work units. Managers use different methods and systems to exercise control of different levels. Some of the tools and mechanisms devised by managers and others, over the years to control specific aspects of activity and performance of an enterprise are discussed here.

I. **Budgetary Control**- Budgets are useful as tools of control to the extent that they, permit, monitoring, measurement, evaluation, regulation and correction of enterprise activity along desired pre determined directions.

II. **Financial Statements**-The annual financial statements of enterprises ; Trading and Profit and Loss Account and Balance Sheet are powerful tools of control. They epitomize the financial dimension of enterprise operations at periodic intervals of time.

III. **Break-even analysis**- Also called Cost-Volume Profit analysis, break-even Analysis is a tool of control to size up the behaviour of costs, revenues and profit various levels of activity.

IV. **Management information System (MIS)-** MIS can helpful to managers in carrying out the planning, controlling and operational functions by gathering storing and converting data into useful information.

V. **Management Audit**- The term 'Management Audit' is defined as a systematic evaluation of the functioning, performance and effectiveness of management of an organisation.

The other important function of Management is **Co-ordination**. Coordination is a conscious and rational process of pulling together the different parts of an organization and unifying them into a team to achieve predetermined goals in an effective manner.

According to Henry Fayol, 'To coordinate is to harmonise all the activities of a concern so as to facilitate its working and its success. In a well-co ordinated enterprise, each department or division works in harmony with others and is fully informed of its role in the organisation. The working schedules of various departments are constantly tuned to circumstances."

Basic Features of Co-ordination:

a. Coordination is not a distinct function but the very essence of management,

b. Coordination is the basic responsibility of management and no manager can evade or avoid this responsibility,

c. The heart of coordination is the unity of purpose which involves fixing the time and manner of performing various activities,

d. Coordination is a continuous or on-going process. It is also a dynamic process involving give and take,

e. Coordination is required in group efforts, not in individual effort. It involves the orderly arrangement of group efforts,

f. Coordination recognises the diversity and interdependence of organisational systems and the need for fusion and synthesis of efforts,

g. Coordination is the result of conscious and concerted action by management. It cannot be left to chance.

Another important function of management is **'Directing'**. It is that managerial function which imitates organized action.
According to Joseph Massie "directing concerns the total manner in which a manager influences the actions of subordinates. It is the final action of a manager in getting orders to act after all preparations have been completed."
Direction is an indispensable managerial function because it deals

with human resources. Most importantly it deals with human relations and suggests ways of improving the performance by the employees in an enterprise. Direction is aimed at maintaining harmony among employees and groups in an organisation. It is the process around which all other management functions revolve. Direction is a kin to 'nucleus' of an organisation. The individual goals and organisational objectives are integrated only through directing function. This integration is achieved through the elements of direction viz communication, motivation, leadership, and supervision.

The Principles of Direction can be summed up as under:—

(i) Harmony of objectives– One very important principle of direction is to harmonise the objectives or goals of individuals with that of the enterprise. Goal incongruence may lead to ineffectiveness and inefficiency.
(ii) Unity of command– Another sound principle of direction is that the subordinates should receive orders from one and only one superior or boss. Presence of dual subordination inevitably brings chaos and disorder.
(iii) Direct Supervision– When manager is directly involved in supervising, a sense of belonging gets developed in the minds of employees and this paves way for escalated morale and making sub-ordinate happy.
(iv) Appropriate leadership style– Leadership is a process of influencing the employees in the work environment. Leadership style is a function, of characteristics of leader, characteristics of subordinates, and the situation.
(v) Use of motivational techniques– One of the principles of effective direction is motivation. Motivation leads to higher job satisfaction.
(vi) Follow up– The last, but not least important, principle of direction is 'follow-up' because without such a follow up, it is quite likely that the subordinates just receive orders and do not follow them at all.

The term 'Power' is often considered as synonymous to authority. In fact, there is a difference between the two terms. Power refers to the ability or capacity to influence the behaviour or attitudes of other individuals. A manager's power may be considered as his ability to cause subordinates to do what the manager wished them to do. Power is a broader concept than authority. 'Authority' is the right to decide and to direct others to perform certain duties in achieving organizational goals. It refers to the right to make decisions and to get the decisions carried out. It is the right to act. According to Simon, "Authority may be defined as the power to take decisions which guide the actions of others."

Now, what is meant by 'Delegation of Authority'!
Delegation of authority is "the process a manager follows in dividing the work assigned to him so that he performs that part which only he, because of his unique organisational placement, can perform effectively and so that he can get others to help with what remains."

General Characteristics of Delegation:
❖ Delegation takes place when a superior grants some discretion to a subordinate. The subordinate must act within the limits prescribed by the superior.

❖ A manager cannot delegate the entire authority to his subordinates because if he delegates all his authority he passes his position to the subordinates.

❖ A manager retains the authority to take policy decisions and to exercise control over the activities of subordinates.

❖ Delegation may be specific or general, written or implied, formal or informal.

❖ Delegation does not imply reduction in the authority of a manager. A superior retains authority even after delegation.

❖ The extent of authority which is delegated depends upon several factors, e.g., the ability philosophy of management, the confidence of the superior in his subordinates, etc.

❖ Delegation does not mean abdication of responsibility. No manager can escape from his obligation by delegating authority to subordinates.

What is the **Distinction between Delegation and Decentralisation**?

Delegation means transfer of authority from one individual to another. But decentralisation implies diffusion of authority throughout the organisation. Decentralisation is much more than delegation.
The main points of distinction between delegation and decentralisation are presented as follows:
1. Delegation is the process of devolution of authority whereas decentralisation is the end result which is achieved when delegation is systematically repeated up to the lowest level.
2. Delegation can take place from one individual (superior) to another (subordinate) and -be a complete process. But decentralisation is completed only when the fullest possible delegation is made at all levels of organisation.
3. In delegation control rests entirely with the superior. But in decentralisation the top management exercises only overall control and delegates the authority for day today control to the departmental managers.
4. Delegation is a must for management as subordinates must be given sufficient authority to perform their duties. But decentralisation is optional in the sense that top management may or may not disperse authority.
5. Delegation is a technique of management used to get things done through others. However, decentralisation is both a philosophy of management and a technique.

"Success in management requires learning as fast as the World is changing".
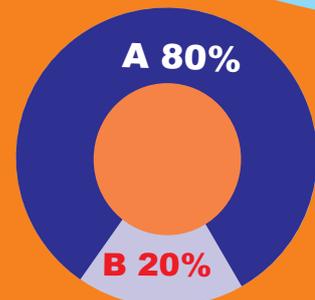
PAPER: 2

FUNDAMENTALS OF ACCOUNTING (FOA)

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CMA

Your Preparation Quick Takes

Syllabus Structure

A Fundamentals of Financial Accounting 80%
B Fundamental of Accounting 20%

A 80%

B 20%

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Learning Objectives:

In order to internalize the concepts of subjects like law one has to have an understanding of the learning objectives of the chapters. Try to go through the Statement of Objects and Reasons issued for every topics as it would give you a background to your study.

CONSIGNMENT

In the last issue we discussed about the treatments for goods sent at cost price with one illustration. Now in this issue we will discuss about the treatments for goods sent at invoice price with one master illustration. Invoice price means cost plus a certain percentage called loading. That is an inflated price. However the consignee is not informed about this extra loading. To him it is as good as a cost price and he sells goods by adding a margin over it. For example if the cost price of one unit is Rs.100 and load is 20% on cost the invoice price becomes Rs.120. now if the consignee sells by adding Rs. 10 per unit as profit margin, the sell price becomes Rs.130 per unit. Other things remain unaltered this loading makes some differences from the accounting treatments as already discussed in the last issue. They are in the treatments of abnormal loss, value of unsold stock and goods sent on consignment in the books of consignor. They will be treated in the following manner:

CONSIGNMENT ACCOUNT (Extract)

	Rs		Rs
To goods sent on consignment	Invoice price	By goods sent on consignment	loading
To abnormal loss	loading	By abnormal loss	Invoice price
To stock reserve	loading	By consignment stock	Invoice price

In this way for every entry there is a corresponding cancellation entry of loading so that the true profit on consignment comes out. One important thing to be also noted about the del Credere commission which is given to the consignee as a special commission to bear the added responsibility and risk of selling goods in credit and collection from debtors. In simple terms if delcredere commission is paid the consignor will not be accepting the risk of occurring bad debt. Thus if del Credere commission is paid bad debt will not appear in the consignment account. Its like a tiger and a cow who never meet in the same pond to drink water.

Following are the entries normally passed to record the transactions:

1. *A.For goods sent:*

   Consignment A/C …………………………………….dr   AT INVOICE PRICE

        To goods sent on consignment A/C

   B.For loading :

   Goods sent on consignment A/C…………………..dr   LOADING

        To consignment A/C

2. *For expenses incurred by the consignor:*

   Consignment A/C …………………………………………..dr

        To Cash/ Bank A/C

3. *For expenses borne by the consignee :*

    Consignment A/c ……………………………………………………dr

    To Consignee A/C

4. *For sale of goods reported by consignee:*

    Consignee A/C ……………………………………………………dr

    To Consignment A/C

5. *For bank draft received along with account sales :*

    Bank A/C ……………………………………………………………dr

    To Consignee A/C

6. *A.Recording the value of unsold stock :*

    Stock on Consignment A/c ……………………………………dr   AT INVOICE PRICE

    To Consignment A/C

    B.for loading in stock:

    Consignment A/C……………………………………………..dr   LOADING

    To stock reserve

7. *For commission(for both kind of commissions)*

    Consignment A/C……………………………………………………dr

    To consignee A/C

8. *To transfer the balance of goods sent on consignment :*

    Goods sent on consignment A/C …………………………...dr

    To Trading C/C   or   Purchase A/C

9. *For profit :*

    Consignment A/C…………………………………...dr

    To Profit and loss A/C

(for loss reverse of the above entry)

ILLUSTRATION :

Ravi sent 150 boxes of goods to Chhabi at an invoice price of Rs. 750 per box.(invoice price Rs.1000) Ravi spent Rs. 1900 as insurance charges, Rs. 3500 as freight and Rs. 2600 as dock charges. Chhabi receiving the goods at her end spent Rs. 2500 for clearing charges, Rs. 870 as cartage and Rs. 750 as warehouse rent. Chhabi is entitled to an ordinary commission of 10 % and a del Credere commission of 7 % on sales. During transit 5 boxes were totally lost.

In her account sales she reported that only 100 boxes could be sold @Rs. 1250 per box.

He also reported that a customer to whom goods were sold on credit for Rs.1000 could not be traced and it is irrecoverable.

Compute the profit or loss on consignment.

CONSIGNMENT ACCOUNT

TO	Goods sent on consignment(150x1000)	150000	BY	Goods sent on consignment(150x250)	37500

TO	Bank—for expenses	8000	BY	Consignee—for sale	125000
TO	Consignee—for exp	4120	BY	Stock on consignment	48446
TO	Consignee—for commission	12500	BY	Abnormal loss—if any	5267
TO	Consignee—for DLC commission	8750			
TO	Stock reserve(45x250)	11250			
TO	Abnormal loss(5x250)	1250			
TO	P/L A/C – for profit	20343			
		216213			**216213**

VALUATION OF ABNORMAL LOSS AND UNSOLD STOCK:

		Quantity	Rs.
Goods sent on consignment	(150x1000)	150	150000
Add : expenses borne by the consignor		---	8000
		150	158000
Less : loss in transit – abnormal	(158000/150x5)	5	5267
		145	152733
Add : non recurring expenses incurred by consignee		---	3370
	TOTAL	145	156103
Less : goods sold		100	---
Unsold stock	(156103/145x45)	45	48446

Note : Rs. 750 as warehouse rent is not added while calculating the value of unsold stock since this is a recurring expense.

Per unit loading is Rs. 250, (i.e Rs.1000-Rs.750). Therefore loading on unsold stock is 45 units x Rs 250 and loading on abnormal loss is 5 units x Rs 250.

Bad debt of Rs. 1000 were not entered in the account since the consignor pays del Credere commission.

Keep practicing these kind of problems.

PAPER: 3

FUNDAMENTALS OF LAWS AND ETHICS (FLE)

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Your Preparation Quick Takes

Syllabus Structure

A Fundamentals of Commercial Laws **70%**
B Fundamentals of Ethics **30%**

B 30%

A 70%
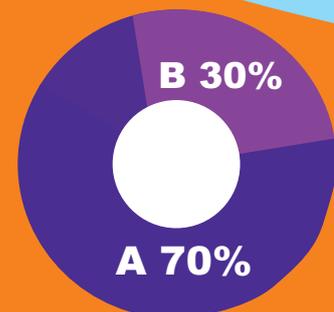
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Learning Objectives:

- Read the Study Material minutely.
- For details or if you don't understand Study Material or the section is important to identify the topic, then refer to Bare Act, otherwise reference to Bare Act is not necessary. For Company Law, book by Avtar Singh is recommended. For other laws Institute Study Material is sufficient.
- The words used in any of the texts as mentioned above should be understood by immediate reference to the Dictionary.
- The main points coming out in any of the provisions should be either underlined or written in separate copy which has to be repeated again and again.
- Theoretical knowledge should be adequate and clear before solving practical problems.
- Don't write wrong English. It changes the meaning and therefore answer may be wrong even when the student's conception is clear. Also don't make spelling mistakes.

INDIAN CONTRACT ACT

By now you have got an idea of what is a contract and few of the essential elements of contracts as discussed in the earlier issues. Like capacity of parties entering into contract or presence of free consent are essential for forming a valid contract, similarly the legality of object and consideration is also of paramount importance for forming a legal and valid contract.

An agreement is not enforceable at the court of law if its object or consideration is not lawful. In this issue we would be walking through the legality of object and consideration and most importantly we would be discussing about what are unlawful consideration and object.

In this connection note that the "object" of an agreement refers to the "purpose" of the contract i.e. the reason inherent or behind the formation of the contract and consideration refers to the material "in return" or in lieu against the performance of the agreement. So it can be said that any agreement whose purpose or object of formation and consideration are unlawful, it is termed as avoid agreement. Section 23 specifies certain acts and cases whose object and consideration are unlawful in the eyes of law and hence those renders an agreement to be void.

UNLAWFUL CONSIDERATION AND OBJECT:

➤ Any act or undertaking is forbidden if it is a punishable offence in the eyes of law. Any act which is prohibited by any law or special legislation or regulation of the country is forbidden and a punishable offence. Of the object or purpose or design of the agreement is the doing of such a forbidden act then the agreement is void and the object of the agreement is unlawful.

➤ If the objector the consideration of an agreement is such that it would lead to violation of any act prevalent, then the legal object of the agreement is defeated.

➤ The object and consideration of an agreement will be unlawful if an agreement has been entered into only for the purpose to defraud others i.e. if the intent of any agreement is to fraud other party or to gain any material consideration by fraud then the agreement will be void.

➤ If the intention or purpose of the agreement is to injure any person or property then also it will be considered as a void agreement with unlawful consideration and object.

➤ If the court regards the object or purpose to be immoral or opposed to public interest or an agreement which is injurious to public health is a void agreement as the object of the agreement is unlawful.

Section 24 however also cites some rules in cases if the object or consideration is unlawful in part. Where the agreement cannot be divided into parts i.e. a legal and an illegal part then:-

➤ If there are several objects but a single consideration then the agreement will be void if any of the objects or purpose is unlawful.

➤ If there is a single object but several considerations then the agreement will be a void one if any one of the considerations are unlawful.

But where in an agreement the legal and illegal part both in terms of 'object' and 'consideration' can be clearly differentiated then the legal part of the contract can be enforced while the illegal part of the agreement will be void.

Supplement your readings with the study material and books and case studies for a deeper understanding of the subject.

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FUNDAMENTALS OF BUSINESS MATHEMATICS AND STATISTICS (FBMS)

Dr. Lakshmi Kanta Roy
Guest Lecturer
Vidyasagar Mahavidyalaya

Your Preparation Quick Takes

Syllabus Structure

A Fundamentals of Business Mathematics **40%**
B Fundamentals of Business Statistic **60%**

A 40%

B 60%
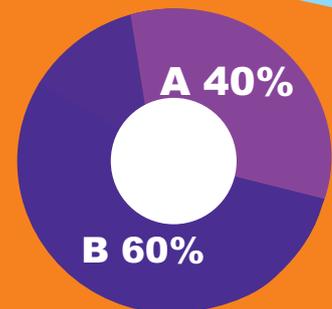
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Learning Objectives:

- appreciate the usefulness, power and beauty of mathematics
- enjoy mathematics and develop patience and persistence when solving problems
- understand and be able to use the language, symbols and notation of mathematics
- develop mathematical curiosity and use inductive and deductive reasoning when solving problems
- become confident in using mathematics to analyse and solve problems both in professional and in real-life situations

1.1 INTRODUCTION:

Let us have a look at the following number written row wipe:

2,6,9,11,17,22, …………………………… (i)
3,7,11,15,19,23, ………………………… (ii)

What is observed in the first row is that the numbers are written haphazardly while in the second row these are written following a definite rule and the rule is that each succeeding number can be obtained by adding a constant number to its preceding number. Hence the second row is called a SEQUENCE. If the numbers of a sequence are added by + sign to each other, the sequence is called a SERIES. So the second row will become a series if the numbers are added by + sign to each other as follows:

3+7+11+15+19+23 ………………………(iii)

The mathematical series (iii) is also termed as arithmetic Progression, abbreviated by A.P. Hence the significances of an A.P. are as hereunder:

I.   The difference of any term from its succeeding term or preceding term remains constant. This contact number is termed as common Difference generally written as p. So it is found that

7-3=11-7=15-11=23-19= ………………=4

Hence, here the common Difference (b) = 4

Thus if "a" is the first term of b is the common Difference, then the A.P. can be written as

a+(a+b)+(a+2b)+(a+3b)+ ………………

II.   In an A.P.

   a)   If any number is added to each term
   b)   If any number is subtracted from each term
   c)   If each term is multiplied by any number ($\neq$ 0) and
   d)   If each term is divided by any number ($\neq$ 0)

then the series thus obtained will remain as A.P. also.

Example: Let us take an A.P. as follows.

   4+6+8+10+12+14+16+……………… (i)

i.   Let a number 3 is added to each term of the A.P. (1). The series becomes

(4+3)=7+9+11+13+15+17+19+……………
…

Here   9-7=13-11=17-15=19-17=…………………..(ii)

i.e., the common Difference (b)=2

Hence the series 7+9+11+13+15+17+19 is also an A.P. with common Difference 2.

ii.   Let a number 2 is subtracted from each term of the above the A.P.(i). Then the terms become:

   4-2=2,4,6,8,10,12,14,………………………

Hence 4-2=6-4=10-8=12-10=14-12=…..=2, the common Difference.

Therefore the series thus obtained is

2+4+6+8+10+12+14+……………

Which is also an A.P. with common difference 2.

iii.   Let a number 4 is multiplied with each term of the A.P.(i). Then the series becomes

   16+24+32+40+48+5+64+……………

Here   24-16=32-24=40-32=48-40=56-48=64-56=…………=8 the common Difference.

The   series 16+24+32+10+48+56+64+………………   thus obtained is also an A.P. with common Difference 8.

iv.   Finally let each term of the A.P.(i) is dived by a number 2. Then the A.P. becomes

$\frac{4}{2}$ =2+3+4+5+6+7+8+………………

Here 3-2=4-3=5-4=6-5=7-6=8-7=………..=1 the common Difference.

Therefore, the series this obtained.

2+3+4+5+6+7+8+……………………+ is also an A.P. with the common Difference 1

1.2.   **DEFINATION OF THE ARITHMATIC PROGRESSION:**

A mathematical series is said to be an Arithmetic Progression (A.P) if any term of the series can be obtained either by adding a constant number to its preceding term or by subtracting the same constant number from its succeeding term. As already known the

constant number is called the common difference (C.D).

Let us suppose that the first term of an A.P. is a and the common Difference is b, then the A.P. will be as follows:

$a+(a+b)+(a+2b)+(a+3b)+\ldots\ldots\ldots\ldots$

NOTE: i. Number of terms of an A.P. > 0

ii. Common Difference (b) $\neq$ 0

1.3. TO FIND THE nth TERM (t_n) OF AN A.P. :

Let "a" be the first term and "b" be the common difference of an A.P.

Then the first term (t_1) = $a = a+o.b = a+(1-1)^b$

The second term (t_2) = $a+$ $b = a+(2-1)^b$

The third term (t_3) = $a+b+b = a+2b = a+(3-1)^b$

$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$
$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$

The Fifth term (t_5) = $a+4b = a+(5-1)b$

$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$
$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$

The nth term (t_n) = $a+(n-1)^b$

The nth term is also denoted by I, the last term

Thus $I = a+(n-1)^b$

Now putting n-1,2,3 …………, the successive terms of an A.P. can be obtained: This is why the nth term is called General Term.

EXAMPLE: Find the 18th term of the A.P. 5,8,11, ………

SOLUTION: Here the given A.P. is 5,8,11, …………….. (I)

From (I) it is found that the first term (a) of the A.P.=5 and the common Difference (b) = 8-5 = 3

∴ The 18th term (t_{18}) = $a+(n-1)^b$

= $5+(18-1)^3$ [Here n=18]

=b+51

=56

(II) Which term of the A.P. 4,9,14,19 …………. is 99?

SOLUTION: The given A.P. is 4,9,14,19,…………….. Let the nth term of the given A.P. is 99.

Here the first term (a)=4 and the common difference (b) = 9-4 =5

∴ The nth term (t_n) = $a+(n-1)^b$ = $4+(n-1)^5$ = 5n-1

∴ According to the problem t_n =99 i.e., 5n-1=99 → 5n= 100 → n=20

i.e., the 20th term of the given A.P. is 99

1.4. TO FIND THE SUM OF A SERIES IN A.P.:

Let a, b and I be respectively the first term, the common Difference and the last term of an A.P. and the number of terms be n. Then the A.P. series is as follows:

$a,(a+b),(a+2b),(a+3b)$

$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots a+(n-1)^b$.

If s_n denotes the sum of n terms of the A.P.

Then s_n =$a+(a+b)+(a+2b)+(a+3b)+\ldots\ldots\ldots\ldots$

$+\{a+(n-1)^b\}$

=$a+(a+b)+(a+2b)+(a+3b)+ \ldots\ldots\ldots\ldots +I$ [I being the last term]

= $a+(a+b)+(a+2b)+(a+3b)+\ldots\ldots\ldots\ldots+$ $(I-2b)+(I-b)+I \ldots\ldots\ldots\ldots(1)$

Writing the series in the reverse order, we get

$s_n = I+(I-b)+(I-2b)+ \ldots\ldots\ldots\ldots + (a+2b)+(a+b)+a \ldots\ldots\ldots\ldots\ldots(2)$

Now adding (1+2), we have $2 s_n = (a+I)+(a+I)+(a+I)+ \ldots\ldots\ldots\ldots + (a+I)$

= $n.(a+I)$ [∵ Number of Terms is n]

=$n [a+a+(n-1)^b]$ [∵ $I = a+(n-1)^b$]

=$n [2a+(n-1)^b]$

→ $s_n = \dfrac{n}{2} [2a+(n-1)^b]$

EXAMPLE: (1) Find the sum of the series -4-1+2+5+ …….. to 21 terms

SOLUTION: Let s_n = -4-1+2+5+ …….. to 21 terms

Here the first term (a) = -4

The common Difference (b) = -1-(-4) = -1+4 = 3

Number of terms (n) = 21

Now applying the formula $s_n = \dfrac{n}{2} [2a+(n-1)^b]$

We get $s_n = \dfrac{21}{2} [2.(-4)+(21-1)3]$

= $\dfrac{21}{2} [-8+60]$

= $\dfrac{21}{2} \times 52$

=21×26

= 546

(ii) Find the sum of the prices : $10 + 9\frac{1}{2} + 9 +$

.... $+ \frac{1}{2}$

SOLUTION: Here the first term (a) of the given series = 10

The common Difference (b) = $9\frac{1}{2} - 10 = -\frac{1}{2}$

and the last term (l) = $\frac{1}{2}$

Let the number of terms = n

Applying the formula $l = a + (n-1)^b$, we have

$\frac{1}{2} = 10 + (n-1) \cdot (-\frac{1}{2})$

$= \frac{1}{2} = 10 - \frac{n}{2} + \frac{1}{2}$

$= \frac{n}{2} = 10$

$= n = 20$

So the number of terms of the given series = 20

Now applying the formula $s_n = \frac{n}{2}[a+l]$

[This formula has been used as the last term is known]

So $s_n = \frac{n}{2}[a+l]$

$= \frac{20}{2}[10 + \frac{1}{2}]$

$= \frac{20}{2} \times \frac{21}{2}$

$= \frac{10 \times 21}{2}$

$= 105$

1.5.1: To find the sum of the first n natural numbers

SOLUTION: Let the sum of the first n natural numbers = s_n

$\therefore s_n = 1+2+3 \ldots \ldots \ldots \ldots +n$

It is known that $n^2 - (n-1)^2 = n^2 - n^2 + 2n - 1$

$\implies n^2 - (n-1)^2 = 2n - 1 \ldots \ldots \ldots \ldots (1)$

Now putting n=1,2,3, ... , n in the identity (1), we have

$1^2 - 0^2 = 2.1 - 1$

$2^2 - 1^2 = 2.2 - 1$

$3^2 - 2^2 = 2.2 - 1$

....

$n^2 - (n-1)^2 = 2.n - 1$

By adding we have $n^2 = 2(1+2+3+\ldots\ldots+n) - (1+1+1+\ldots\ldots\ldots+1)$

$\rightarrow n^2 = 2 \cdot s_n - n$

$\rightarrow 2s_n = n^2 + n = n(n+1)$

$\rightarrow s_n = \frac{n(n+1)}{2}$

ALTERNATIVE SOLUTION BY FORMULA:

The sum of the series (s_n) = $1+2+3+4+\ldots\ldots\ldots+n$

Here a=1, b=2-1=3-2= .... =1

L=n

$\therefore$ By formula, $s_n = \frac{n(a+l)}{2} = \frac{n(l+n)}{2} = \frac{n(n+l)}{2}$

Again by another formula (when the last term l is not known) $s_n = \frac{n}{2}[2a + (n-1)^b]$

$= \frac{n}{2}[2.1 + (n-1).1]$

$= \frac{n}{2}[2 + n - 1]$

$= \frac{n}{2}(n+1)$

$= \frac{n(n+l)}{2}$

1.5.2: To find the sum of the squares of the first n natural numbers:

SOLUTION: Let the sum of the squares of the first n natural numbers - s_n

Therefore, $s_n = 1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots +n^2$

It is known that

$n^3 - (n-1)^3 = n^3 - (n^3 - 3n^2 + 3n - 1)$

$= n^3 - n^3 + 3n^2 - 3n + 1$

$= 3n^2 - 3n + 1 \ldots\ldots\ldots\ldots (1)$

Now putting n=1,2,3, ..., n in the identify..... (1) we have,

$1n^3 - 0^3 = 3(1^2 - 3.1 + 1)$

$2^3 - 1^3 = 3.2^2 - 3.2 + 1$

$$3^3 - 2^3 = 3.3^2 - 3.3 + 1$$
....
....

By adding we get,

$$n^3 = 3(1^2 + 2^2 + 3^2 + ... + n^2) - 3(1+2+3+....+n) + (1+1+1+...+1)$$

$$\Rightarrow n^3 = 3s_n - 3.\frac{n(n+1)}{2} + n$$

$$\Rightarrow 3s_n = n^3 + \frac{3n(n+1)}{2} - n$$

$$\Rightarrow s_n = \frac{n^3}{3} + \frac{3n(n+1)}{2.3} - \frac{n}{3}$$

$$= \frac{2n^3 + 3n^2 + 3n - 2n}{6}$$

$$= \frac{2n(n^2-1) + 3n(n+1)}{6}$$

$$= \frac{2n(n+1)(n-1) + 3n(n+1)}{6}$$

$$= \frac{n(n+1)[2(n-1)+3]}{6}$$

$$= \frac{n(n+1)[2n-2+3]}{6}$$

$$\Rightarrow s_n = \frac{n(n+1)(2n+1)}{6}$$

1.5.3: To find the sum of the cubes of the first n natural numbers:

SOLUTION: Let s_n denotes the sum of the cubes of the first n natural numbers

Hence: $s_n = 1^3 + 2^3 + 3^3 + ... + n^3$

It is known that

$$n^4 - (n-1)^4 = n^4 - [n^4 - 4n^3 + 6n^2 - 4n + 1]$$

$$4n^3 - 6n^2 + 4n - 1 ....(1)$$

Now putting n=1,2,3,.......... n in the identity (1)
We obtain,

$$1^4 - 0^4 = 4.1^3 - 6.1^2 + 4.1 - 1$$

$$2^4 - 1^4 = 4.2^3 - 6.2^2 + 4.2 - 1$$

$$3^4 - 2^4 = 4.3^3 - 6.3^2 + 4.3 - 1$$
....
....

$$n^4 - (n-1)^4 = 4.(n^3 - 6.n^2 + 4.n - 1)$$

By adding we have

$$n^4 = 4(1^3 + 2^3 + 3^3 + ... + n^3)$$

$$-6(1^2 + 2^2 + 3^2 + ... + n^2)$$

$$+4(1+2+3+......+n) - (1+1+1+.....+1)$$

$$\Rightarrow n^4 = 4s_n - 6\frac{n(n+1)(2n+1)}{6} + 4\frac{n(n+1)}{2} - n$$

$$= n(n^3 + 1) + n(n+1)(2n+1) - 2n(n+1)$$

$$= n(n+1)(n^2 - n + 1) + n(n+1)(2n+1) - 2n(n+1)$$

$$= n(n+1)[n^2 + n]$$

$$= n(n+1)n(n+1)$$

$$\Rightarrow 4s_n = n^2(n+1)^2$$

$$\Rightarrow s_n = \frac{n^2(n+1)^2}{2}$$

$$\Rightarrow s_n = \left[\frac{n(n+1)}{2}\right]^2$$

EXAMPLE: To find $1^4 + 2^4 + 3^4 + ... + n^4$

SOLUTION: Let $s_n = 1^4 + 2^4 + 3^4 .... + n^4$

It is known that

$$n^5 - (n-1)^5 = n^5 - [n^5 - 5n^4 + 10n^3 - 10n^2 + 5n - 1]$$

$$\Rightarrow n^5 - (n-1)^5 = 5n^4 - 10n^3 + 10n^2 - 5n + 1 .....(1)$$

Now putting n=1,2,3,...... n in the identity (1) we have

$$1^5 - 0^5 = 5.1^4 - 10.1^3 + 10.1^2 - 5.1 + 1$$

$$2^5 - 1^5 = 5.2^4 - 10.2^3 + 10.2^2 - 5.2 + 1$$

$$3^5 - 2^5 = 5.3^4 - 10.3^3 + 10.3^2 - 5.3 + 1$$
....
....

$$n^5 - (n-1)^5 = 5.n^4 - 10.n^3 + 10.n^2 - 5.n + 1$$

After adding we obtain

$$n^5 = 5(1^4 + 2^4 + 3^4 + ... + n^4) - 10(1^3 + 2^3 + 3^3 .... + n^3)$$

$$+10(1^2 + 2^2 + 3^2 + ... + n^2) - 5(1 + 2 + 3 + ... + n) + (1+1+1+ .... +1)$$

$$= 5s_n - 10\left[\frac{n(n+1)}{2}\right]^2 + 10\frac{n(n+1)(2n+1)}{6} - 5.\frac{n(n+1)}{2} + n$$

$$\Rightarrow 5s_n = n^5 + 10.\frac{[n(n+1)]}{4} - 10\frac{n(n+1)(2n+1)}{6} + \frac{5n(n+1)}{2} - n$$

$$= n(n^4 - 1) + \frac{10}{4}[n(n+1)]^2 - \frac{10}{6}n(n+1)(2n+1) + \frac{5n(n+1)}{2}$$

$$= n(n^2 + 1)(n+1)(n-1) + \frac{10}{4}[n(n+1)]^2$$

$$- \frac{10}{6}n(n+1)(2n+1) + \frac{5}{2}n(n+1)$$

$$= n(n+1)\left[(n-1)(n^2 + 1) + \frac{10}{4}n(n+1) - \frac{10}{6}(2n+1) + \frac{5}{2}\right]$$

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$$= n(n+1)\left[\frac{12n^3 + 12n - 12n^2 - 12 + 30n^2 + 30n - 40n - 20 + 30}{12}\right]$$ Again

$$= n(n+1)\left[\frac{12n^3 + 8n^2 + 2n - 2}{12}\right]$$

$$= \frac{n(n+1)(6n^3 + 9n^2 + n - 1)}{6}$$

1.6. REPRESENTATION OF TERMS IN ARITHMETIC PROGRESSION:

For solving the problems of Arithmetic progression, sometimes it will be more convenient to represent the terms in A.P. as follows:

i.   There terms: a-b, a, a+b
ii. Four terms: a-3b, a-b, a+b, a+3b
iii. Five terms: a-2b, a-b, a, a+b, a+2b
iv. Six terms: a-5b, a-3b, a-b, a+b, a+3b, a+5b
v.   Seven terms: a-3b, a-2b, a-b, a, a+b, a+2b, a+3b

Let us take some examples to show how these terms can be used for solution.

EXAMPLES1: Find the three number in A.P., where the sum of the numbers is 12 and the sum of their cubes is 288.

SOLUTION: Let the three numbers is A.P. be (a-b), a and (a+b)

Then according to the problem

$$(a-b)+a+(a+b)=12$$
$$\Rightarrow 3a=12$$
$$\Rightarrow a=4$$

and

$$(a-b)^3 + a^3 + (a+b)^3 = 288$$
$$\Rightarrow (4-b)^3 + 4^3 + (4+b)^3 = 288$$
$$\Rightarrow 64 - 48b + 12b^2 - b^8 + 64 + 64 + 48b$$
$$12b^2 + b^3 = 288$$
$$\Rightarrow 24b^2 + 192 = 288$$
$$\Rightarrow 24b^2 = 288 - 192 = 96$$
$$\Rightarrow b^2 = \frac{96}{24} = 4$$
$$\Rightarrow b = \pm 2$$

Hence the numbers are $4 \mp 2, 4, 4 \pm 2$

i.e., 2 or 6, 4, 6 or 2

i.e., 2,4,6

EXAMPLE2: Divide 40 in to five parts in A.P. such that the ratio of the second part and the fourth part is 3:5.

SOLUTION: Let the five parts in A.P. be a-2b, a-b, a, a+b and a+2b

∴ According to the problem

$$a-2b+a-b+a+a+b+a+2b=40$$
$$\Rightarrow 5a=40$$

$$\Rightarrow a=8$$

$$\frac{a-b}{a+b} = \frac{3}{5} \Rightarrow 5a - 5b = 3a + 3b$$

$$\Rightarrow 8b = 2a = 16 [\because a = 8]$$

$$\Rightarrow b = 2$$

Hence the five parts in A.P. are

8-4, 8-2, 8, 8+2, 8+4

i.e., 4, 6, 8, 10, 12

1.7. ARITHMeTIC MEAN:

If three numbers are in A.P. then middle one is called ARITHMETIC MEAN (briefly written as A.M.) of the other two numbers. If a,b,c are three numbers in A.P., then b is the A.M. of a and c in this case.

$$b-a=c-b$$
$$\Rightarrow 2b = a+c$$
$$\Rightarrow b = \frac{a+c}{2}$$

Now if any number of quantities are in A.P. then the quantities lying in between the first and the last quantities are called the Arithmetic Means. Thus if $a, x_1, x_2, x_3, ... x_n, b$ are in A.P., the quantities $x_1, x_2, x_3, ... x_n$ are the A.M.S.

1.8 INSERTION OF ARITHMATIC MEAN:

Let the quantities $a, m_1, m_2, m_3, ... m_n, b$ are in A.P. Then the quantities $m_1, m_2, m_3, ... m_n$ are the A.M.S. between a and b. Now these n Arithmetic Means are to find out.

Here the total number of terms is (n+2) and the $(n+2)^{th}$ term is b i.e., $t_{n+2} = b$. a is the first term and let p is the common Difference.

$$\therefore t_{n+2} = a+(n+2-1)p = b$$
$$\Rightarrow a+(n+1)p=b$$
$$\Rightarrow (n+1)p=b-a$$
$$\Rightarrow p = \frac{b-a}{n+1}$$

Hence $m_1 = a + p = a + \frac{b-a}{n+1}$

$$m_2 = a + 2p = a + 2\frac{b-a}{n+1}$$
$$m_3 = a + 3p = a + 3\frac{b-a}{n+1}$$
$$.................................$$
$$.................................$$
$$m_n = a + np = a + n\frac{b-a}{n+1}$$

EXAMPLE: Insert 10 Arithmetic Mean between the numbers 2 and 57.

SOLUTION: Let $m_1, m_2, m_3, \ldots m_{10}$ are the ten A.M.S. between the numbers 2 and 57. Then the quantities 2, $m_1, m_2, m_3, \ldots m_{10}$, 57 form an A.P. whose first term is 2 and the 12th term is 57. Again let b is the common Difference of the A.P.

∴ According to the problem $t_{12} = 57$

$$\Rightarrow a + (12-1)b = 57$$
$$\Rightarrow 2 + 11b = 57$$
$$\Rightarrow 11b = 55$$
$$\Rightarrow b = \frac{55}{11} = 5$$

Hence, the ten A.M.S are

$$m_1 = 2+b = 2+5 = 7$$
$$m_2 = 2+2b = 2+10 = 12$$
$$m_3 = 2+3b = 2+15 = 17$$
$$m_4 = 2+4b = 2+20 = 22$$
$$m_5 = 2+5b = 2+25 = 27$$
$$m_6 = 2+6b = 2+30 = 32$$
$$m_7 = 2+7b = 2+35 = 37$$
$$m_8 = 2+8b = 2+40 = 42$$
$$m_9 = 2+9b = 2+45 = 47$$
$$m_{10} = 2+10b = 2+50 = 52$$

∴ The 10 A.M.S. are 7,12,17,22,27,32,37,42,47 and 52.

1.9. SUMMARISATION:

If a is the first term, b is the common Difference l is the last term and n is the number of terms of on A.P., then

i.   The last term (t_n) = a+(n-1)b = l

ii. Sum of the n terms = $s_n = \frac{n(a+l)}{2} = \frac{n}{2}\left[2a+(n-1)b\right]$

iii. Sum of the n natural numbers (s_n) = $\frac{n(n+l)}{2}$

iv. Sum of the squares of n natural numbers (s_n) = $1^2 + 2^2 + 3^2 + \ldots n^2 = \frac{n(n+1)(2n+1)}{6}$

v.   Sum of the cubes of n natural numbers (s_n) = $1^3 + 2^3 + 3^3 + \ldots n^3 = \left[\frac{n(n+1)}{2}\right]^2$

vi. Arithmetic mean between a and b = $\frac{a+b}{2}$

vii. N Arithmetic Means between the numbers a and b are: $a + \frac{b-a}{n+1}$, $a + 2\frac{b-a}{n+1}$, $a + 3\frac{b-a}{n+1}$, ..., $a + n\frac{b-a}{n+1}$

1.10. ILLUSTRATIVE EXAMOLES

1.   How many terms of the series 93+90+87+ .... amounts to 975 ? Find also the last term.

SOLUTION: Let the number of terms required for amounting to 975 is n.

Here a=93, common Difference (b) = 90-93=-3

Hence using the formula $s_n = \frac{n}{2}[2a + (n-1)b]$

We have $975 = \frac{n}{2}[2 \times 93 + (n-1) \times -3]$

$$\Rightarrow 1950 = n[186 - 3n + 3]$$
$$\Rightarrow 1950 = 186n - 3n^2 + 3n$$
$$\Rightarrow 3n^2 - 189n + 1950 = 0$$
$$\Rightarrow n^2 - 63n + 650 = 0$$
$$\Rightarrow (n-13)(n-50) = 0$$

∴ Either n-13=0 ⟹ n = 13
Or n-50 = 0 ⟹ n = 50

When n=13, the last term $= n^{th}$ term $= a + (n-1)b$
$= 93 + (13-1) \times -3$
$= 93 - 36 = 57$

When n= 50, the last term = n^{th} term
$= a + (n-1)b$
$= 93 + (50-1) \times -3$
$= 93 - 147$
$= -54$

2.   If the sums of first p, q, and r terms of an A.P. be x,y,z respectively, prove that

$$\frac{x}{p}(q-r) + \frac{y}{q}(r-p) + \frac{z}{r}(p-q) = 0$$

SOLUTION: Let the 1st term of an A.P. be a and the common Difference =b

Then the sum of p terms of the A.P. = S
$$= 2[2a + (p-1)b]$$

∴ According to the problem

$$x = \frac{p}{2}[2a + (p-1)b] \ldots\ldots\ldots (1)$$

$$y = \frac{q}{2}[2a + (q-1)b] \ldots\ldots\ldots (2)$$

and $$z = \frac{r}{2}[2a + (r-1)b] \ldots\ldots\ldots (3)$$

From (1): $\frac{x}{p} = a + (p-1)\frac{b}{2}$

From (2): $\frac{y}{q} = a + (q-1)\frac{b}{2}$

From (3): $\dfrac{z}{r} = a + (r-1)\dfrac{b}{2}$

Here L.H.S.=

$\dfrac{x}{p}(q-r) + \dfrac{y}{q}(r-p) + \dfrac{z}{r}(p-q)$

$= [a + (p-1)\dfrac{b}{2}](q-r) + [a + (q-1)\dfrac{b}{2}]$

$(r-p) + [a + (r-1)\dfrac{b}{2}](p-q)$

$= a(q-r) + \dfrac{b}{2}(p-1)(q-r) + a(r-p) + \dfrac{b}{2}$

$(q-1)(r-p) + a(p-q) + \dfrac{b}{2}(r-1)(p-q)$

$= a(\cancel{q}-\cancel{r}+\cancel{r}-\cancel{p}+\cancel{p}-\cancel{q}) + \dfrac{b}{2}$

$(\cancel{pq}-pr-\cancel{q}+\cancel{r}+qr-\cancel{q}p-\cancel{r}+\cancel{p}+rp-\cancel{qr}-\cancel{p}+\cancel{q})$

$= a \times 0 + \dfrac{p}{2} \times 0$

$=0$

3. Show that the sum of all odd numbers between 2 and 1000 which are divisible by 3 is 83,667 and of those not divisible by 3 is 1,66,332.

SOLUTION: It appears that the first odd number divisible by 3 is 3 and the last number (<1000) divisible by 3 is 999. Thus we have to find out the sum of 3+9+15+21+……..+999…..(1)

The last term of the A.P. (1) is 999 and let t_n =999

i.e., $3+(n-1)6 = 999$

$\Rightarrow (n-1)6 = 996$

$\Rightarrow n-1 = 166$

$\Rightarrow n = 166+1 = 167$

$\therefore$ Hence the number of terms = 167

So the required sum $\dfrac{167}{2}[2.3+(167-1)6]$

$= \dfrac{167}{2}[6+166\times6]$

$= \dfrac{167}{2}[6+996]$

$= \dfrac{167}{2}\times1002$

$= 167 \times 501$

$=83,667$

Again it is observed that the odd numbers between 2 and 1000 not divisible by 3 are 5,7,11,13,17,………. 995, 997 …….. (2)

It appears from (2) that the common difference of the series 5,11,17, …. is 6 and that of the series 7,13,19, ….. is also 6. For this the mathematical series (2) can be divided into two reason A.P. S. as follows:

$(5+11+17+…..+995) + (7+13+19+…..+997)$

If t_p =995, then $5+(p-1)6 = 995$

$\Rightarrow (p-1)6 = 990$

$\Rightarrow p-1 = 165$

$\Rightarrow p = 166$

Hence $s_p = \dfrac{166}{2}[10+(166-1)6] = 83\times1000$

$=83000$

And if t_q =997, then $7+(q-1)6=997$

$\Rightarrow (q-1)6 = 990$

$\Rightarrow q-1 = 165$

$\Rightarrow q=166$

Therefore $s_q = \dfrac{166}{2}[14+(166-1)6]$

$=83[14+165\times6]$

$=83\times1004$

$=83,332$

Hence the required sum = 83,000 + 83,332

$=166,332$

4. Find the middle term of the series 1+5+9+… +333

SOLUTION:

Here the 1st term of the given series is 1, i.e., a=1 and the common Difference is 4, i.e., b=4 Let t_n

=333 i.e, $1+(n-1)4 = 333$

$\Rightarrow (n-1)4 = 332$

$\Rightarrow n-1 = 83$

$\Rightarrow n = 84$

Hence the 84th term of the given series is 333 which indicates that there are 84 terms in this series. Since the number of terms is even, the series has two middle terms. One middle term is $\left(\dfrac{84}{2}\right)^{th}$ term i.e, 42th term and the other middle term is $\left(\dfrac{84}{2}+1\right)^{th}$ term i.e., 43th term.

Here t_{42} =1+(42-1)4=1+164=165

And t_{43} = 165+4=169

Hence the required two middle terms are 165 and 169.

NOTE: If the number of terms of an A.P. is Even Then the number of the Middle Term is Two: one is $\left(\dfrac{n}{2}\right)^{th}$ term and other is $\left(\dfrac{n}{2}+1\right)^{th}$ term where n is the total number of terms of the A.P. In case if n is odd, then there is one Middle term and it is $\left(\dfrac{n+1}{2}\right)^{th}$ term.

SUBMISSIONS

Give you thoughts on the Student E-Bulletin. Do you have some news, an achievement, or an aspect of achievement that you would like to share? It so, We would love to hear from you.

E- Mail:- studies.ebulletin@icmai.in
Website: http://www.icmai.in

It you do not think you are getting the e-bulletin via E-Mail, Please let us know, as all students should receive it.

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Please put your opinions so that we can make your e-bulletin everything that you want it to be.

PRACTICAL ADVICE

ABOUT YOUR STUDIES - FOUNDATION

Practical Support, information and advice to help you get the most out of your studies

Assess Yourself

Read The Tips

Appear For Examination
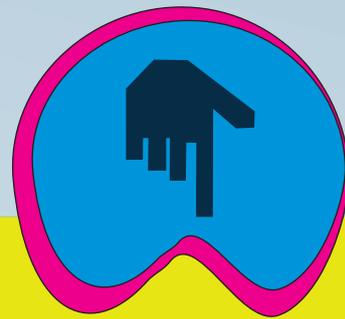
Read Study Notes & MTPs

Solve Exercises given in Study Notes

Examination
TIME TABLE

THE INSTITUTE OF COST ACCOUNTANTS OF INDIA
(Statutory body under an Act of Parliament)

Day & Date	Foundation Course Examination Syllabus-2012 Time 2.00 p.m. to 5.00 p.m.	Foundation Course Examination Syllabus-2016 Time 2.00 p.m. to 5.00 p.m.
11th June, 2017 Sunday	Fundamentals of Economics & Management (FEM)	Fundamentals of Economics & Management (FEM)
12th June, 2017 Monday	Fundamentals of Accounting (FOA)	Fundamentals of Accounting (FOA)
13th June, 2017 Tuesday	Fundamentals of Laws & Ethics (FLE)	Fundamentals of Law & Ethics (FLE)
14th June, 2017 Wednesday	Fundamentals of Business Mathematics & Statistics (FBMS)	Fundamentals of Business Mathematics & Statistics (FBMS)

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Message from the
Directorate of Studies

Dear Students,

National Students' Convocation-2017 was held on 30th March, 2017 at Kolkata. Prospective students have received their awards and certificates of merit. It gives us immense pleasure to see their bright faces and we appreciate the spirit of our budding cost accountants.

For the smooth and flawless preparation, Directorate of Studies have provided meaningful tips which will help you to gain sufficient knowledge about each subject. "Tips" are given in this E-bulletin by the knowledge experts, for the smooth encouragement in your preparation. We are sure that all students will definitely be benefitted by those tips and that will help them to brush up their knowledge and also to swim across.

Take the course seriously from the very beginning but don't be panicky. Please try to follow the general guidelines, mentioned below; which may help you in your preparation.

Essentials for Preparation:

🕭 Conceptual understanding & overall understanding of the subject both should be clear.

🕭 Candidates are advised to go through the study material provided by the institute in an analytical manner.

🕭 Students should improve basic understanding of the subject with focus on core concepts.

🕭 The candidates are expected to give to the point answer, which is a basic pre-requisite for any professional examination.

🕭 To strengthen the answers candidates are advised to give answer precisely and in a structured manner.

🕭 In-depth knowledge about specific terms required.

🕭 Write question numbers correctly and prominently.

🕭 Proper time management is also important while answering.

Be Prepared and Get Success;

Desclaimer:

Although due care and diligence have been taken in preparation and uploading this E-bulletin, the institute shall not be responsible for any loss or damage, resulting from any action taken on the basis of the contents of this E-bulletin.

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Glimpses of National Students' Convocation - 2017
held on March 30, 2017 at Kolkata.

The Institute of Cost Accountants of India
(STATUTORY BODY UNDER AN ACT OF PARLIAMENT)
National Students' Convocation — 2017

Bank of India

Shri Keshari Nath Tripathi
Hon'ble Governor of West Bengal

Prof. Saikat Mai
Vice Chancellor, Maulana Abul Kalam Azad University of Technol

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