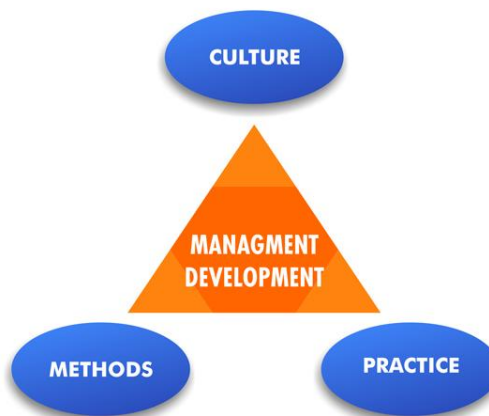# Paper 1: Fundamentals of Economics and Management (FEM)

DEVELOPMENT OF A MANAGEMENT

The process of the development of the science of management can be studied under three board stages.

The Scientific Management: F. Winslow Taylor (1856-1915) was the first to emphasis the need for adopting a scientific approach to management. He concluded that the main cause of low efficiency of workers was the lack of knowledge on the part of management as to how much work should be done by a worker in a day. His approach was:

(i)   Scientific method in place of value of thumb method.

(ii)   Scientific selection and training of workers.

(iii) Harmony between workers and management.

(iv)   Maximum output.

(v)   Equitable division of work.

(vi)   Development of each man to his maximum efficiency.


Taylor's Scientific Management

4 elements

- natural soldiering

- piecework

- ratebusting

- systematic soldiering

Functional Approach to Management: Henry Fayol (1841-1925), the originator of this approach, for the first time mentioned the functions of management. According to him all activities of an industrial undertaking are divided into six groups:

(i)   Technical (Production)

(ii)   Commercial (Buying & Selling)

(iii)   Financial (Optimum use of capital) (iv) Security (Protection of property)

(v)   Accounting (of costs and financial transaction)

(vi)   Managerial (function of planning, controlling etc.)

○ **Henri Fayol(1841-1925)**
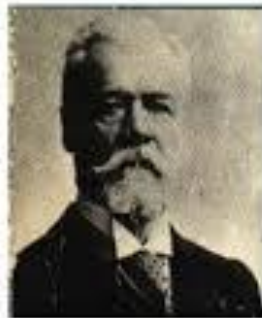
Father of
modern operational
management theory

Fayol's General Principles of Management:

Fayol was MD of a large mining and steel complex. He offered fourteen principles of management that he had found useful in his career as an executive.

1. **Division of work:** It is the specialisation which promotes efficiency. It permits all types of work to be performed more effectively with greater knowledge and skill because the tasks are more familiar.

2. **Authority and responsibility:** The right and power to give orders are balanced by the responsibility for performing necessary functions.

3. **Discipline:** It is obedience, application, energy and respect. Penalties for poor performance should be coupled with competent and fair supervision.

4. **Unity of command:** A subordinate should take two orders from only one superior.

5. **Unity of direction:** Each organisation has same objectives to have only one head and one plan.

6. **Subordinate of individual interest to general interest:** Interest of organisation should supersede the interest of individuals.

7. **Remuneration of personnel:** Pay should be just and fair and provide maximum possible satisfaction to employers and employees.

8. **Centralisation:** There should be one central point in the organisation which exercises overall directional control of all the parts.

9. **Scalar chain:** There is an unbroken chain or line of authority from the bottom to top of organisation.

10. **Order:** An organisation should be based on an orderly, rationally thought out plan, where there should be place for everything and everything should be on its place.

11. **Equity:** Kindliness and justice on the part of managers will evoke loyalty and devotion from employees.

12. **Stability of tenure of personnel**: Unnecessary labour turnover should be avoided.

13. **Initiative:** It is concerned with thinking out and executing plans.

14. **Espirit de corps:** In unior there is strength and emphasised the need for team work.

Behavioural Sciences Approach

This is the current thinking of management and was highlighted by the famous Hawthron studies. This approach is concerned with the application of the methods and findings of psychology, social psychology for understanding of the group and individuals. Elton Mayo, the director of Hawthrone studies, is said to be the founder of this human relations thinking. Mary Parker Follet was other pioneer contributing to this theory of management.
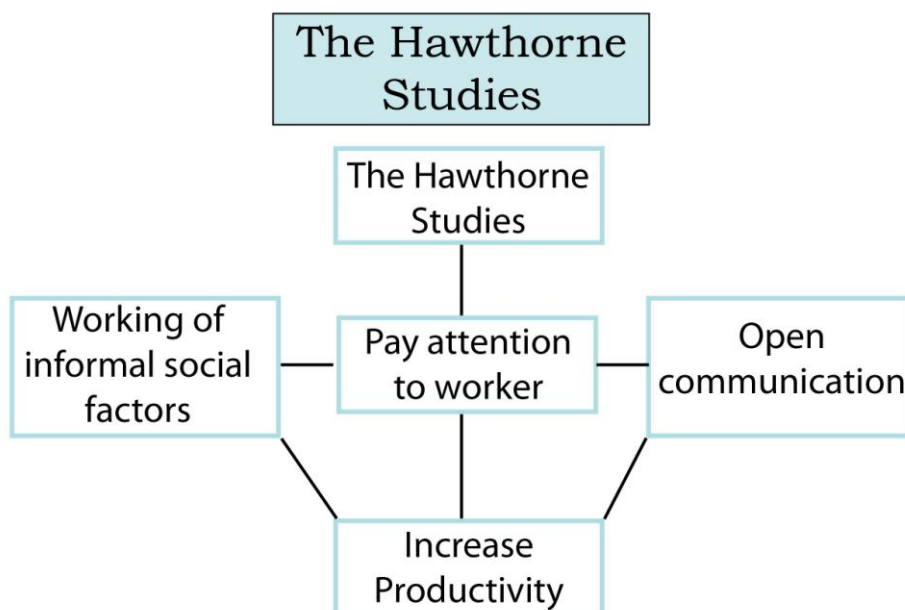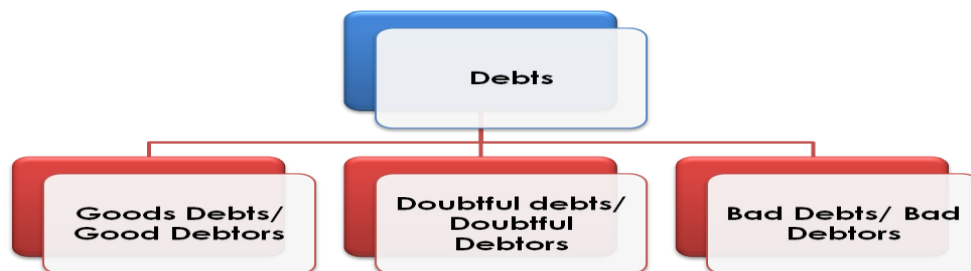
Paper 2: Fundamentals of Accounting (FOA)

Accounting Treatment of Bad debts

Bad debts ⟶ **Amount that are irrecoverable**

- It arises out of Credit Sales

- When you have <u>failed to recover the dues</u>

Transformation

Good ⟶ Doubtful ⟶ Bad
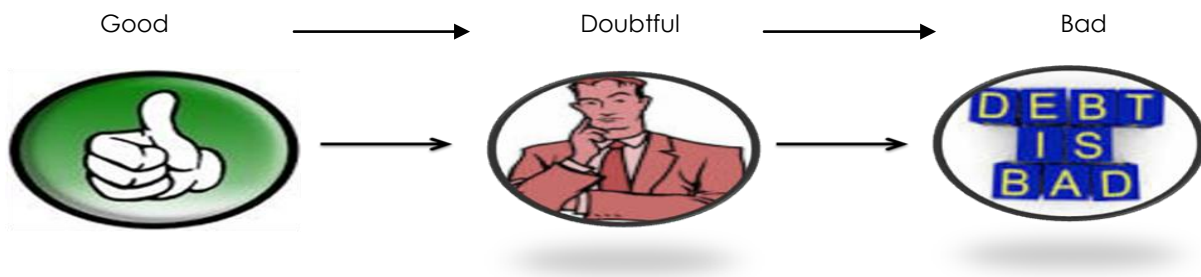
Age Analysis

- Upto six months

- Beyond six months

Good Debts

The debts which are not bad i.e., there is neither any possibility of bad debts nor any doubts about its realization, is called good debts. As such, no provision is necessary for it.

Doubtful Debts

If there is any doubt regarding the collection of recovery of a Debt it is called a Doubtful Debt.

Bad Debts

- Bad debts are uncollectable or irrecoverable debt or debts which are impossible to collect.

- If it is definitely known that amount recoverable from a customer cannot be realized at all, it should be treated as a business loss and should be adjusted against profit.

Why Bad Debt is a Loss?

➢ Sale of goods on credit

➢ Sales is an income

➢ Income is based on accrual basis

➢ In case of credit sales we have to wait until the customer pays the due

❖ If the amount is unpaid the sales amount is inflated

❖ It increases the gross profit

Dr.		Trading Account		Cr.
		By, Sales A/c (Credit sale ₹20)		₹100
To, Gross Profit c/d	↑ ₹20			

❖ to the extent of bad debts

❖ it is required to come down to the net profit

❖ which is net of bad debt

Dr.		Trading Account	Cr.
	↑	By, Sales A/c (Credit sale ₹20)	₹100
To, Gross Profit c/d (including Credit sales of ₹20)	₹100		

Dr.		Profit and Loss Account	Cr.
		By, Gross Profit A/c	₹100
		₹20 ↑	
To, Bad Debt A/c	₹20		

So, Bad Debts

✓ are a charge against profit

✓ are losses

Bad Debts can also arise in case of Non-trading organizations

Example
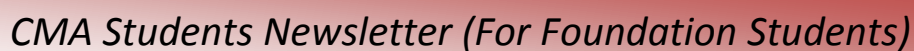
Subscription receivable from a member of an organisation. He left the organisation without informing the organisation or the member has died or has become insolvent. Amount of Subscription receivable from him was ₹5.

Here —

The amount of subscription receivable will have to be charged with the amount unrecovered subscription

Treatment

Year 1				
Dr.		**Income and Expenditure Account**	**Cr.**	
Particulars	**Amount**	**Particulars**		**Amount**
		By, Subscription Received ₹100		
		Subscription Receivable ₹10		₹110

Year 2				
Dr.		**Income and Expenditure Account**	**Cr.**	
Particulars	**Amount**	**Particulars**		**Amount**
To, Unrecovered Subscription	₹5			

Journal Entries

(a)   For actual amount of bad debts (if there is no provision)

Bad Debt A/c.   Dr.

To Debtors A/c or Sundry Debtors A/c.

(b)   For transferring Bad debts

Profit and Loss A/c.   Dr.

To Bad Debts A/c.

In case of Non-trading Organizations

Income and Expenditure A/c   Dr.

To, Unrecovered Subscription A/c

Bad debt and Provision for Bad and Doubtful debts

Bad debts ⟶ Actual Loss

Provision for Bad and doubtful debts ⟶ Anticipated Loss

Provisions for Bad and Doubtful Debts

❖ For any unknown/ known part of doubtful debts provisions must be made against Profit and Loss Account on the basis of past experience or past history.

❖ It is like retaining a part of income to meet certain unforeseen expenses/ losses.

❖ This is known as Provision for Bad Debts; Reserve for Bad Debts or Provision for Bad and Doubtful Debts.

❖ It is charged against Profit and Loss Account in the form of Provision.

Example

If ₹20,000 is maintained to meet emergency medical expenses —

– If there is no such situation arising the total amount will become a savings

₹20,000 is actually a provision which is created to meet this type of unforeseen circumstances.

If ₹20,000 is maintained to meet emergency medical expenses —

– If there is an expenses of ₹18,000. ₹18,000 can be met out of that provision of ₹20,000 maintained.

Dr.	Provision for Emergency Medical Expenses		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Expenses (incurred)	₹ 18,000	By, Balance b/d	₹ 20,000
To, Balance c/d	₹ 2,000		
	₹ 20,000		₹ 20,000

To the Contrary…

If ₹20,000 is maintained to meet emergency medical expenses —

– If there is an expenses or actual loss of ₹21,000. ₹20,000 can be met out of that provision of ₹20,000 and the balance is to be charged to the Profit and Loss A/c

Dr.	Provision for Emergency Medical Expenses		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Expenses (incurred)	₹ 21,000	By, Balance b/d	₹ 20,000
		By, Profit and Loss A/c	₹ 1,000
	₹ 21,000		₹ 21,000

Note: ₹1,000 is the amount of excess/ additional provision required.

Treatment of Bad Debt

– Opening balance of Provision for Bad and Doubtful Debts is a Liability; it is a charge against income.
– If opening balance of is ₹20,000

Dr.	Provision for Bad and Doubtful Debts		Cr.
Particulars	Amount	Particulars	Amount
		By, Balance b/d	₹ 20,000

Posting in Bad Debt Account

If opening balance of is ₹20,000

– Actual Bad Debt is ₹25,000

Dr.	Bad Debts Account		Cr.
Particulars	Amount	Particulars	Amount
To, Sundry Debtors A/c	₹25,000	By, Provision for Bad and Doubtful Debts A/c	₹25,000
	₹25,000		₹25,000

Dr.	Provision for Bad and Doubtful Debts Account		Cr.
Particulars	Amount	Particulars	Amount
To, Bad Debts A/c	₹25,000	By, Balance b/d	₹20,000
		By, Profit and Loss A/c	₹5,000
	₹25,000		₹25,000

Note: Assuming no further provision is required.

Posting in P&L Account

– ₹5,000 will be a charge against Profit and Loss A/c

Dr.	Profit and Loss Account (Extract)		Cr.
Particulars	Amount	Particulars	Amount
To, Provision for Bad and Doubtful Debts A/c	₹5,000		

Review

Dr.	Bad Debts Account			Cr.
Particulars	**Amount**	**Particulars**		**Amount**
To, Sundry Debtors A/c	₹25,000	By, Provision for Bad and Doubtful Debts A/c		₹25,000
	₹25,000			₹25,000

Dr.	Provision for Bad and Doubtful Debts			Cr.
Particulars	**Amount**	**Particulars**		**Amount**
To, Bad Debts A/c	₹25,000	By, Balance b/d		₹20,000
		By, Profit and Loss A/c		₹5,000
	₹25,000			₹25,000

Dr.	Profit and Loss Account (Extract)			Cr.
Particulars	**Amount**	**Particulars**		**Amount**
To, Provision for Bad and Doubtful Debts A/c	₹5,000			

To the Contrary…

– Opening balance of Provision for Bad and Doubtful Debts is a Liability, it is a charge against income.

– If opening balance of is ₹20,000

Dr.	Provision for Bad and Doubtful Debts Account		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
		By, Balance b/d	₹20,000

If actual Bad Debt is less than Provision maintained

If opening balance of is ₹20,000

– Actual Bad Debt is ₹15,000

Dr.	Bad Debts Account		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Sundry Debtors A/c	₹15,000	By, Provision for Bad and Doubtful Debts A/c	₹15,000
	₹15,000		₹15,000

Impact on Provision for Bad and Doubtful Debts Account

Dr.	Provision for Bad and Doubtful Debts Account		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Bad Debts A/c	₹ 15,000	By, Balance b/d	₹20,000
To, Profit and Loss A/c (excess provision written back)	₹5,000		
	₹20,000		₹20,000

Transferred to Profit & Loss Account (Cr.)

Transfer to P & L Account
– excess of ₹5,000 will be a written back

Transferred from Provision for Bad and Doubtful Debts A/c

Dr.	Profit and Loss Account (Extract)		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
		By, Provision for Bad and Doubtful Debts A/c	₹5,000

Review…

Dr.	Bad Debts Account		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Sundry Debtors A/c	₹15,000	By, Provision for Bad and Doubtful Debts A/c	₹15,000
	₹15,000		₹15,000

Dr.	Provision for Bad and Doubtful Debts Account		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
To, Bad Debts A/c	₹15,000	By, Balance b/d	₹20,000
To, Profit and Loss A/c (excess provision written back)	₹5,000		
	₹20,000		₹25,000

Dr.	Profit and Loss Account (Extract)		Cr.
Particulars	**Amount**	**Particulars**	**Amount**
		By, Provision for Bad and Doubtful Debts A/c	₹5,000

Charging Bad Debts

```
                        ┌─────────────────────┐
                   ┌───▶│  Profit and Loss A/c │
                   │    └─────────────────────┘
┌───────────┐      │
│ Bad Debts │──────┤
└───────────┘      │    ┌─────────────────────┐      ┌─────────────────────┐
                   └───▶│ Provision for Bad and│─────▶│ Profit and Loss A/c │
                        │   Doubtful Debts     │      └─────────────────────┘
                        └─────────────────────┘
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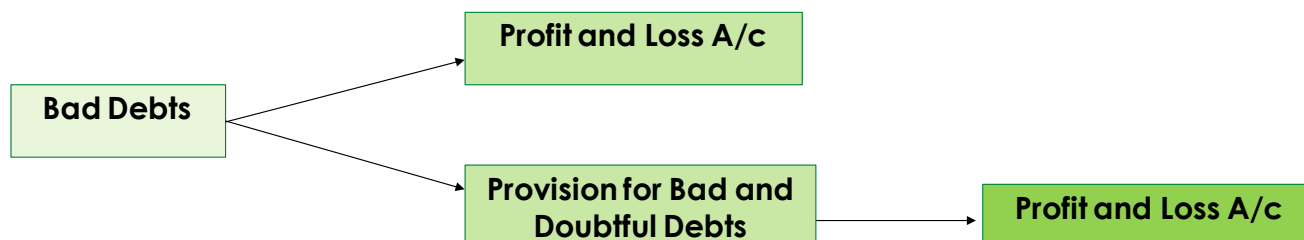
Entry when — Bad Debts ⟶ Profit and Loss A/c

Profit and Loss A/c   Dr.

    To, Bad Debts A/c

Entries when — Bad Debts ⟶ Provision for Doubtful Debts A/c

        ⟶ Profit and Loss A/c

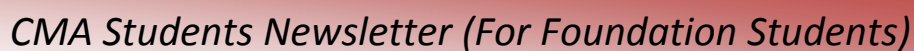(a) Provision for Doubtful Debts   Dr.

    To, Bad Debts A/c

(b) Profit and Loss A/c   Dr.

    To, Provision for Doubtful Debts A/c

Provision for Discount on Debtors

❖ We know that Cash discount is allowed by the suppliers to customer for prompt settlement of cash. Naturally a provision is created for this purpose.

❖ Thus, the provision which is created on Sundry Debtors for allowing discount on receipt of Cash in that accounting period is called Provision for Discount on Debtors.

Example

Say, Sundry Debtors	₹10,000
Less: Bad Debt	₹1,000
Balance	₹9,000
Provision for Doubtful Debts @5% i.e. ₹9,000×5% =	₹450
Balance	₹8,550
Provision for Discount on Debtors of 2% i.e. ₹8,550×2% =	₹171
Net balance of debtors to be shown on the Balance Sheet	₹8,379

Balance Sheet (Extract)

Liabilities	Amount	Assets	Amount
		Sundry Debtors	**₹8,379**

Anticipated Liabilities

Provision for Bad and Doubtful Debts ⟶ Bad Debts

Provision for Discount on Debtors ⟶ Discount allowed in excess of what was not anticipated

Journal Entries

In case of provision for discount on debtors any discount allowed

- which is not a part of the trading agreement or

- which is in excess of trading agreement

For discount Allowed —

  Discount Allowed A/c   Dr.

    To, Sundry Debtors A/c

Which was in case of Bad debts —

  Bad Debts A/c   Dr.

    To Sundry Debtors A/c

Transferring of Bad Debt to Provision for Doubtful Debts…

  Provision for Bad Debts A/c   Dr.

    To, Bad Debt A/c

For provision for Bad and Doubtful Debts

(i) If closing provision is more than the opening provision-

  Profit and Loss A/c   Dr.

    To Provision for Bad and Doubtful Debts A/c

(ii) If Closing Balance is less than opening provision -

  Provision for Bad and Doubtful Debts A/c   Dr.

    To Profit and Loss A/c

Transferring of Discount allowed to Provision for Discount on debtors …..

Provision Discount on Debtors A/c   Dr.

       To, Discount Allowed A/c

Discount Allowed can also be transferred directly to Profit and Loss.

It is advisable Discount allowed to be routed through Provision for Discount on Debtors.

Next year provision is estimated-

(i) If new provision is more than old one-

       Profit and Loss A/c   Dr.

            To, Provision for Discount on Debtors A/c

(ii) If new provision is less than old one-

       Provision for Discount on Debtors A/c   Dr.

            To, Profit and Loss A/c

Example

❖ Sundry Debtors (before Bad Debt and Discount allowed) — ₹50,000.

❖ Provision for Discount on Debtors — ₹800 (opening bal.).

❖ Provision for Bad and Doubtful Debts — ₹ 2,500 (opening bal.).

❖ Bad Debt — ₹2,000.

❖ Provision for Bad and Doubtful Debts — 3%.

❖ Provision for Discount for Debtors — 2%.

Solution

Dr.	Sundry Debtors Account		Cr.	
Particulars	**Amount(₹)**	**Particulars**		**Amount (₹)**
To, Balance b/d	50,000	By, Bad Debts A/c		2,000
		By, Discount Allowed A/c		1,000
		By, Balance c/d		47,000
	50,000			50,000

Dr.	Bad Debts Account		Cr.	
Particulars	**Amount(₹)**	**Particulars**		**Amount (₹)**
To, Sundry Debtors A/c	2,000	By, Provision for Bad and Doubtful Debts A/c		2,000

Transfer Entry

Dr.	Provision for Bad and Doubtful Debts Account		Cr.	
Particulars	Amount(₹)	Particulars		Amount (₹)
To, Bad Debts A/c	2,000	By, Balance b/d		2,500
To, Balance c/d	1,440	By, Profit and Loss A/c		940
	3,440			3,440

Dr.	Discount Allowed Account		Cr.	
Particulars	Amount(₹)	Particulars		Amount (₹)
To, Sundry Debtors A/c	1,000	By, Provision for Discount on Debtors A/c		1,000

Provision for Discount on Creditors

❖ We also know that cash discount is received by the customer which is allowed by the creditors for prompt settlement of debts.

❖ a provision should be created for the purpose.

❖ provision which is created on Sundry Creditors for securing discount for payment of cash in the next accounting period is called Provisions for Discount on Creditors

❖ It is an anticipated gain

Journal Entries

Payment to Creditors —

        Creditors A/c   Dr.   ₹100

            To, Bank A/c   ₹95

            To, Discount Received A/c   ₹5

Treatment of Discount Received

Closing or Transfer Entry —

        Discount Received A/c   Dr.

            To, Provision for Discount on Creditors A/c

• This the process of adjusting discount received

• Ultimately the provision shall be transferred to the Profit and Loss (P&L) A/c

If Bad Debts are routed through the Provision for Doubtful Debts

• Bad Debts will not be shown in P&L A/c

• The balance of Provision for Bad and Debts will be shown in P&L A/c

If Discount allowed is transferred through the Provision for Discount Debtors A/c

• Balance of Provision for Discount on Debtors will be shown in P&L A/c

• In the same way Provision for Discount on Creditors will be shown in P&L A/c

Example

• Sundry Creditors (before Discount received) — ₹30,000.

• Provision for discount on creditors — ₹900 (opening bal.).

• Discount Received — ₹600

• Provision for Discount on Creditors — 3% to be created

Solution

Dr.	Sundry Creditors Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
To, Discount Received A/c	600	By, Balance b/d	30,000	
To, Balance c/d	29,400			
	30,000		30,000	

Dr.	Discount Received Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
To, Profit and Loss A/c	600	By, Sundry Creditors A/c	600	

OR,

Dr.	Sundry Creditors Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
To, Discount Received A/c	600	By, Balance b/d	30,000	
To, Balance c/d	29,400			
	30,000		30,000	

Dr.	Discount Received Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
To, Provision for Discount on Creditors A/c	600	By, Sundry Creditors A/c	600	

Impact in Provision for Discount on Creditors Account

Dr.	Provision for Discount on Creditors Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
To, Balance b/d	900	By, Discount Received A/c	600	
To, Profit and Loss A/c	582	Balance c/d	882	
	1,482		1,482	

Dr.	Profit and Loss Account		Cr.	
Particulars	Amount(₹)	Particulars	Amount (₹)	
		By, Provision for Discount on Creditors A/c	582	

Bad Debt Recovery

If in the past there was an amount written off as a Bad Debt. Again, if the organisation is able to recover that due, that will be known as Bad Debt Recovery.

Bad Debt Recovery ⟶ Gain

Journal Entries

(a) Cash/Bank A/c   Dr.

         To, Bad Debt Recovery A/c

The Customer Account was already written off.

(b) Bad Debt Recovery A/c   Dr.

         To, Profit and Loss A/c

Example
In year 1

Dr.	Mr. X Account		Cr.
Particulars	**Amount(₹)**	**Particulars**	**Amount (₹)**
		By, Bad Debts A/c (for closing the account)	10,000

Dr.	Bad Debts Account		Cr.
Particulars	**Amount(₹)**	**Particulars**	**Amount (₹)**
To, Mr. X A/c	10,000	By, Profit and Loss A/c	10,000

Dr.	Profit and Loss Account		Cr.
Particulars	**Amount(₹)**	**Particulars**	**Amount (₹)**
To, Bad Debt A/c	10,000		

Say, in year 4 — Recovery of Bad Debt

Dr.	Cash Account		Cr.
Particulars	**Amount(₹)**	**Particulars**	**Amount (₹)**
To, Bad Debt Recovery A/c	10,000		

Dr.	Bad Debts Recovery Account		Cr.
Particulars	**Amount(₹)**	**Particulars**	**Amount (₹)**
		By, Cash A/c	10,000

Paper 3: Fundamentals of Laws and Ethics (FLE)

LABOUR WELFARE

The Oxford dictionary defines labour welfare as "elforts to make life worth living for workmen".


These efforts have their origin either in some structure formed by the state or in some local custom or in a collective agreement or in the employer's own initiative. An employer may voluntarily initiate labour welfare measures in his undertaking with the following objectives:

1. To give expression to philanthropic and paternalistic.

2. To win over employee's loyalty and increases their morale.

3. To combat trade unionism and socialist ideas.

4. To build up stable labour force, to reduce labour turnover and absenteeism.

5. To develop efficiency and productivity among workers.

6. To serve oneself from heavy taxes on surplus profits.

7. To earn goodwill and enhance public image.

8. To reduce the threat of further government intervention.

9. To make recruitment more effective (because these benefits add to job appeal)

It is however difficult to precisely define the scope of labour welfare efforts. Different writers have defined it in different way. Some writer say that only voluntary efforts on the part of employers to improve the conditions of employment in their factories from the scope of labour welfare efforts. Some others say it includes not only voluntary efforts of the employer but also the minimum standards of hygiene's and safety laid down in general legislation.

Labour Welfare in India
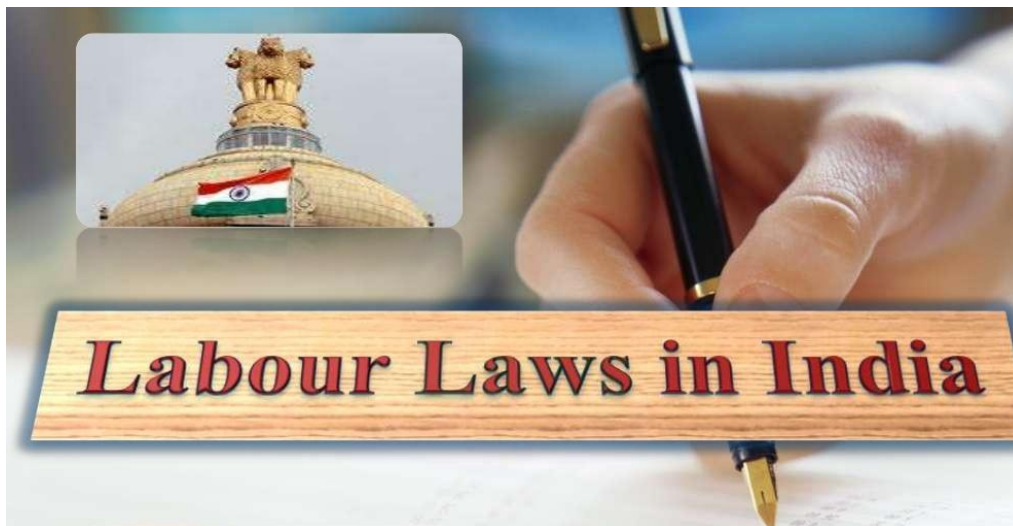
The chapter of the directive principles of state policy in our constitution expressed the need for labour welfare thus.

Article 32

The State shall make effective provision for securing the right to work, to education and to public assistance, in case of un-employment, old age, sickness, disablement and other cases of underserved want.

Article 33

The State shall make provision for securing just and human conditions of work and for maternity relief.

Article 39

The State shall, in particular, direct, its policy toward securing—

(a) That the citizens men and women equally have the right to an adequate means of livelihood.

(b) That the ownership and control of the material resources are so distributed as to subserve the common good.

(c) That the operation of the economic system does not result in the concentration of wealth and means of production of the common detriment.

(d) That there is equal pay for equal work for both men and women, and

(e) That the health and strength of worker, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter a vocation unsuited for their age or strength.

Article-41

The State shall, within the limits of its economic capacity and development make effective provision for securing the right to work, to education and to public assistance in case of unemployment, old age, sickness and disablement, and other case of under- served wants.

Article-42

The State shall make provision for securing just human conditions of work for maternity relief.

Article-43

The State shall endeavor to secure, by suitable legislation or economic organisation or in any other way to all worker—agricultural, industrial or otherwise work a living wage, condition of work ensuring a decent standard of life and full employment of leisure and social and cultural opportunities and in particular, the State shall endeavor to promote cottage industries on an individual or co-operation basic in rural areas.

Article 43-A

The State shall take steps, by suitable legislation or in any other way to secure participation of worker in the development of undertaking, establishment or other organisations engaged in any Industry.

Factories Act, 1948.

The principal act to provide for various labour welfare measure in India is the Factories Act 1948, This act contains among other, detailed provision about—

(i)   The appointment of a labour welfare officer.

(ii)   The health worker.

(iii)   The safety of worker and.

(iv) The welfare of worker.

Labour Welfare Officer

Section 49 of the factories act provides for various that in every factory wherein 500 or more workers are ordinarily employed the employer shall a point at least one welfare officer. The welfare officer should possess—

(i)   University degree

(ii)   Degree or Diploma in social service or social work or social welfare from a recognised institutions, and

(iii) Adequate knowledge of the language spoken by the majority of the worker in the area where the factory is situated. The duties of a labour welfare officer are as follows.

1.   Supervision of—

(i)   safety, health and welfare programmes like housing, recreation, sanitation service etc.

(ii)   working of joint committees.

(iii)   grant of leave with wages.

(iv)   redressal of worker's grievances.

2.   Counseling workers in—

(i)   personal and family problems.

(ii)   adjustment to their work environment and

(iii)   understanding their right and privileges

3.   Advising Managements in matters of—

(i)   formulating labour and welfare policies.

(ii) apprenticeship training programmes.

(iii) meeting statutory obligation to worker.

(iv) developing fringe benefit and.

(v) worker educations and use of communication media.

4. Establishing liaison with worker so that they may—

(i) understand various limitation under which they work.

(ii) appreciate the need of harmonious industrial relations in the plant.

(iii) interpret company policies correctly and

(iv) come to a settlement in case of disputes.

(v) establishing liaison with management so that the latter may appreciate worker view point on various matter in plant.

(vi) Working with management and workers to improve productivity.

(vii) Working with outside public to secure proper enforcement of various acts.

In brief, a welfare officer is expected to act as an adviser counsellor, mediator and liasion officer between management and labour. He is required to act as a maintenance engineer on the human side.

Health of Workers

Health provision are contained in chapter III of Factories Act, 1948

These are follows:

1. **Cleanliness:** Every factory shall be kept clean by daily sweeping or washing the floors and work rooms and by using disinfectant where necessary. Walls, doors and windows shall be repainted or re-varnished at least once in every 5 years.

2. **Disposal of wastes and effluents:** Effective arrangements shall be made for the disposal of wastes and for making them innocuous.

3. **Ventilation and temperature:** Effective arrangements shall be made for ventilation and temperature so as to provide comfort to the workers and prevent injury to their health.

4. **Dust and fume:** Effective measures shall be taken to prevent the undulation and accumulation of dust and funis or other impurities at the work place.

5. **Artificial humidification:** The State Government shall make rules prescribing standards of humidification and methods to be adopted for this purpose. It will be incumbent on the management to use effectively purified water for humidification.

6. **Overcrowding:** There shall be in every work room of a factory in existence on the date of commencement of this Act at least 9.9 cubic metres and of a factory built after the commencement of this Act at least 4.2 cubic metres of space for every worker.

7. **Lighting:** The state government may prescribe standards of sufficient and suitable lighting. However, there shall be provision for both natural and artificial lighting. Glares and shadows which cause eye strain shall be avoided and all artificial lighting arrangements shall be kept clean.

8. **Drinking water:** There shall be effective arrangement for wholesome drinking water for workers at convenient points. If their number is more than 250 then the arrangement shall be made for cool drinking water during hot weather.

9. **Latrines and urinals:** There shall be sufficient number of latrines and urinals, clean, well -ventilated, conveniently situated and built according to prescribed standards separately for male and female workers.

10. **Spittoons:** There shall be sufficient number of spittoons placed at convenient.

Safety of Workers

Safety provisions are made in chapter IV and IV-A of the Factories Acts.

These are as follows:

1. **Fencing of machinery:** All dangerous and moving parts of a machinery shall be securely fenced. Screws, bolts and teeth shall be completely encased to prevent danger.

2. **Work on or near machinery in motion:** Lubrication or other adjusting operation on a moving machinery shall be done only by a especially trained adult male worker. No woman or young person shall be allowed for this work.

3. **Employment of young person's on dangerous machines:** No young person shall be allowed to work on any dangerous machine so prescribed by the State Government unless he is sufficiently trained or is working under the supervision of a knowledgeable person. Similarly, no woman or child shall be employed in any part of a factory for pressing cotton in which a cotton opener is at work. The woman or child can, however, be employed at the delivery end if this end has been partitioned and separated from the feed end of cotton opener.

4. **Device for cutting off power:** Suitable device for cutting off power in emergencies shall be provided. There shall also be suitable arrangement to prevent accidental starting of the machinery.

5. **Hoists and lifts:** These shall be made of good material and strength thoroughly examined at least once in every six month and suitably protected to prevent any person or thing from being trapped.

6. **Proper construction and maintenance of floors and stairs:** Floors and stairs should be of sound construction and properly maintained free from any obstruction. Opening of floor, if any. shall be surly covered.

7. **No excessive weights:** No persons, in the factory shall carry load which is in excess of the weight prescribed by the slate government.

8. Suitable precautions against excessive lights, dangerous fumes and gases, portable electric light and fix. Effective screens or goggles shall be provided to the workers to give them protection against excessive light. Manholes of adequate si/e shall be provided for effective egress of gases and fumes. No portable electric light of more than 24 volts shall be permitted inside any chamber. There shall be suitable facilities for extinguishing lire beside safe means of escape.

9. **Safety of building and machinery:** The Inspector is empowered to serve on the occupier or manager of the factory an order in writing:

    (a) To furnish such particular as would enable the inspector to determine the plant and buildings safety, or

    (b) To take certain safety measures before certain date.

    (c) To discontinue the use of plant stand building until these have been properly repaired.

10. **Appointment of safety officers in every factory:**

    (i) Wherein one thousand or more worker are ordinarily employed or.

    (ii) Wherein the opinion of the State Government, any manufacturing process or operation is carried on which process or operations involve any risks of bodily injury poisoning or diseases or any other hazards to health, to the person employed in the factory.

The occupier shall, if so required by the state Government by notification in official gazette, employ such number of safety officers as may be specified in that notification. The duties. qualification and conditions of service of safely officer shall be such as may be prescribed by the State Governments.

11. **Hazardous process defined:** Hazardous process means any process or activity in relations to an industry specified in the first schedule where unless special care is taken, raw material used therein or the inter media or finished product waste or effluents theory would.

    (i) Cause material impairment of the health of the persons engaged in or connected therewith or.

    (ii) result in the pollution of the general environment.

    A notable feature of the present act in the special chapter (IV A) on hazardous process providing for—

(a) The constitution of the Site Appraisal Committee for advising the state government on application for agent of permission for the initial location of a factory involving a hazardous process or for the expansion of any factory.

(b) The disclosure by the occupier of all information regarding damages and health hazard and measure taken by him to control these hazards.

(c) The maintenance of accurate and up-to-date health records of the worker in the factory including their medical examination both at the beginning and at the end of their assignment to hazardous jobs.

(d) The appointment of an enquiry committee by the Central Government to inquire into the standards of health and safety observed in the factor)'.

(e) The laying down of emergency standards of safety where the existing standards are inadequate.

(f) The setting up of a bipartite safety committee consisting of equal number of representatives of worker and management to promote cooperation between the two in maintaining proper safety and health at work and to review periodically the measure taken in that behalf.

(g) The worker's right to warn the employer about imminent danger either directly or through the safety committee and the employer's duty to take immediate remedial action.

The third schedule attached to Factories Act gives a list of 29 notifiable diseases under sec 89 of the Act both the manager and the doctor of the factory are required to send information about any worker of company these disease to prescribed authority in the prescribed manner.

Section III of the Act casts upon every worker the duty not be willfully ignore the use or tissue any appliance provided for the purpose of securing the health and safety of workers.

Section III A gives a corresponding right to every worker to obtain from the occupier information relating to worker's health and safety at work. He is also given the right to get himself trained by the employer in health and safety.

Paper 4: Fundamentals of Business Mathematics and Statistics (FBMS)

In problems of algebra dealing with factorization, equations of third power and in many problems of geometry related to three dimensional figures, one will often find the need to calculate the cube root of numbers. Calculating the cube root of a number by the traditional method is a slightly cumbersome procedure, but the technique used by Vedic Mathematicians is so fast that one can get the answer in two to three seconds!

The technique for solving cube roots is simply so amazing that the student will be able to correctly predict the cube root of a number just by looking at it and without the need for any intermediate steps.

You might find it difficult to believe, but at the end of this study, you will be calculating cube roots of complicated numbers like 262144, 12167 and 117649 in 2-3 seconds. Even primary school students who have learnt these techniques from me are able to calculate cube-roots in a matter of seconds.

Before we delve deeper in this study, let us clear our concepts relating to cube roots.

WHAT IS CUBE ROOTING?

Let us take the number 3. When we multiply 3 by itself we are said to have squared the number 3. Thus 3 x 3 is 9. When we multiply 4 by itself we are said to have squared 4 and thus 16 is the square of 4.

Similarly the square of 5 is 25 (represented as 5^2)
The square of 6 is 36 (represented as 6^2)

In squaring, we multiply a number by itself, but in cubing we multiply a number by itself and then multiply the answer by the original number once again.

Thus, the cube of 2 is 2 x 2 x 2 and the answer is 8. (represented as 2^3)
The cube of 3 is 3 x 3 x 3 and the answer is 27. (represented as 3^3)

Basically, in squaring we multiply a number by itself and in cubing we multiply a number twice by itself.

Now, since you have understood what cubing is it will be easy to understand what cube rooting is. Cube-rooting is the procedure of determining the number which has been twice multiplied by itself to obtain the cube. Calculating the cube-root is the reciprocal procedure of calculating a cube.

Thus, if 8 is the cube of 2, then 2 is the cube-root of 8.

If 27 is the cube of 3 then 3 is the cube root of 27 and so on.

In this chapter, we will learn how to calculate cube-roots. Thus, if you are given the number 8 you will have to arrive at the number 2. If you are given the number 27 you will have to arrive at 3. However, these are very basic examples. We shall be cracking higher order numbers like 704969, 175616, etc.

At this point, I would like to make a note that the technique provided in this chapter can be used to find the cube-roots of perfect cubes only. It cannot be used to find the cube root of imperfect cubes.

METHOD

I have given below a list containing the numbers from 1 to 10 and their cubes. This list will be used for calculating the cube roots of higher order numbers. With the knowledge of these numbers, we shall be able to solve the cube-roots instantly. Hence, I urge the reader to memorize the list given below before proceeding ahead with the chapter.

NUMBER	CUBE
1	1
2	8
3	27
4	64
5	125
6	216
7	343
8	512
9	729
10	1000

The cube of 1 is 1, the cube of 2 is 8, the cube of 3 is 27 and so on....

Once you have memorized the list I would like to draw your attention to the underlined numbers in the key. You will notice that I have underlined certain numbers in the key. These underlined numbers have a unique relationship amongst themselves.

In the first row, the underlined numbers are 1 and 1. It establishes a certain relationship that if the last digit of the cube is 1 then the last digit of the cube root is also 1.

In the second row, the underlined numbers are 2 and 8. It establishes a relationship that if the last digit of the cube is 8 then the last digit of the cube root is 2. Thus, in any given cube if the last digit of the number is 8 the last digit of its cube-root will always be 2.

In the third row, the underlined numbers are 3 and 7 (out of 27 we are interested in the last digit only and hence we have underlined only 7). We can thus conclude that if the last digit of a cube is 7 the last digit of the cube root is 3.

And like this if we observe the last row where the last digit of 10 is 0 and the last digit of 1000 is also 0. Thus, when a cube ends in 0 the cube-root also ends in 0.

On the basis of the above observations, we can form a table as given below:

The Last Digit Of The Cube	The Last Digit Of The Cube Root
1	1
2	8
3	7
4	4
5	5
6	6
7	3
8	2
9	9
0	0

From the above table, we can conclude that all cube-roots end with the same number as their corresponding cubes except for pairs of 3 & 7 and 8 & 2 which end with each other.

There is one more thing to be kept in mind before solving cube-roots:

Whenever a cube is given to you to calculate its cube-root, you must put a slash before the last three digits.

If the cube given to you is 103823 you will represent it as 103|823

If the cube given to you is 39304, you will represent it as 39 |304

Immaterial of the number of digits in the cube, you will always put a slash before the last three digits.

SOLVING CUBE ROOTS

No.	1	2	3	4	5	6	7	8	9	10
Cube	1	8	27	64	125	216	343	512	729	1000

We will be solving the cube root in 2 parts. First, we shall solve the right hand part of the answer and then we shall solve the left hand part of the answer. If you wish you can solve the left hand part before the right hand part. There is no restriction on either method but generally people prefer to solve the right hand part first.

As illustrative examples, we shall take four different cubes.

(Q) Find the cube root of 287496.

- We shall represent the number 287496 as 2871496
- Next, we observe that the cube 287496 ends with a 6 and we know that when the cube ends with a 6, the cube root also ends with a 6. Thus our answer at this stage is ____ 6. We have thus got the right hand part of our answer.
- To find the left hand part of the answer we take the number which lies to the left of the slash. In this case, the number lying to the left of the slash is 287. Now, we need to find two perfect cubes between which the number 287 lies in the number line. From the key, we find that 287 lies between the perfect cubes 216 (the cube of 6) and 343 (the cube of 7).
- Now, out of the numbers obtained above, we take the smaller number and put it on the left hand part of the answer. Thus, out of 6 and 7, we take the smaller number 6 and put it beside the answer of ____ 6 already obtained. Our final answer is 66. Thus, 66 is the cube root of 287496.

(Q) Find the cube root of 205379.

- We represent 205379 as 205 379
- The cube ends with a 9, so the cube root also ends with a 9. (The answer at this stage is ____9.
- The part to the left of the slash is 205. It lies between the perfect cubes 125 (the cube of 5) and 216 (the cube of 6)
- Out of 5 and 6, the smaller number is 5 and so we take it as the left part of the answer. The final answer is 59.

(Q) Find the cube root of 681472.

- We represent 681472 as 681 472
- The cube ends with a 2, so the root ends with an 8. The answer at this stage is_____8.
- 681 lies between 512 (the cube of 8) and 729 (the cube of 9).

- The smaller number is 8 and hence our final answer is 88.

(Q) Find the cube root of 830584.

- The cube ends with a 4 and the root will also end with a _____4.
- 830 lies between 729 (the cube of 9) and 1000 (the cube of 10).
- Since, the smaller number is 9, the final answer is 94.

You will observe that as we proceeded with the examples, we took much less time to solve the cube-roots. After some practice you will be able to solve the cube-roots by a mere observation of the cube and without the necessity of doing any intermediary steps.

It must be noted that immaterial of the number of digits in the cube, the procedure for solving them is the same.

(Q) Find the cube root of 2197.

- The number 2197 will be represented as   2 197
- The cube ends in 7 and so the cube root will end with a 3.
  We will put 3 as the right hand part of the answer.
- The number 2 lies between 1 (the cube of 1) and 8 (the cube of 2).
- The smaller number is 1 which we will put as the left hand part of the answer. The final answer is 13.

We may thus conclude that there exists only one common procedure for solving all types of perfect cube-roots.

In my seminars, the participants often ask what is the procedure of solving cube roots of numbers having more than 6 digits. (All the examples that we have solved before had 6 or fewer digits.)

Well the answer to this question is that the procedure for solving the problem is the same. The only difference in this case is that you will be expanding the number line.

Let us take an example.

We know that the cube of 9 is 729 and the cube of 10 is 1000. Now let us go a step ahead and include the higher numbers. We know that the cube of 11 is 1331 and the cube of

12 is 1728.

Number	9	10	11	12
Cube	729	1000	1331	1728

(Q) Find the cube root of 1157625.

- We put a slash before the last three digits and represent the number as 1157| 625.
- The number 1157625 ends with a 5 and so the root also ends with a 5. The answer at this stage is _____5.

- We take the number to the left of the slash, which is 1157. In the number line it lies between 1000 (the cube of 10) and 1331 (the cube of 11).
- Out of 10 and 11, we take the smaller number 10 and put it beside the 5 already obtained. Our final answer is 105.

(Q) Find the cube root of 1404928.

- The number will be represented as 1404 928
- The number ends with a 8 and so the cube-root will end with a 2.
- 1404 lies between 1331 (the cube of 11) and 1728 (the cube of 12). Out of 11 and 12 the smaller number is 11 which we will put beside the 2 already obtained. Hence, the final answer is 112.

The two examples mentioned above were just for explanation purposes. Under normal circumstances, you will be asked to deal with cubes of 6 or less than 6 digits in your exams. Hence, knowledge of the key which contains cubes of numbers from 1 to 10 is more than sufficient. However, since we have dealt with advanced level problems also, you are well equipped to deal with any kind of situation.

COMPARISON

As usual, we will be comparing the normal technique of calculation with the Vedic technique. In the traditional method of calculating cube-roots we use prime numbers as divisors.
Prime numbers include numbers like 2, 3, 5, 7, 11, 13 and so on.
Let us say you want to find the cube root of 64. Then, the process of calculating the cube root of 64 is as explained below.

2	64
2	32
2	16
2	8
2	4
2	2
	1

First, we divide the number 64 by 2 and get the answer 32.
- 32 divided by 2 gives 16
- 16 divided by 2 gives 8
- 8 divided by 2 gives 4
- 4 divided by 2 gives 2
- 2 divided by 2 gives 1

(We terminate the division when we obtain 1) Thus, 64 = 2x2x2x2x2x2

To obtain the cube root, for every three similar numbers we take one number. So, for the first three 2's, we take one 2 and for the next three 2's we take one more 2.

When these two 2's are multiplied with each other we get the answer 4 which is the cube root of 64.

It can be represented as:

64 = 2x2x2 x 2x2x2

    2   x   2   equals 4.

Hence, 4 is the cube root of 64.

Similarly, to find the cube root of 3375 by the traditional method, we can use the following procedure.

5	3375
5	675
5	135
3	27
3	9
3	3
	1

3375 = 5x5x5 x 3x3x3

    5   x   3   =15

Hence, 15 is the cube – root of 3375.

After studying the above two examples, the reader will agree with me that the traditional method is cumbersome and time-consuming compared to the method used by Vedic mathematicians. However, you will be shocked to see the difference between the two methods when we try to calculate the cube root of some complicated number.

Example: Find the cube root of 262144.

The Traditional Method   The Vedic Mathematics method

2	262144
2	131072
2	65536
2	32768
2	16384

262 | 144 = 64

2	8192
2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

=2x2x2x2x2x2

= 64.

It can be observed from the comparison that not only does the Vedic method helps us to find the answer in one line but also helps us to find the answer directly without the need for any intermediate steps. This characteristic of this system helps students in instantly cracking such problems in competitive exams.

With this comparison we terminate this study. Students are urged to solve the practice exercise before proceeding to the next chapter.

EXERCISE

PART A

Q. (1) Find the cube roots of the following numbers with the aid of writing material.

    (1) 970299

    (2) 658503

    (3) 314432

    (4) 110592

    (5) 46656

    (6) 5832

    (7) 421875

    (8) 1030301

PART B

Q. (2) Find the cube roots of the following numbers without the aid of writing material.

(1)   132651

(2)   238328

(3)   250047

(4)   941192

(5)   474552

(6)   24389

(7)   32768

(8)   9261