

St. Xavier's Sr. Sec. School, Chandigarh

Class 12

English Worksheet -2

Question 1

Referring to the play The Tempest by Shakespeare, discuss the following :

- a. Why was Prospero banished?
- b. Who is Ariel? Who does he work for? Why?
- c. Who is Caliban? Why does he hate Miranda and Prospero?
- d. How does Prospero manipulate Alonso and his company?
- e. Where is the scene taking place?
- f. Can you give a reason why Shakespeare begins this play with a storm?
- g. What do learn about Ferdinand? What happens when he meets Miranda?
- h. What expression of the Realistic, the Romantic, and the Supernatural does Shakespeare give in this Act?
- i. What description of the island does Gonzalo give?
- j. What does Ariel do for Gonzalo?
- k. What is the dramatic purpose of Act 1 and Act 2?
- l. How does Shakespeare convey the terror of the storm in the opening scene?
- m. How did Prospero and Miranda come to live on the island?

Question 2

Critically analyze the story Quality.

Question 3

Write an argumentative essay on “We live in deeds not in years.”

Question 4

Choose any recent science fiction book that you have read and give an account of it , based on the following: Name and writer- Cost-genre-Setting-Plot- Characters- Your favourite character- theme-Presentation -Author's style-Critical acclaim-Your opinion .

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CHAPTER – 1 (Continued)**Meaning and distinction between Charge Against Profit and Appropriation out of Profit: -**

A **Charge Against Profits** is a deduction to be made from revenue in order to determine the profit for a given period while an **Appropriation out of Profits** is an allocation of the profit determined after deducting the charges. A charge against profits must be debited to the profit and loss account whether it results in a profit or loss to the firm whereas an item of appropriation can be debited only when the profit is sufficient to cover the same.

Difference between Charge Against Profit and Appropriation Out of Profit: -

Charge Against Profit	Appropriation Out of Profit
1. It indicates expenses to be deducted from profits while calculating net profit or loss.	1. It indicates distribution of net profit to various heads.
2. It is always debited to profit and loss account.	2. It is debited to profit and loss appropriation account.
3. It is necessary to make charges against profits even if there is loss.	3. Appropriations are made only when there is profit.
4. Examples are interest on partner's loan and rent paid to a partner.	4. Examples are interest on capital, salary or commission due to partners.

CAPITAL ACCOUNTS OF PARTNERS

In case of partnership a separate capital account is prepared for each partner. For example, if A & B are partners in a firm then A's Capital A/c and B's Capital A/c are maintained in the books of the firm.

METHODS OF MAINTAINING CAPITAL ACCOUNTS:-

1. **Fixed Capital Accounts Method**: Under this system the original capital invested by the partners

are not allowed to change during the lifetime of business except - a) The partner introduces further capital.

b) The partner withdraws out of his or her capital.

When fixed capital account method is followed, two accounts that is a capital account and a current account for each partner are maintained.

Capital A/c: Capital account of a partner continues to show same balances year after year unless further capital is introduced which is credited to partner's capital account or the drawl is made out of capital which is debited to the account.

Current A/c: Current account is maintained to record transactions other than transactions relating to capital such as drawings against profit, interest charged on drawings, interest allowed on capital, salary or commission payable to a partner and share of profit or loss etc. It means balance in the current account fluctuates with every transaction with the partner.

2. Fluctuating Capital Accounts Method: Under this method only one account namely Capital Account is

maintained for each partner. All transactions of a partner for example capital introduced or withdrawn, salary or commission, interest allowed on capital, drawings, interest charged on drawings, share of profit or share of loss etc. are recorded in this Capital Account of partners. As a result, balance in the Capital Account fluctuates with every transaction. Such Capital Accounts May show credit or debit balance. Credit balance of capital account is shown on the liabilities side of balance sheet while the debit balance is shown on the asset side.

DIFFERENCE BETWEEN:

Fixed Capital Accounts	Fluctuating Capital Accounts
1. Balance in fixed capital account does not change except when further capital is introduced or capital is withdrawn.	1. The balance changes with every transaction of the partner with the firm.
2. Two accounts are maintained for each partner that is Fixed Capital Account and Current Account.	2. Only one account that is capital account is maintained for each partner.
3. Fixed capital account can never show a debit balance.	3. Fluctuating Capital Account can also show a debit balance.
4. When the capitals are fixed transactions relating to drawings, interest on capital, interest on drawings, salary, share of profit or loss etc., are not made in Capital Account but are entered in separate Current Accounts.	4. In this case all transactions relating to partners are made directly in the Capital Accounts itself.

DIFFERENCE BETWEEN:

CAPITAL ACCOUNT	CURRENT ACCOUNT
1. It is prepared in all the cases, that is under fixed capital account method and fluctuating capital methods.	1. It is prepared when fixed capital account method is followed.
2. It will always have a credit balance when fixed capital method is followed. In fluctuating capital method it may have either credit or debit balance.	2. This account may have a credit or debit balance.
3. Capital account balance generally remains unchanged from year to year in case of fixed capital method. It will change only when further capital is introduced or capital is withdrawn from business.	3. Current account fluctuates with every transaction.
4. Capital account records the amount invested by a partner in the firm.	4. Current account records the transactions such as drawings, interest on capital, interest on drawings, salary, commission, profit or loss, etc.

NOTE – 1: Any amount payable to a partner, such as salary, commission, interest on capital etc. (except interest on partner’s Loan and rent payable to a partner) Is treated as appropriation of profit and not a charge against profit. Hence, these items are debited to Profit and Loss Appropriation A/c and NOT in Profit and Loss A/c.

NOTE – 2: Loan advanced by a partner to the firm is a liability for the firm and will be shown in Liabilities side of the Balance Sheet of the firm. Interest on partner’s loan is a charge against profit and will be transferred to the debit of the Profit and Loss Account and NOT in Profit and Loss Appropriation A/c. This Interest on Loan is credited to his Loan A/c and NOT to his Capital A/c.

PROFORMA OF

Dr. CAPITAL ACCOUNTS (When the Capital are fixed)
Cr.

Particulars	A	B	C	Particulars	A	B	C
	Rs.	Rs.	Rs.		Rs.	Rs.	Rs.
To Cash/Bank A/c (Permanent Withdrawal of Capital)				By Balance b/d (Opening Balance)			
To Balance c/d (Closing Balance)				By Cash/Bank A/c (additional Capital)			

Dr. CURRENT ACCOUNTS
Cr.

Particulars	A	B	C	Particulars	A	B	C
	Rs.	Rs.	Rs.		Rs.	Rs.	Rs.
To Balance b/d (In case of debit opening balance)				By Balance b/d (In case of Credit opening balance)			
To Drawings				By Interest on Capital			
To interest on Drawings				By Salary			
To P & L A/c (Share of loss, in case of loss)				By Commission			
To Balance c/d*				By P & L Appropriation A/c (share of profit, in case of profit)			

* The balances may be on the opposite side also

**PROFORMA OF
CAPITAL ACCOUNTS (When the Capital are fluctuating)**

Dr.
Cr.

Particulars	A	B	C	Particulars	A	B	C
	Rs.	Rs.	Rs.		Rs.	Rs.	Rs.
To Drawings				By Balance b/d (Opening Balance)			
To Interest on Drawings				By Cash/Bank A/c (additional Capital)			
To P & L A/c (Share of loss, in case of loss)				By Interest on Capital			
To Balance c/d (Closing Balance)				By Salary			
				By Commission			
				By P&L Appropriation A/c (share of profit, in case of profit)			

Current Accounts are not prepared when the capitals are fluctuating

After this worksheet you should be able to answer following questions:

Q1- Distinguish between:

- a) Fixed Capital Account and Fluctuating Capital Account.
- b) Capital Account and Current Account.

Q2- Give two instances in which the fixed capital is of partners may change.

Q3- How interest on partner's loan and rent paid to partners are treated in the accounts of a partnership firm?

Q4- How are following items shown in case the capital are- a) fixed and b) fluctuating:

- Additional capital introduced
- Drawings
- Withdrawal of capital
- Interest on capital
- Interest on loan from a partner.

BUSINESS ENVIRONMENT – CHAPTER 1

- Importance of Business Environment
- Dimensions of business environment

Importance of business environment:

It is very important for business firms to understand their environment and changes occurring in it. Business enterprise which know their environment and are ready to adapt to environmental changes would be successful. Therefore, management of a business enterprise must have deep understanding and appreciation of the environment. The changes taking place in the environment must be continuously monitored to judge their impact on business. Some of the direct benefits of understanding the environment are given below:

1. **First Mover Advantage:** Awareness of environment helps an enterprise to take advantage of early opportunities instead of losing them to competitors. For example Maruti Udyog became the leader in small car market because it was the first to recognise the need for small car on account of rising petroleum price and a large middle class in India.
2. **Early Warning Signal:** Environmental awareness serves as an early warning signal. It makes a firm aware of the impending treat or crisis so that the firm can take timely action to minimise the adverse effects.
3. **Customer focus:** Environmental understanding makes the management sensitive to the changing need and expectations of customers. For example, HUL and other FMCG companies launched small sachets of shampoo and other products realising the wishes of customers and to increase their revenue as well.
4. **Coping with changes:** Business leaders are expected to cope with rapid changes in environment. In order to decide the direction and nature of change the leaders need to understand the aspiration of people and other environmental forces through environmental scanning.
5. **Continuous learning:** Environmental analysis serves as broad based and on-going education for business executives. It keeps them in touch with the changing scenario so that they are never caught unaware. Managers can react in an appropriate manner and thereby increase the success of their organisations.

Dimensions of business environment:

The dimensions or the factors constituting the business environment are divided into two broad categories:

1. Micro (includes internal and external factors)
2. Macro (includes general factors like economic, social, legal, technological and political factors.)

1. **Micro Environment:** It refers to the internal and external factors which are close to a business that have a *direct* impact on its business operations and success. Micro environment is also termed as Direct Environment. It may be classified into two categories, viz. internal and external factors.

A: Internal Factors:

Forces or condition or surroundings within the boundary of the organisation are the elements of the internal micro environment. Internal factors can be controlled because these are within the decision-making power of the business enterprise. For example, a business enterprise can change the internal policies to keep pace with the changing environment. Some of the internal factors which influence the business are as follows:

- (i) **Management structure:** Management structure includes the composition of the board of directors, pattern of shareholding, organisation structure, etc. These factors influence the decision making.
- (ii) **Mission and objectives:** The objective of any business is to maximise its profits. However, mission is the overall purpose for the existence of business enterprise. Objective is a much narrower concept as compared to mission .Both objectives and missions influence short-term and long-term decision-making of the business and determine its strength and weaknesses. The mission of Dhirubhai Ambani to make Reliance the biggest group in the private sector prompted him to launch world scale plant in petrochemicals and other industries.
- (iii) **Value system:** The value system of an organisation means the beliefs that help the organisation in achieving its objective. Value system of a business enterprise has an important bearing on the choice of business, policies, behaviour towards employees, society etc.

- (iv) **Human Resources:** The success of a business enterprise depends to a great extent on the skills and capabilities of its employees. Employees' friendly management is most likely to achieve the desired objectives. Employees should be kept motivated by providing various benefits like, bonus, good performances appraisals, awards and recognition, etc. A well-motivated employee helps a business to effectively and efficiently achieve its objectives.
- (v) **Company image and Brand Equity:** The image and brand equity of the company play a significant role in raising finance, forming alliances, choosing dealers and suppliers, launching new products, entering foreign markets etc.

B. External Factors:

An external environment is comprised of all those outside factors or influences that impact the operation of a business enterprise. Micro external forces have a significant effect on business operations of a firm. Some of the external factors which influence the business are as follows:

- (i) **Suppliers:** Inputs such as raw material, fuel etc. are provided by the suppliers and help in smooth conduct of the business/. A business enterprise should have more than one supplier so that change in policies of one supplier does not affect the smooth function of the business.
- (ii) **Competitors:** Business firms compete with each other to gain competitive edge. They constantly watch the competitor's policies and adjust their policies accordingly.
- (iii) **Customers:** Since sale of a product or service is critical for the firm's survival and growth, customer satisfaction must be given top priority. A business firm must understand needs and requirements of its customers so as to ensure success.
- (iv) **Market Intermediaries:** They are the links that help to promote, sell and distribute the products to final customers. Market intermediaries include agents and merchants such as wholesalers, retailers etc. They are an important link between a business enterprise and its buyers. A business must maintain good relations with the intermediaries if it has to succeed in this age of intense competition.

2. **Macro Environment:**

Macro environment refers to the general environment that *can affect the working of all business enterprises*. It influences the business either indirectly or distantly because the business is not continuously interacting with the macro environment. Therefore, macro environment is also known as Indirect Environment. These factors are uncontrollable. These comprise the following elements:

(i) **Economic Environment:**

It refers to all those economic factors, which have a bearing on the functioning of a business enterprise. Following are the main components of Economic Environment of a business.

- (a) Economic policies such as industrial policy, monetary policy etc.
- (b) Inflation rate, tax rates, interest rates etc.
- (c) Demand and Supply patterns
- (d) Industrial and economic development
- (e) General price level changes
- (f) Composition of trade, pattern of investment etc.,
- (g) Economic system
- (h) Infrastructure (Transportation, power etc.)

(ii) **Social Environment :**

Social Environment of business comprises all factors which socially affect a business enterprise. Social factors include customers, fashions, traditions, level of education, religious value, etc. For example the young generation prefers to shop online while older generation will prefer traditional shopping methods, i.e., by visiting the stores. Main components of Social Environment are:

- (a) Educational level
- (b) Demographic trend
- (c) Customs, culture and traditions – as per culture and tradition, festivals like Eid, Diwali, Xmas etc. provide opportunities for consumer durables, restaurants, sweets etc.
- (d) Social Trend- the craze for health and fitness led to a revolution in establishing fitness spas as well as diet foods.
- (e) Social concerns (e.g. concern for pollution)
- (f) Business ethics and values.

(iii) **Legal Environment :**

The legal or regulatory environment comprises diverse laws, e.g. the Indian Contract Act, 1872, the Sale of Goods Act, 1930, the Consumer

Protection Act 1986, various other industrial and labour laws, etc., passed by the government of a country, court judgements, administrative orders issued by government authorities, etc. It is important for the entrepreneurs to understand the legal framework in running the business smoothly and to avoid legal consequences if any.

(iv) Technological Environment :

It includes the discovery of new methods of producing goods and services, new techniques of operating business, innovations and improvement in the existing methods of doing business etc. The survival of a business largely depends upon its technological advancement. For example, innovation in mobile industry by the entry of smartphones had a great impact on camera companies like Kodak.

(v) Political Environment:

Political environment in a country affects the business organisations. The political environment may change because of the policies of governments. Following factors affect the political environment. Following factors affect the political environment:

- (a) Policies of the ruling party
- (b) Political stability
- (c) Extent of government intervention in business
- (d) Type of government (i.e. single-party or multi-party)
- (e) Peace in the country.

Assignments:

Short Answer Question

- 1. Name various dimensions of Business Environment.
- 2. Name any *two* benefits of understanding the environment.
- 3. Give any *two* differences between micro and macro environment.

Long answer question

- 1. Explain the significance of understanding environment in shaping future of business.
- 2. Briefly explain any *five* external factors of micro environment of business
- 3. Discuss any *five* elements of macro environment.

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TOPIC- MONEY : MEANING AND FUNCTIONS

- Read the text given below and answer the following questions:

13.4 FUNCTIONS OF MONEY


Money came into existence to overcome the difficulties of barter system of exchange. By performing various functions in the economy, money has solved the difficulties of barter and made the functioning of the economy easier and better. In fact, we have defined money in terms of its functions.

Money performs several important functions. Prof. Kinley has classified the functions of money into three groups:

- (i) Primary functions
- (ii) Secondary functions
- (iii) Contingent functions.

David Kinley (1861–1944)

David Kinley was a Scotland born economist who worked in the United States. He was professor and head of the department of economics at the University of Illinois. Later he became the President of this University. As an economist, he specialised in the field of money and banking.



13.4.1 Primary Functions

In this category are included those functions of money which are fundamental and essential. These functions must be performed by money in every economy under all circumstances.

Primary functions of money are as follows:

1. **Medium of Exchange:** The most important function of money is that it serves as a medium of exchange. This function of money is so important that the definition of money emphasises particularly this function of money. Money commands general purchasing power to purchase goods and services which people want. Money is generally and widely accepted as the medium through which most of the purchases or sales are made. The use of money as a common medium of exchange has facilitated exchange greatly. It has removed the inconvenience and inefficiency which characterise the barter system. It has avoided the wastage of time and resources involved in exchange, and has eliminated the need for double coincidence of wants needed in barter. Thus, money has promoted efficiency in exchange. Moreover, use of money has also promoted efficiency in production by making it possible to exploit the gains from specialisation and division of labour.

2. **Measure of Value:** The second important function of money is that it acts as a common measure of value or unit of account. Just as we use kilogram in measuring the weight of a commodity, similarly for measuring value of a commodity we take money as a unit of account. Money serves as a unit of measurement in terms of which the values of all goods and services are measured and expressed. When we express the value of a commodity in terms of money, it is known as price. Price is nothing but the units of money, say rupees, for which a unit of a commodity is exchanged or sold.

The use of money as a measure of value has simplified the problem of measuring the exchange values of various commodities in the market. Since the values of all commodities are expressed in terms of money, it becomes easy to determine the rate of exchange between them. For example, if the price of a trouser is ₹1000 and the price of a shirt is ₹500, then the rate of exchange between a trouser and a shirt is one

trouser for 2 shirts. Under the barter system of exchange, the number exchange ratios among goods and services is unusually large since value of each commodity has to be expressed in terms of every other commodity. Use of money as a measure of value has simplified this problem.

13.4.2 Secondary Functions

In this category, we include those functions of money which are derived from the primary functions. The following are the secondary functions of money:

1. **Standard of Deferred Payments:** Money serves as a standard of deferred payment. Acting as a standard of deferred payments means that a payment to be made in future can be stated in money terms. This is an extension of the medium of exchange function of money. Here again, money is used as a medium of exchange, but this time the payment is spread over a period of time. Thus, as soon as money is used as a medium of exchange and as a unit of value, it is almost inevitably used as the unit in terms of which all future or deferred payments are expressed.

In a modern economy, a large number of transactions involve payments in future. For example, interest, rent, salaries, pensions, loans, insurance premia, are the transactions which involve such future payments expressed in money terms. The reason why they are expressed in money terms is that money has the quality of general acceptability and it can be expressed in definite and standardised units. Loans, interest, rent, wages, etc. expressed in kind are not uncommon, but expressing these in terms of commodities is likely to be very inconvenient and indefinite. Thus, when you lend ₹10,000 for a year, you know the definite amount you would be getting back after one year. But if you lend a horse for a year, you may not get back a horse of the same virtues and qualities after a year.

2. **Store of Value:** Money also serves as a store of value, i.e., people can keep their wealth in the form of money. In the barter

➤ **Very Short Answer Questions (2 marks)**

Question 1. What are the primary functions of money?

Question 2. What are the secondary functions of the money ?

➤ **Short Answer Questions (3 marks)**

Question 1. Discuss two contingent functions of money .

Question 2.. Explain the following functions :

a) Medium of exchange b) store of value

Long Answer Questions (6 marks)

Question - Explain the concept of money. Discuss various functions performed by money in an economy.

MATRICES (CONTD.....)

As we know $A^2 = A \cdot A$, $A^3 = A^2 \cdot A$ and so on , but when we have to prove $A^n = A \cdot A \dots \dots n$ times then we use **Induction Method**.

ILLUSTRATION 3:

If $A = \begin{pmatrix} a & 1 \\ 0 & a \end{pmatrix}$, then prove that $A^n = \begin{pmatrix} a^n & na^{n-1} \\ 0 & a^n \end{pmatrix}$

Solution: Put $n=1$ $A^1 = \begin{pmatrix} a & 1 \\ 0 & a \end{pmatrix}$ Which is true. -----(1)

Assume that the given result is true for $n = k$ i.e. $A^k = \begin{pmatrix} a^k & ka^{k-1} \\ 0 & a^k \end{pmatrix}$ ----- (2)

Now we have to prove for $n = k+1$ i.e. $A^{k+1} = A^k \cdot A^1 = \begin{pmatrix} a^{k+1} & (k+1)a^k \\ 0 & a^{k+1} \end{pmatrix}$ -----(3) To be Proved.

Putting the values of (1) and (2) , we get $A^k \cdot A^1 = \begin{pmatrix} a^k & ka^{k-1} \\ 0 & a^k \end{pmatrix} \begin{pmatrix} a & 1 \\ 0 & a \end{pmatrix}$
 $= \begin{pmatrix} a^k \cdot a + 0 & a^k \cdot 1 + ka^{k-1} \cdot a \\ 0 + 0 & 0 + a^k \cdot a \end{pmatrix} = \begin{pmatrix} a^{k+1} & a^k(1+k) \\ 0 & a^{k+1} \end{pmatrix} =$ same as (3). Hence Proved.

Prove by the Principle of Mathematical Induction:

1. If $A = \begin{pmatrix} 3 & -4 \\ 1 & -1 \end{pmatrix}$, then prove for all positive integers n ; $A^n = \begin{pmatrix} 1 + 2n & -4n \\ n & 1 - 2n \end{pmatrix}$
 2. If $A = \begin{pmatrix} a & b \\ 0 & 1 \end{pmatrix}$, then prove that $A^n = \begin{pmatrix} a^n & \frac{b(a^n-1)}{a-1} \\ 0 & 1 \end{pmatrix}$ for all positive integers n .
 3. If $A = \begin{pmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{pmatrix}$, then prove for all positive integers n ; $A^n = \begin{pmatrix} \cos nx & \sin nx \\ -\sin nx & \cos nx \end{pmatrix}$
 4. If $A = \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix}$, then prove that $A^n = \begin{pmatrix} 2^{n-1} & 2^{n-1} \\ 2^{n-1} & 2^{n-1} \end{pmatrix}$ for all positive integers n .
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ILLUSTRATION 4 :

Find the matrix X such that $\begin{pmatrix} 5 & 4 \\ 1 & 1 \end{pmatrix} X = \begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$

Solution: Since $\begin{pmatrix} 5 & 4 \\ 1 & 1 \end{pmatrix}$ is 2×2 matrix , and resulting product $\begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ is also 2×2

First of all we judge the order of matrix X . $[2 \times 2 \text{ matrix}] X = [2 \times 2 \text{ matrix}]$ therefore

According to order criteria X should also be of 2×2 matrix. Then only $[]_{2 \times 2} []_{2 \times 2} = []_{2 \times 2}$

Therefore let us assume $X = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

Now $\begin{pmatrix} 5 & 4 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$

$\Rightarrow \begin{pmatrix} 5a + 4c & 5b + 4d \\ a + c & b + d \end{pmatrix} = \begin{pmatrix} 1 & -2 \\ 1 & 3 \end{pmatrix}$ or $5a + 4c = 1$, $a + c = 1$ which gives $a = -3$, $c = 4$

And $5b + 4d = -2$, $b + d = 3$ gives $b = -14$, $d = 17$

Therefore $X = \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} -3 & -14 \\ 4 & 17 \end{pmatrix}$

Solve the following:

5. If $A = \begin{pmatrix} 3 & -4 \\ -1 & 2 \end{pmatrix}$, find matrix B such that $BA = I$

Ans: $\begin{pmatrix} 1 & 2 \\ 1/2 & 3/2 \end{pmatrix}$

[Hint: B will also be of order 2x2 and I is identity matrix]

6. Find matrix A such that $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} A = \begin{pmatrix} 3 & 3 & 5 \\ 1 & 0 & 1 \end{pmatrix}$

Ans: $\begin{pmatrix} 2 & 3 & 4 \\ 1 & 0 & 1 \end{pmatrix}$

[Hint: A will be of order 2x3 matrix]

TRANSPOSE OF A MATRIX

Transpose of a matrix is *Interchanging Rows with Columns and vice versa*. That means First row will become first column, second row will become second column and so on.

Transpose of a matrix is denoted by A' or A^t

e.g. $A = \begin{pmatrix} 1 & 2 & 3 \\ -1 & 0 & 5 \end{pmatrix}$, then $A^t = \begin{pmatrix} 1 & -1 \\ 2 & 0 \\ 3 & 5 \end{pmatrix}$ So clearly if A is of order 2x3, A^t will be of order 3x2.

Properties of Transpose

1. $(A^t)^t = A$
2. $(\lambda A)^t = \lambda A^t$
3. $(A + B)^t = A^t + B^t$
4. $(AB)^t = B^t A^t$

[watch carefully: order reverses. It is also called Reversal Law]

Symmetric and Skew Symmetric Matrix

A square matrix A of order mxn is called *Symmetric* if $A' = A$ and it is *Skew Symmetric* if $A' = -A$

For e.g. if $A = \begin{pmatrix} a & h & g \\ h & b & f \\ g & f & c \end{pmatrix}$, then $A' = \begin{pmatrix} a & h & g \\ h & b & f \\ g & f & c \end{pmatrix}$ that means A' is same as A

Therefore A is a *Symmetric Matrix*.

Whereas if $B = \begin{pmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{pmatrix}$, then $B' = \begin{pmatrix} 0 & -a & -b \\ a & 0 & -c \\ b & c & 0 \end{pmatrix}$. We can clearly see that $B' = -B$

Therefore B is a *Skew Symmetric Matrix*.

Important Observation: You will observe that all diagonal elements of a Skew symmetric matrix are always zero.

Proof: Since diagonal element is denoted by a_{ii}

[a_{11} , a_{22} , a_{33} are diagonal elements]

In a skew symmetric matrix for $A' = -A \Rightarrow a_{ji} = -a_{ij}$

$\Rightarrow 2 a_{ij} = 0$ or $a_{ij} = 0$, means diagonal elements will be always zero in case of a skew symmetric matrix.

ILLUSTRATION 5:

(i) $A = \begin{pmatrix} 3 & -1 & 1 \\ 4 & 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{pmatrix}$ Prove that $(A + B)^t = A^t + B^t$

$(A + B)^t$ $A^t + B^t$

$$A + B = \begin{pmatrix} 2 & 1 & 2 \\ 5 & 4 & 6 \end{pmatrix}$$

$$\Rightarrow (A + B)^t = \begin{pmatrix} 2 & 5 \\ 1 & 4 \\ 2 & 6 \end{pmatrix}$$

$$A^t = \begin{pmatrix} 3 & 4 \\ -1 & 2 \\ 1 & 3 \end{pmatrix} \text{ and } B^t = \begin{pmatrix} -1 & 1 \\ 2 & 2 \\ 1 & 3 \end{pmatrix}$$

$$\Rightarrow A^t + B^t = \begin{pmatrix} 2 & 5 \\ 1 & 4 \\ 2 & 6 \end{pmatrix}$$

(ii) $A = \begin{pmatrix} -1 & 2 \\ 0 & 3 \\ 4 & 2 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 & 5 \\ 3 & -2 & 6 \end{pmatrix}$, Prove that $(A B)^t = B^t A^t$

$$AB = \begin{pmatrix} -1+6 & 0-4 & -5+12 \\ 0+9 & 0-6 & 0+18 \\ 4+6 & 0-4 & 20+12 \end{pmatrix}$$

$$\Rightarrow AB = \begin{pmatrix} 5 & -4 & 7 \\ 9 & -6 & 18 \\ 10 & -4 & 32 \end{pmatrix}$$

$$\Rightarrow (AB)^t = \begin{pmatrix} 5 & 9 & 10 \\ -4 & -6 & -4 \\ 7 & 18 & 32 \end{pmatrix}$$

$$B^t = \begin{pmatrix} 1 & 3 \\ 0 & -2 \\ 5 & 6 \end{pmatrix} \text{ and } A^t = \begin{pmatrix} -1 & 0 & 4 \\ 2 & 3 & 2 \end{pmatrix}$$

$$B^t A^t = \begin{pmatrix} -1+6 & 0+9 & 4+6 \\ 0-4 & 0-6 & 0-4 \\ -5+12 & 0+18 & 20+12 \end{pmatrix}$$

$$\Rightarrow B^t A^t = \begin{pmatrix} 5 & 9 & 10 \\ -4 & -6 & -4 \\ 7 & 18 & 32 \end{pmatrix}$$

Solve the following :

7. If $A = \begin{pmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{pmatrix}$, then verify that $A' A = I_2$

8. If $A' = \begin{pmatrix} -2 & 3 \\ 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 0 \\ 1 & 2 \end{pmatrix}$, then find $(A + 2B)'$

Ans: $\begin{pmatrix} -4 & 5 \\ 1 & 6 \end{pmatrix}$

9. If $A = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 0 \\ 2 & 5 \\ 3 & 4 \end{pmatrix}$, then find $(BA)'$

Ans: $\begin{pmatrix} -3 & 1 & 5 \\ -2 & 9 & 10 \end{pmatrix}$

10. Find the values of 'a' and 'b' if $A A^t = 9I_3$ where $A = \begin{pmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{pmatrix}$

Ans: a = -2, b = -1

11. For what value of 'x', is $A = \begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{pmatrix}$ skew symmetric. [$A' = -A$]

Ans: x = 2

ILLUSTRATION 6: If $A = \begin{pmatrix} 1 & 4 \\ 3 & 7 \end{pmatrix}$, Show that $A - A^t$ is skew symmetric.

Solution: $A - A^t = \begin{pmatrix} 1 & 4 \\ 3 & 7 \end{pmatrix} - \begin{pmatrix} 1 & 3 \\ 4 & 7 \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

Now $A - A^t$ will be skew symmetric if $(A - A^t)' = -(A - A^t)$

$(A - A^t)' = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} = -(A - A^t)$, Hence $A - A^t$ is skew symmetric.

12. If $A = \begin{pmatrix} 4 & 1 \\ 5 & 8 \end{pmatrix}$, Show that $A + A^t$ is symmetric matrix.

13. If A, B are skew symmetric matrices and $AB = BA$, Show that AB is symmetric.

Solution: Since A, B are skew symmetric matrices, it means $A' = -A$, $B' = -B$

Now AB will be symmetric if $(AB)' = AB$

$\Rightarrow B' A' = AB \Rightarrow (-B)(-A) = AB \Rightarrow BA = AB$ which is true. (Given)

Hence AB is symmetric.

14. If A and B are skew symmetric matrices of the same order, prove that AB is symmetric if and only if A and B Commute. **[Hint : To prove $AB = BA$]**

15. If A and B are symmetric matrices of same order, prove that $AB - BA$ is a skew symmetric matrix.

16. Find the integral value of 'x' if $\begin{bmatrix} x & 4 & -1 \end{bmatrix} \begin{bmatrix} 2 & 1 & -1 \\ 1 & 0 & 0 \\ 2 & 2 & 4 \end{bmatrix} \begin{bmatrix} x & 4 & -1 \end{bmatrix}^t = 0$ Ans: -4

[Hint: $\begin{bmatrix} \quad \end{bmatrix}_{1 \times 3} \begin{bmatrix} \quad \quad \quad \end{bmatrix}_{3 \times 3} \begin{bmatrix} \quad \quad \quad \end{bmatrix}_{3 \times 1} = \begin{bmatrix} \quad \end{bmatrix}_{1 \times 1}$

$\begin{pmatrix} 2x + 4 - 2 & x + 0 - 2 & -x + 0 - 4 \end{pmatrix} \begin{pmatrix} x \\ 4 \\ -1 \end{pmatrix} = 0$

Cricket

The size of the field on which the game is played varies from ground to ground but the pitch always remains the same.

Pitch:

- It is a rectangular area of **20.12 m (22 yds)** in length and **3.05 m** in width.
- The popping (batting) crease is marked **1.22 m** in front of the stumps at either end, with the stumps set along the bowling crease.
- The return creases are marked at right angles to the popping and bowling creases and are measured **1.32 m** either side of the middle stumps.
- The two set of wickets at opposite ends of the pitch stand **71.1 cm or (28 inches)** high and three stumps measure **22.86 cm or (9 inches)** wide in total.

The ball :

- A cricket ball is made with a core of cork, which is layered with tightly wound string, and covered by a leather case with a slightly raised sewn seam.

Cricket ball specifications	
Weight	Circumference
5.5 to 5.75 ounces or (156 to 163 grams)	8.81 to 9 inches or (224 to 229 mm)

The Bat:

- The **length** of the bat is not more than **38 inches** and **width** of the bat is not more than **4.25 inches**, the overall **depth** not more than **2.64 inches** and an edge not more than **1.56 inches**. Bats typically weigh from **1.2 to 1.4 kg** though there is no standard.

Stumps and Bails:

- The stumps and bails are usually made of wood, most commonly ash and together form a wicket at each end of the pitch. The overall width of each wicket is **9 inches (22.9 cm)**. each stump is **28 inches (71.1 cm)** high with maximum and minimum diameters of 1.5 inches (3.81 cm) and $1\frac{3}{8}$ inches (3.49 cm). each stump is referred to by a specific name:
- Off stump is the stump on the off side of the wicket (the same side as the batsman's bat).
- Middle stump is the centre stump, the middle of the three stumps.

- Leg stump is the stump on the on (leg) side of the wicket (the same side as the batsman's legs).

Note: these names are relative to the batsman, so a right handed batsman's leg stump becomes the off stump when a left hander player is batting.

- A bail is one of the two smaller sticks placed on top of the three stumps to form a wicket. Each bail shall have the following specifications:
 - Overall length of bail 10.95 cm or 2.87 inches
 - The bails are used to determine when the wicket is broken, which in turn is one of the critical factors in determining whether a batsman is out bowled, stumped, run out or hit wicket.
- ❖ The wicket is considered to be broken if one or both of the bails fall from the stumps, or a stump is struck out of the ground, by:
 1. The ball
 2. The striking batsman's bat, or any part of the striker's body or clothing (even if it falls off)
 3. A fielder with the hand or arm holding the ball.

Compulsory equipments:

The equipments which are required or must be on the field are

- Cricket ball
- Cricket bat
- Wickets (stumps)
- Bails
- Protective Gear: pads, gloves (batting), helmet etc. for batsmen to wear to prevent injury when struck by the ball.
- Shoes: leather, usually with spiked soles for grip on the grass.

The player's equipments:

Following are the equipments worn by the player:

- Abdominal guard or "box" or an L Guard for male batsmen and wicket keepers.
- Sun hats and cricket caps.
- Spiked shoes to increase traction.
- Helmet worn by batsmen and fielders close to the batsman on strike to protect their heads.
- Leg pads, worn the two batsmen and the wicket keeper, used to protect the shin bone against impact from the ball.
- Thigh guards, arm guards, chest guard, and elbow guards to protect the body of the batsmen.

- Batting gloves for batsmen only.
- Wicket keeper's gloves for the wicket keeper. Usually includes webbing between the thumb and index fingers.
- Safety glasses, for wicket keepers, to prevent damage to the eyes from dislodged bails impacting between the grill and peak of the helmet.

Ball becomes dead when:

- It is finally settles in the hands of the wicket keeper or the bowler.
- A boundary is scored e.g. boundary for four runs or boundary for six runs.
- A batsman is dismissed. (Any of the way of getting out).
- Weather played or not it lodges in the clothing or equipment of a batsman or the clothing of an umpire.
- Lost ball is called.
- The umpire calls over or time.
- Intervening in a case of unfair play;
- A possibly serious injury to a player or umpire occurs;

Duties of officials before during and after the match:

Duties before match:

- Inspect the pitch area, make sure that all equipment is set out, and check that the boundary is correctly marked before play begins.
- Collect the nomination.
- Discuss hours of play, the timings of food and drink break with team captains. (Instructions on various matters).
- Check the weather and light conditions.
- To see that the wickets are properly pitched.

During the match:

- The umpires should ensure that the game is conducted and the equipments used strictly in accordance with the laws.
- Umpires shall make frequent and regular inspections of the condition of the ball.
- If there is any dispute regarding the use of the ball, the umpires shall change the ball after consultation and the ball must be of similar condition to that in use.
- It is the umpire's duty to intervene in the case of the time wasting, ball tampering, dangerous bowling or damage of the pitch.
- Umpires are also responsible for signal for no balls, wide balls, byes, leg byes and boundary for four and six runs.

- Leg umpire is responsible for stumping, run out at his end, no ball above the waist height, hit wicket, and check the bowling action of the bowler.

Duties after match:

- After the match both umpires discuss the whole match scenario and if any problems lie then they report the authority. Their duty is also to check the pitch and field equipments on the ground.

Third umpire and match referee:

- The third umpire has the right to say on decisions refereed to the television replay by the on-field umpires. This ruling includes run outs, stumping, balls stopped on the boundary by a fielder and catches that the on field umpires are unsure about. A red light indicates that the batsman is out and a green one otherwise.
- There is one **match referee** in a standard cricket match. The match referee is responsible for handling disciplinary matters. He has the power to fine a player for arguing with the umpires or expressing dissent.

Scorer:

- The scorer is someone is appointed to record all runs scored, all wickets taken and , where appropriate, the numbers of over bowled. In professional games, in compliance with the laws of cricket, two scorers are appointed for the match.

