Unit # 01
Quadratic Equation

"Those equations which contain highest power two of unknown variable are called quadratic equations."

Example:

$$2x^2 + x - 1 = 0$$

Standard Form:

$$ax^2 + bx + c = 0$$

Types:

- Quadratic Equation
- Pure quadratic equation

Pure Quadratic Equation:

"If $b = 0$ in $ax^2 + bx + c = 0$, then $ax^2 + c = 0$ is called pure quadratic equation."

Example:

$$2x^2 + 1 = 0$$

Imp. points:

- It has **three terms**.
- It has **two roots**.
- It's graph is called **parabola**.

Parabola:

In mathematics, parabola is a plane curve which is u-shaped.

Methods:

There are three methods to solve a quadratic equation:

- Factorization
- Completing Squares
- Quadratic Formula

Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Reciprocal Equation:

"An equation which **remain unchanged** when x is replaced by $\frac{1}{x}$ is called reciprocal equation."

Example:

$$x^2 + x + 1 = 0$$

Exponential Equation:

"An equation in which the variable occurs in the **exponential form** is called exponential equation."

Example:

$$2^{x^2-2} + 2^x - 1 = 0$$

Radical Equation:

The equation in which the

variable occurs under the **radical sign** is called radical equation."

Example:

$$\sqrt{x^2-x}+1=0$$

Extraneous Root:

"The root of an equation which does not **satisfy the equation** is called extraneous root."

Example:

$$\sqrt{2x-1}+5=2$$

Imp. point:

If $a=0$ in $ax^2+bx+c=0$, then it reduces to a linear equation $bx+c=0$.

Unit # 02
Theory of Quadratic Equations

Discriminant:

"In quadratic formula $\left(\frac{-b \pm \sqrt{b^2-4ac}}{2a}\right)$ b^2-4ac is called discriminant."

Importance:

Discriminant tells the **nature of root.**

Determination:

We can determine the nature of roots through discriminant.

- **$b^2-4ac > 0$:-**

  If $b^2-4ac > 0$ and complete square then roots will be **rational and unequal**.

- **$b^2-4ac > 0$:-**

  If $b^2-4ac > 0$ but not complete square then roots will be **irrational and unequal.**

- **$b^2-4ac = 0$:-**

  If $b^2-4ac = 0$, then roots will be **real** (rational) **and equal**.

- **$b^2-4ac < 0$:-**

  If $b^2-4ac < 0$, then roots will be **imaginary**.

Synthetic Division:-

"The process of finding the **quotient** and **remainder**, when a polynomial is divided by a **linear polynomial** is called synthetic division."

Example:

$$(x^4 - x^3 + x^2) \div (x-1)$$

Symmetric Function:-

"Symmetric functions are those functions in which the roots involved in such a way that the value of expression involving them remain unaltered, when **roots are interchange.**"

Simultaneous Linear Equations:-

"There are two equations which have a **common solution** are called simultaneous linear equations."

Unit # 03
Variations

Ratio:-

"A relation between two quantities of the same kind is called **ratio.**"

Example:

1 : 2

Points:

- The **order of elements** in ratio is important.
- In ratio a : b , the first term a is called **antecedent** and the second term b is called **consequent**.
- A ratio has no **units** .
- a:b is standard form.

Proportion:-

"Equality of two ratios is called proportion."

Example:

1 : 2 :: 4 : 8

Standard Form:

a : b :: c : d

Extremes:

"In $a:b::c:d$, **a , d** are called extremes."

Means:

"In $a:b::c:d$, **b , c** are called means."

Types:

- Third Proportional
- Fourth Proportional
- Mean Proportional
- Continued Proportional

- **Third Proportional:**

"If three quantities a, b, c are related as $\mathbf{a:b::b:c}$, then c is called third proportional."

- **Fourth Proportional:**

"If four quantities, a, b, c, d are connected as $\mathbf{a:b::c:d}$ then d is called fourth proportional."

- **Mean Proportional:**

"If three quantities a, b, c are related in such a way $\mathbf{a:b::b:c}$, then b is called mean proportional."

- **Continued Proportion:**

If a,b,c are in relation of **a:b::b:c**, where a is first, b is mean proportional, c is third proportional then a,b, c are in a **continued proportion.**

Variation:-

Variation is frequently used in all sciences.

- **Direct Variation:**

If two quantities are related in such a way if one **increase** the other also increase and vice versa.

Example:

- distance and time
- work and time

- **Inverse Variation:**

In inverse variation, two quantities are related in such a way that if one **increase** the other **decrease** and vice verca.

Example:

- worker and time
- speed and time

- **Joint Variation:**

"A combination of **direct and inverse** variations of one or more than one variables forms a joint variation."

Example:

$$y \propto x \Rightarrow y \propto \frac{1}{z}$$
$$y \propto \frac{x}{z}$$

Theorem on Proportion:-

If a, b, c, d form a proportion, then many other useful properties may be deduced by the properties of fractions.

- **Invertendo:**

If $a:b::c:d$, then $b:a = d:c$, then it is known as theorem of **invertendo.**

Example:

$$\frac{3m}{2n} = \frac{p}{2q} \Rightarrow \frac{2n}{3m} = \frac{2q}{p}$$

- **Alternando:**

If $a:b::c:d$, then $a:c = b:d$, is called theorem of **alternando.**

Example:

$$\frac{3p+1}{2q} = \frac{5r}{7s} \Rightarrow \frac{3p+1}{5r} = \frac{2q}{7s}$$

- **Componendo:**

If $a:b::c:d$, then $a+b:b::c+d:d$ or $a:a+b::c:c+d$, is called theorem of **componendo**.

Example:

$$\frac{m+3}{n} = \frac{p}{q-2}$$

$$\frac{(m+3)+n}{n} = \frac{p+q-2}{q-2}$$

- **Dividendo:**

If $a:b::c:d$, then $a-b:b=c-d:d$ or $a:a-b=c:c-d$, is called theorem of **dividendo.**

Example:

$$\frac{m+1}{n-2} = \frac{2p+3}{3q+1}$$

$$\frac{m-n+3}{n-2} = \frac{2p-3q+2}{3q+1}$$

- **Componendo-Dividendo:**

If $a:b::c:d$, then $a+b:a-b::c+d:c-d$ or $a-b:a+b=c-d:c+d$ is called **componendo - dividendo** theorem.

Example: $\frac{2m}{3n} = \frac{lc}{4d} \Rightarrow \frac{2m+3n}{2m-3n} = \frac{lc+4d}{lc-4d}$

Unit # 04
Partial Fractions

Fraction:-

"The quotient of two numbers or algebraic expressions is called a **fraction.**"

Indication:

The quotient is denoted by a bar (—).

Example:

$\frac{2}{3}$, etc

Rational Fraction:-

"An expression of the form $\frac{N(x)}{D(x)}$, where $N(x)$ and $D(x)$ are **polynomials** with real coefficients and $D(x) \neq 0$ then it is called rational fraction."

Example:

$\frac{2x}{x+1}$, etc

Proper Fraction:-

A rational fraction, $\frac{N(x)}{D(x)}$ with $D(x) \neq 0$ is called **proper fraction** if degree of the polynomials $N(x)$ in the

the numerator is **less than** the degree $D(x)$ in the denominator.

Example:

$$\frac{2}{x+1}, \text{etc}$$

Improper Fraction:

A rational fraction $\frac{N(x)}{D(x)}$, with $D(x) \neq 0$ is called **improper fraction**, if degree of the polynomial $N(x)$ is **greater** or equal to the degree of the polynomial $D(x)$.

Example:

$$\frac{5x}{x+2}, \text{etc}$$

Partial Fraction:

A rational fraction is resolved into **sum of two or more algebraic expressions** is called partial fraction.

Example:

$$\frac{1}{(x+1)(x+2)} = \frac{A}{(x+1)} + \frac{B}{(x+2)}$$

Identity Equation:

An equation which is satisfied by all the **values of variables** is is called identity equation.

Examples:

$$\frac{2x^2}{x} = 2x \text{ , etc}$$

Unit # 05
Sets and Functions

Sets:-

"Set is a collection of set -**define** and distinct objects."

Example:

$A = \{1, 2, 3\}$

Elements:-

"The **objects of set** are called its elements or members."

Example:

$A = \{\underbrace{1, 2, 3}_{\text{elements}}\}$

Important Points:

- Set is always be denoted by capital alphabets i.e., A, B, C, etc.
- The idea of sets was given

by "George Cantor" in his book "Set Theory".

- A set cannot be consist of elements like **moral values, concepts, evils and virtures.**

Expressing a Set:-

There are three ways to express the set.

(i) Descriptive form (ii) Tabular form
(iii) Set builder form

- ## Descriptive Form:

If a set is described with the help of **a statement**, it is called descriptive form.

Example:

N = set of natural numbers
Z = set of integers

- ## Tabular Form:

If we list all elements of a set **with in the** { } and separate each element by using a comma ",". It is called **tabular form or reaster form.**

- Example:

$A = \{a, e, i, o, u\}$

$W = \{0, 1, 2, 3, \ldots\}$

- **Set Builder Form:**

If a set is described by using using a property of all its elements, it is called **set builder form.**

Example:-

"E is the set of even numbers."

$A = \{x | x$ is a solar months of a year$\}$.

Sub-set:-

If A and B are two sets, **each element** of set A is also an element of set B. Then set A is called subset of set B.

- **Symbolically:**

$$A \subseteq B$$

- Example:

$A = \{1, 2, 3\}$, $B = \{1, 2, 3, 4\}$

- **Types:**

These are two types of subset.

(i) proper sub-set

(ii) improper sub-set

(i) Proper Subset:-

If A and B are two sets. Each element of set A is also an element of set B. But **at least one element of set B** is not an element of set A. Then set A is called the proper subset of B.

- **Symbolically:**

$$A \subset B$$

- **Example:**

$A = \{1, 2, 3\}$
$B = \{1, 2, 3, 4, 5\}$

(ii) Improper Subset:-

If A and B are two sets. Set A is called improper subset of set B when set A is a **subset** of set B and set B is also a **subset** of set A.

- **Symbolically:**

$$A \subseteq B$$

- **Example:**

$A = \{1, 2, 3\}$
$B = \{3, 2, 1\}$

Power Set:-

A set consist of all the possible subset of given set is called power set.

Example:

$$A = \{1, 2\}$$

$$P(A) = \{\emptyset, \{1\}, \{2\}, \{1, 2\}\}$$

Important Points:

- Every set is a **subset** of itself.
- Every set is an **improper subset** of itself.
- The formula for finding the number of subset is 2^n.
- The formula for finding the number of **elements** of power set is also 2^n.
- There are no **proper** subset of an empty set.
- **Empty subset** is a common subset of all sets.
- **Empty** set is common **proper subset** of all non-empty sets.

- Singleton set has only one proper subset.
- The formula for finding proper subset is $2^n - 1$.
- The idea of set was given by George Cantor in his book set theory.

Operations on Sets:-

- **Commutative laws** of union and intersection on sets:-

If A and B are two sets then the commutative laws with respect to union and intersection are written as:-

(i) **For Union:**

$$A \cup B = B \cup A$$

(ii) **For Intersection:**

$$A \cap B = B \cap A$$

- **Associative Laws** of union and intersection on sets:-

If A, B, C are three sets then associative laws with respect to union and intersection are written as:-

i) **For Union:**

$$A\cup(B\cup C) = (A\cup B)\cup C$$

ii) **For Intersection:**

$$A\cap(B\cap C) = (A\cap B)\cap C$$

- **Distributive Property:-** For any three sets A, B and C. Distributive property on sets will be:-

(i) **of union over intersection:**

$$A\cup(B\cap C) = (A\cup B)\cap(A\cup C)$$

(ii) **Of intersection over union:**

$$A\cap(B\cup C) = (A\cap B)\cup(A\cap C)$$

- **De-Morgan's laws** for any two sets will be:-

(i) **For Union:**

$$(A\cup B)' = A'\cap B'$$

ii) **For Intersection:**

$$(A\cap B)' = A'\cup B'$$

⇒ **Types of Sets:-** There are many types of set. Some of them are defined below:

(i) **Singelton Set:-**

The set which contains only one element is called singleton set.

Example:

$\{1\}$, etc

(ii) **Empty Set:-**

The set which does not contain any element is called empty set.

Example:

$\{ \}$, ϕ, etc

(iii) **Finite Set:-**

The set which contains finite numbers of elements is called finite set.

Example:

$\{1, 2, 3\}$, etc

(iv) **Infinite Set:-**

The set which contains infinite numbers of elements is called infinite set.

Example:

$\{1, 2, 3, 4, \ldots\}$, etc

v) **Universal Set:-**

A set which contains all the elements of other sets and including its own elements is called universal set.

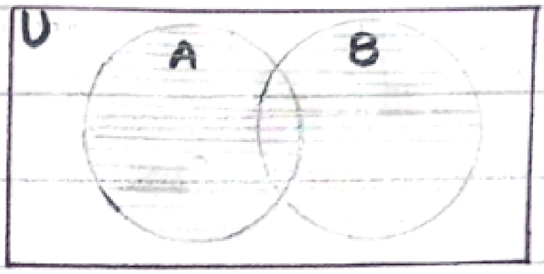
Example:

$U = \{1, 2, 3, \ldots\}$, $A = \{\ \}$, $B = \{2, 4\}$

vi) **Overlapping Sets:-**

If some elements of set A are also in set B then both sets are **overlapping sets.**

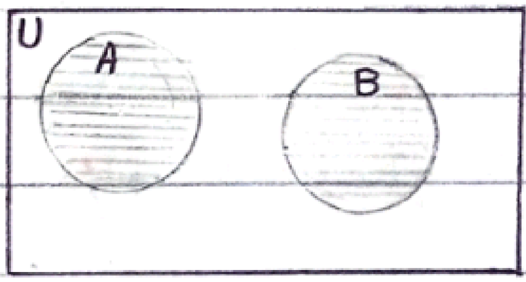
Example:



(vii) **Disjoint Sets:-**

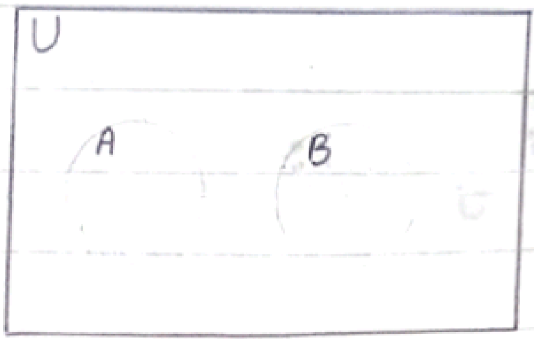
If elements of both sets are different then both sets are disjoint sets.

Example:



☆ **Venn Diagram:-**

Example:



- $A \cap B$

Imp. Point:

- British mathemacian **John Venn** (1834–1923) introduced the idea of venn diagram.
- Venn Diagram was first used by **Levis** in his book "**Servey of symbolic logic**".

Ordered Pair:-

Any two numbers x and y written in the form (x, y) is called ordered pair.

Example:

$$(x, y) = (s, t)$$

Cartesian Product:-

Cartesian product of two empty sets A and B denoted by

$A \times B$ consists of ordered pairs (x, y) such that $x \in A$ and $y \in B$.

Example:-

$A \times B = \{(1,2),(1,5),(2,2),(2,5)\}$

Binary Relation:-

If A and B are any two **non-empty** sets, then a subset $R \subseteq A \times B$ is called binary relation, from set A into set B. and it express a relationship between A and B.

Example:-

$A = \{1, 2\}$, $B = \{3,4\}$

$A \times B = \{(1,3),(1,4),(2,3),(2,4)\}$

$R = (1,4)$

$R \subseteq A \times B$

Domain:-

The set consisting of **first elements** of each ordered pair is called domain.

Denoted by:-

Dom R

Example:-

$(1, 2)$

Range:-

The set consisting of **second elements** of each ordered pair is called range.

Donoted by:-

Rang R

Example:-

(3, 4)

☆ Function:-

Let A and B are two non-empty sets. Then the relation **f: A→B** is called **function or mapping,** if:-

- domain function = A
- range function = B
- No first element ($x \in A$) of each ordered pair should be repeated.

☆ Imp. Points:-

- Formula to find binary relationship:-

- **For different sets:** G.W.Leibn $2^{m \times n}$
- **For same sets:** $2^{m \times m}$

- Function was discovered / invented by **G.W. Leibniz,** in **1673.**
- The relationship between **dependent and independent** variable. such that for each value x their is a unique image of y.

$y = x + 1$

dependent (y) — independent (x)

- Every **function** is a **relation** but every **relation** is not a **function.**
- $y=x+1$ is a realation and function.
- $y^2=x+1$ is a relation but not a function.

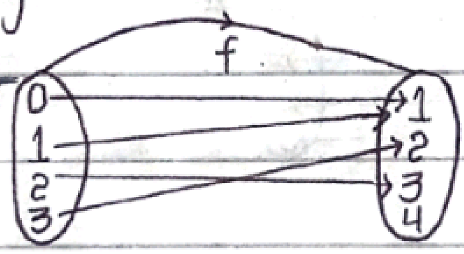
☆ Types of Fuction:-

There are following types of functions:

- **Into Function:**

A function $f: A \longrightarrow B$ is called an into function, if **at least one element in B is not an image of some element of set A,** i.e, Range of $f \subset$ set B.

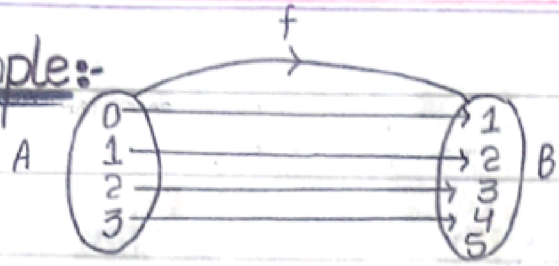
Example:



- **One-one function:**

A function $f: A \longrightarrow B$ is called one-one function, **if all distinct elements of A have distinct images in B.**

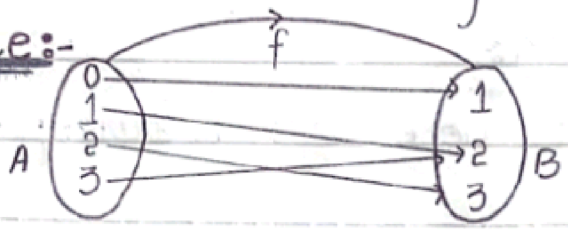
Example:-



- **Onto or surjective function:**

A function $f: A \to B$ is called an onto function, if every element of set B is an image of at least one element set A, i.e., Range of $f = B$.

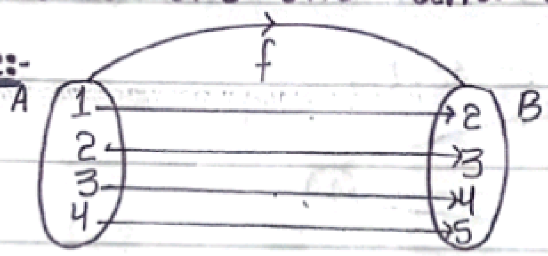
Example:-



- **Bijective function or one to one correspondence:**

A function $f: A \longrightarrow B$ is called bijective function if function is one-one and onto.

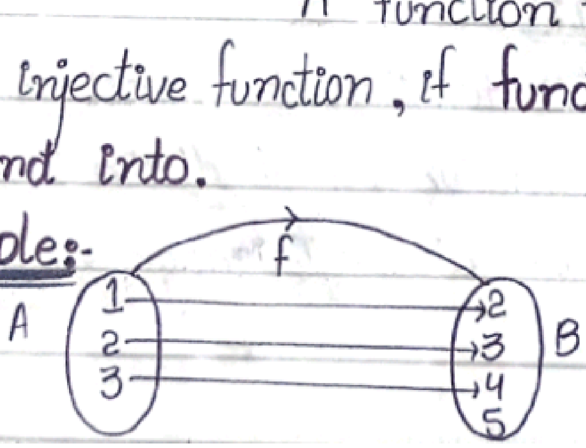
Example:-



- **Injective Function:-**

A function $f: A \to B$ is called injective function, if function is one - one and into.

Example:-



Unit # 06
Basic Statistics

☆ DATA :-

Data is a set of information and facts represented in the form of figures.

Example:-

2 , 4 , 4 , 6

☆ TYPES :-

There are two types of data.

(i) Group Data:-

The data which is arranged in a systematic order is called group data.

Example:

Data	Frequency
51 – 60	4
61 – 70	8
90 – 100	3

Imp. Points:-

- It contain frequency.
- There are further two types of group data

(i) Group data Discrete

(ii) Group data Continuous

(i) **Group data discrete:**

The data which tells us the frequency of individual is called group data discrete.

Example:-

x	f
2	4
3	1
5	2

(ii) **Group data continous:**

The data which tells us the frequency of groups or classes is called group data continous.

Example:-

groups	f
40 – 50	6
51 – 60	10
61 – 70	12

(iii) **Ungroup Data:-**

The data which is not arranged in any systamatic order (group or classes) is called ungroup data.

Example:-

2, 4, 6, 8, 10, etc

Imp. Point:

- It does not contain frequency.

☆ **FREQUENCY:-**

The numbers of times a value occurs in data is called frequency.

Example:

x	f
2	3
4	3

☆ **Frequency Distribution:-**

The tabular arrangement of data by which frequency of each class observed at once is called frequency distribution.

☆ **Class Limits:-**

The minimum and maximum values defined for a class are called class limits.

Imp. Points:-

- Minimum value of class limits is called **lower class limit.**
- Maximum value of class limits is called **upper class limit.**

☆ Class Boundries:-

The real class limits is called class boundries.

Example:-

Class limits	Class Boundries
1 — 9	0.5 — 9.5
10 — 19	9.5 — 19.5

lower class limit

upper class limit

☆ Class Mark / Mid Point:-

Class Mark is obtained by dividing the sum of upper class limit and lower class limit by 2.

Example:

Class limits	Class Mark
1 — 9	$1+9/2 = 5$
10 — 18	$\frac{10+18}{2} = 14$

lower class limit

upper class limit

* Cumulative Frequency:

The total of frequency up to an upper class limit or boundary is called cumulative frequency.

Example:

Class limit	Frequency	Cumulative F.
1 – 5	5	5
6 – 10	6	5+6 = 11
11 – 15	15	11+15 = 26
16 – 20	20	26+20 = 46
21 – 25	25	46+25 = 71
26 – 30	26	71+26 = 97

Measure of Central Tandency.

The technique which we use central value of observation of data is called **Measure central tendency.**

Example:

Mode, Median, Erithmatic Mean

Harmonic Mean   Geomatric Mean

Quartiles

☆ Arithmatic Mean:

Arithmatic mean is a measure that determines a value of the variable under study by dividing the sum of all values of the variable by their numbers.

- **Denoted:** It is denoted by $\bar{X}$.
- **Formula:** $\bar{X} = \frac{\Sigma x}{n}$.
- **Example:** 2, 3, 10, $\bar{X} = \frac{2+3+10}{n} = \frac{15}{3} = 5$

✱ Ungroup data:

- **Direct Method:**

$$\bar{X} = \frac{\Sigma x}{n}$$

- **Indirect method:**

$$\bar{X} = A + \frac{\Sigma D}{n}$$

where derivation defined as:

Differences of the value of variable from a constant "A". "$D = X - A$". where A is called Assumed and provisions mean.

✱ Group data:

- **Direct method:** $\bar{X} = \frac{\Sigma Fx}{\Sigma F}$
- **Indirect method:** $\bar{X} = A + \frac{\Sigma FD}{\Sigma F}$

Median: The middle most value of data is called median.

Example:

1, 2, 3, 4, 5

here, 3 is median.

⇒ **For odd numbers:**

$$\tilde{X} = \left(\frac{n+1}{2}\right)\text{th obs}$$

⇒ **For even numbers:**

$$\tilde{X} = \frac{1}{2}\left[\frac{n}{2} + \frac{n+2}{2}\right]\text{th obs}$$

Mode:

Most frequent value of data is called mode.

Example:

1, 2, 2, 3, 3, 3

here, 3 is mode.

Note:

In which frequency is present in large number / amount, it is called model number.

Properties of Arithmatic Mean:

Mean is affected by change in origin.

Mean is affected by change in scale.

Mean of a variable with similar observations. say constant (K) is the constant (K) itself.

Geometric Mean:

Geometric mean is oblained by product of n^{th} root of $x_1, x_2, x_3, \dots, x_n$ observation.

Example:

$$2, 4, 8$$
$$= (2 \times 4 \times 8)^{1/3}$$
$$= (64)^{1/3}$$
$$= (4^3)^{1/3}$$
$$= 4$$

Ungroup data:

$$G.M = \frac{\Sigma \log x}{n}$$

Group data:

$$G.M = \frac{\Sigma F \log x}{\Sigma F}$$

Harmonic Mean:

Harmonic mean is obtain by reciprocating the mean of reciprocal of $x_1, x_2, \dots, x_n$ observation.

Example:

$$X = 1, \frac{1}{3}, \frac{1}{4}$$
$$\frac{1}{X} = 1, 3, 4$$
$$\Sigma \frac{1}{X} = 8$$
$$\bar{X} = \frac{\Sigma \frac{1}{x}}{n}$$

Ungroup data:

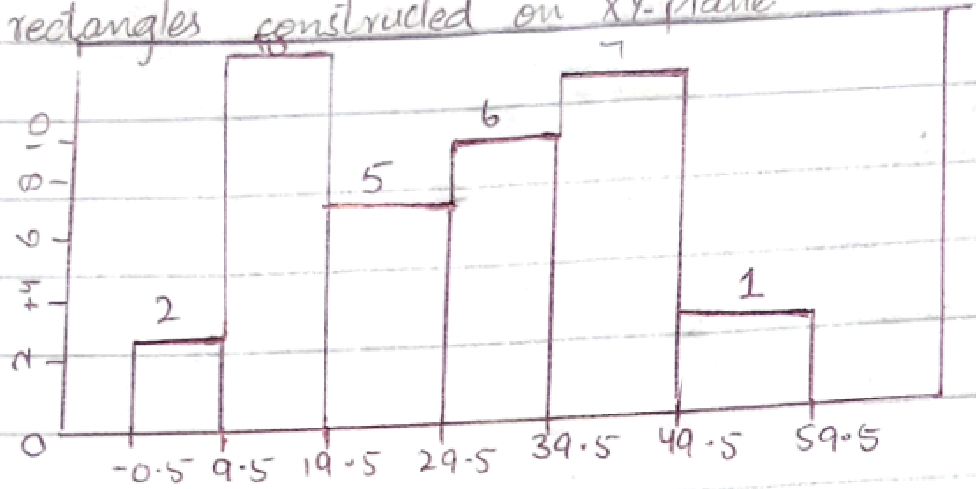
$$H.M = \frac{n}{\Sigma(\frac{1}{x})}$$

Group data:

$$H.M = \frac{\Sigma F}{\Sigma F/x}$$

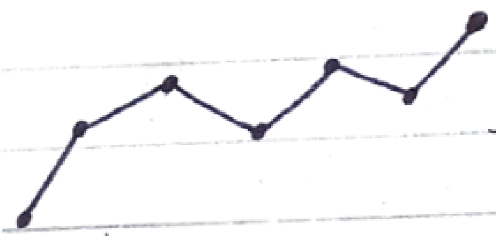
Histogram:

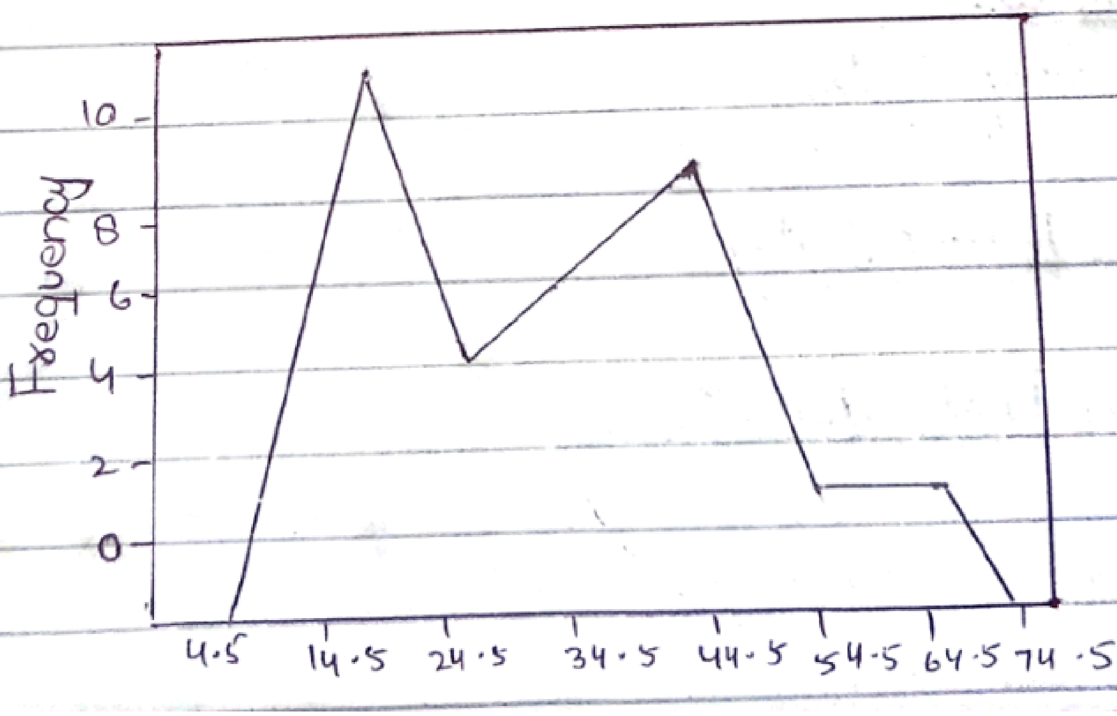
A histogram is a graph of adjacent rectangles constructed on XY-plane



Dispersion :-

Dispersion means spread or scatterness of data set.





- **Measure of dispersion:-** The technique we use to find degree or extent of variations of data is called Measure of dispersion.

Example:

Range, Variances, Standard deviation

Range:

Range measure the extent of variation between two extreme observations of a data set. **Formula:** $Range = X_{max} - X_{min}$

Formula of Variance in ungroup data:

$$V = S^2 = \frac{\sum (X - \bar{X})^2}{n}$$

☆ **Variance:**

Variance is defined as the mean of squared deviation of observation from their arthemetic mean. It is denoted by S^2

Formula:

For Group Data:

$$S^2 = \frac{\sum f (X - X)^2}{\sum f}$$

For Ungroup Data:

$$S^2 = \frac{\sum (X - \bar{X})^2}{n}$$

☆ **Standard deviation:**

The positive square root of mean of squared deviation of observation from their arthemetic mean.

Formula:

⇒ **For Group Data:**

$$S = \sqrt{\frac{\Sigma f(X-X)^2}{\Sigma f}}$$

⇒ **For Ungroup data:**

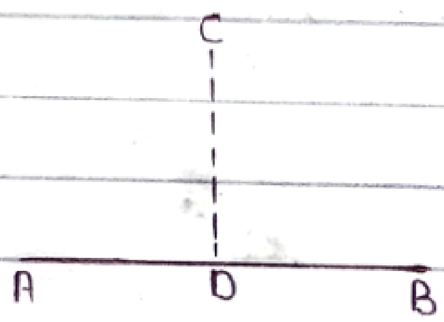
$$S = \sqrt{\frac{\Sigma (X-X)^2}{n}}$$

Chp NO: 08

Definition:

* **Projection:**

The projection of a given point on a line segment is the foot of ⊥ drawn from the point on that line segment. If $\overline{CD} \perp \overline{AB}$, then evidently D is the foot of perpendicular CD from the point C on the line segment AB.

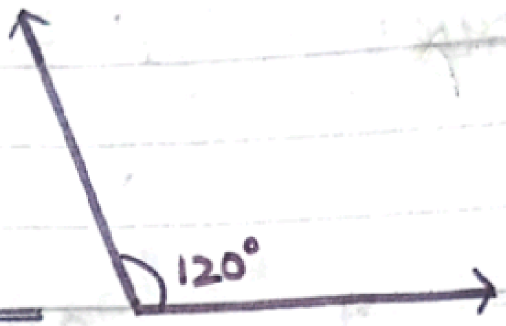


* **Geometry:**

Geometry is an important branch of mathematics, which deals with the shape size and position of geometric figure.

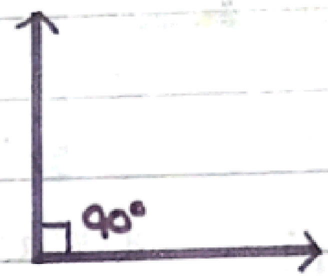
* Obtuse angle:

An angle which is greater than 90° is called obtuse angle.



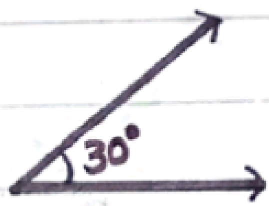
* Right angle:

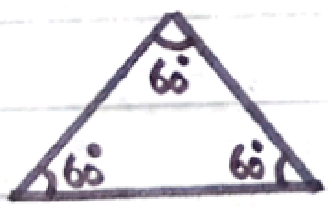
An angle which is equal to 90° is called right angle.



* Acute angle:

An angle which is less than 90° is called acute angle.

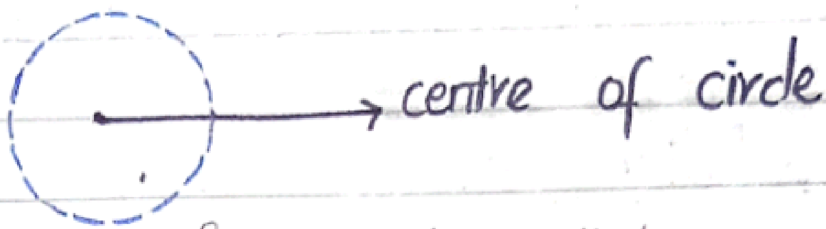




UNIT # 09

* Circle:

A set of point in a plane which is equidistant from a fixed point from a circle.



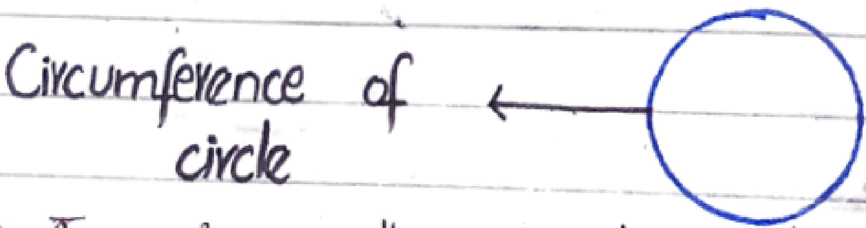
Fixed point of a circle called centre of circle.

⇒ $2\pi r$ is the circumference of a circle of a radius.

⇒ πr^2 is the circular area of a circle of a radius.

* Circumference of circle:

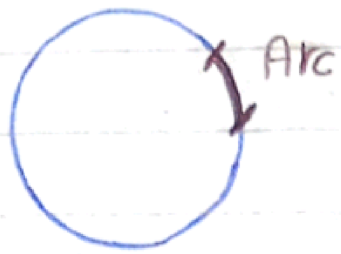
The primeter or the length of the boundry of circle is called circumferrence. o



⇒ π is the ratio between the diameter and circumference of circle

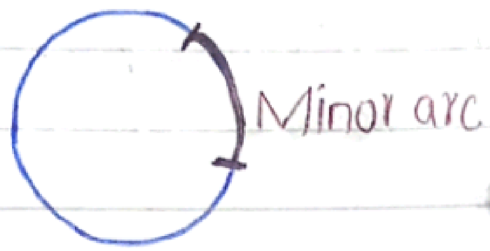
Arc:

Any connected part of the boundary of circle is called arc.



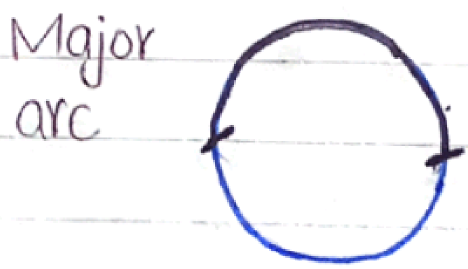
Minor arc:

The arc less than the half of circle is called minor arc.



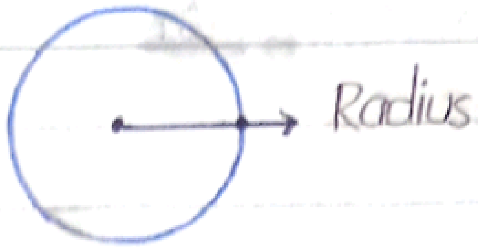
Major arc:

The arc greater than the half of a circle is called major arc.



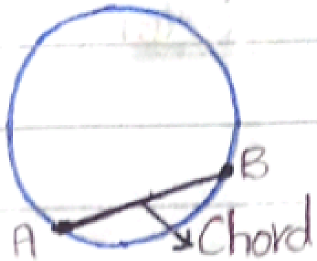
Radius:

Distance between centres to any points on the boundry of circle is called radius.



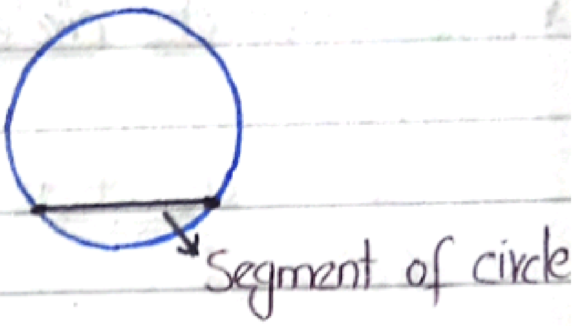
* Chord:

A line segment whose endpoints lies on the boundary of circle called chord.



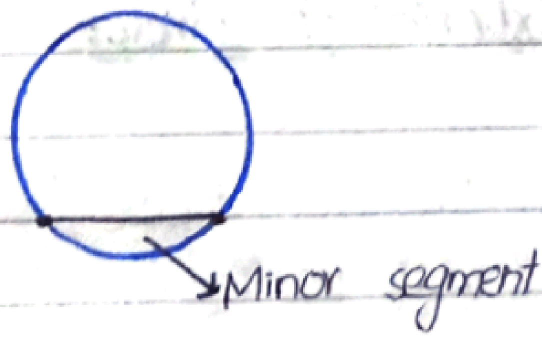
* Segment of circle:

The region bounded by an arc and chord of circle is called segment of circle.



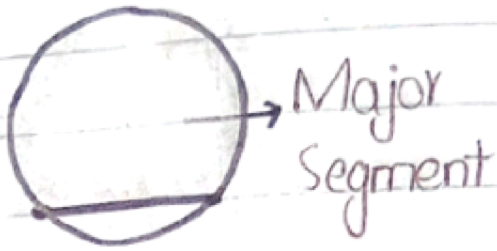
* Minor segment:

The segment less than the half of circle called minor segment.



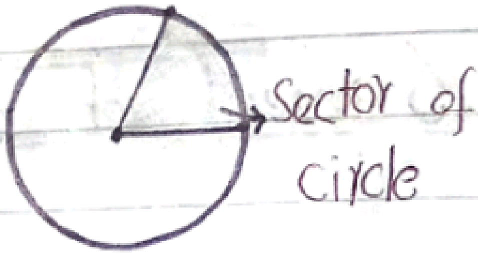
* Major segment:

The segment more than the half of circle called major segment.



* Sector of circle:

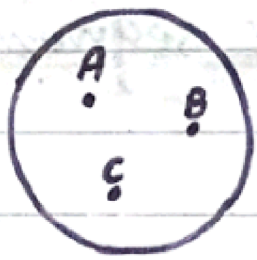
Area bounded by two radii and an arc of circle is called sector of circle.



* Interior of circle:

The interior of a circle is the set of points whose distance from center is less than the radius.

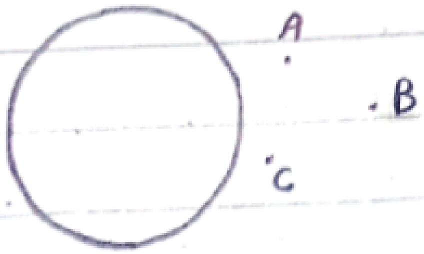
⇒ In given figure A,B,C are interior of circle.



* Exterior of circle:

The exterior of a circle is the set of points whose distance from the center is greater than the radius.

⇒ In given figure A, B and C are exterior of circle.



* Circumcircle:

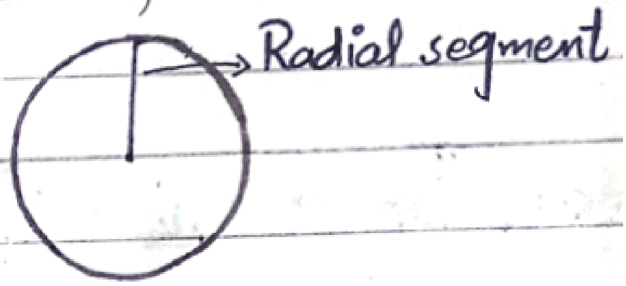
The circle passing through all the three vertices of a triangle is called its circumcircle.

* Collinear points:

Three or more than Three points lying on the same line are collinear points otherwise they are non-collinear.

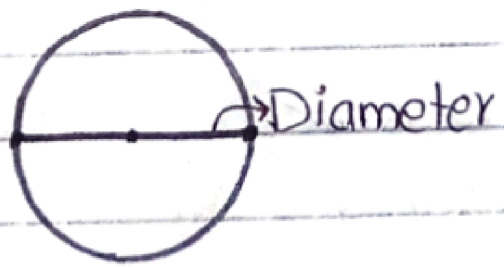
* Radial segment:

Line segment joining any point on the boundary of circle to the centre of circle is called radial segment.



* Diameter:

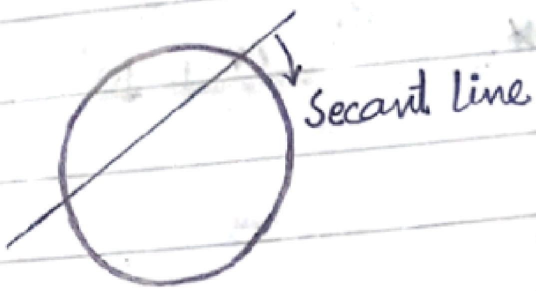
The line segment passes through the centre of circle is called diameter of circle.



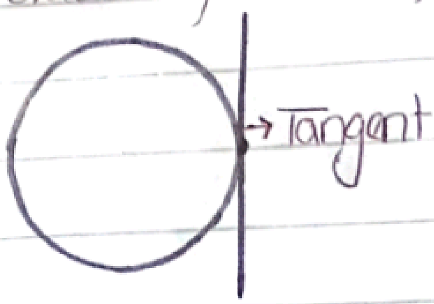
UNIT # 10

Definition:

* **Secant Line:** A line which cut the circumferences of circle at two distinct points is called secant line.



* **Tangent:** A tangent to a circle is the straight line which touches the circumference of circle externally at only one point



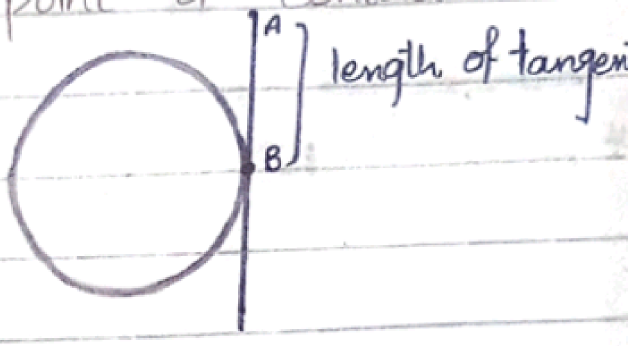
Important Points:

⇒ The two tangents drawn to a circle from a point outside it, are equal in length.

⇒ If two circles touch externally or internally, the distance b/w their centres in respectively equal to the sum or differences of their radii.

* Length of a tangent:

The length of a tangent to a circle is measured from the given point to the point of contact.

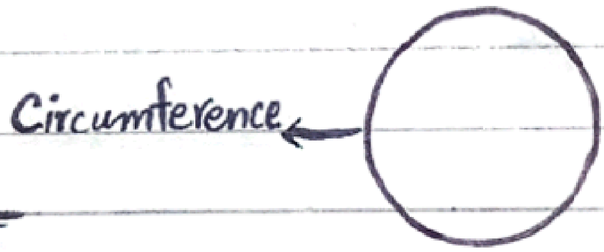


UNIT NO: 11

Definition:

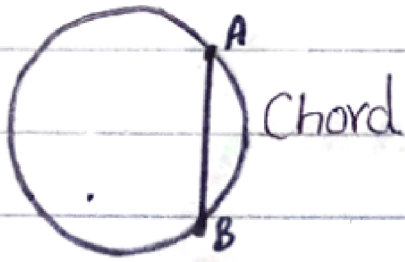
* Circumference:

The perimeter or the length of the boundary of circle is called circumference.



* Chord:

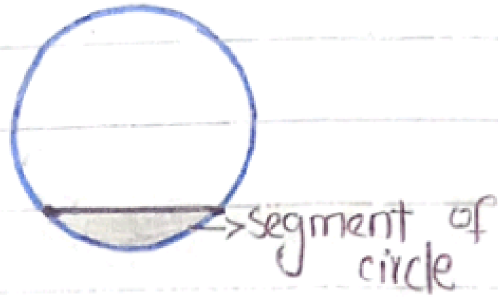
A line segment whose endpoints lies on the boundary of circle is called chord.



* Segment:

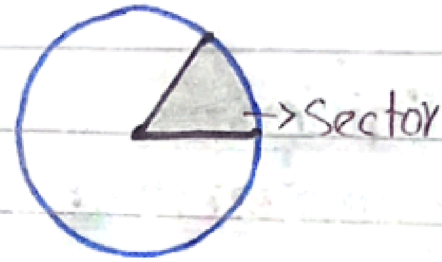
The region bounded by an arc

and chord of circle is called segment of circle.



* Sector:

Area bounded by two radii and an arc of circle is called sector of circle.



Important Points:

- Any two angles in the same of a circle are equal.

⇒ The angle:

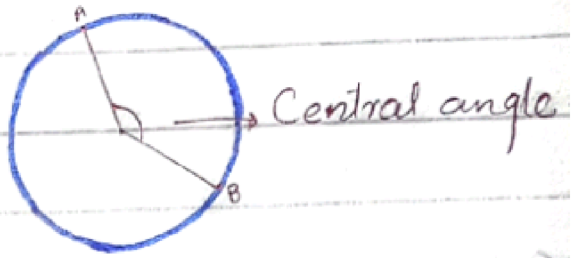
- In a semi-circle is a right angle.
- In a segment greater than a semi-circle is less than a right angle.
- In a segment less than a semi-circle is greater than a right angle.

UNIT NO. 12

Definitions:

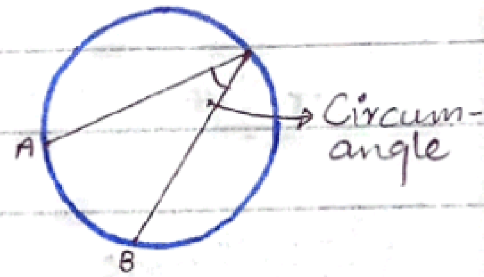
* Central angle:

The angle subtended by an arc at the centre of a circle is called central angle.



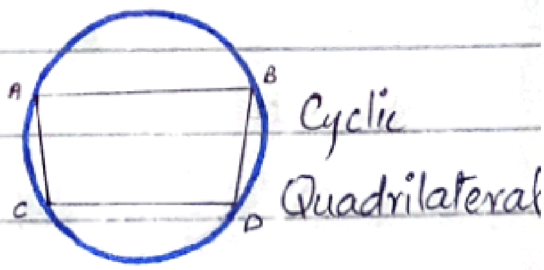
* Circumangle:

The angle subtended by an arc at the circumference of a circle is called a circumangle.



Cyclic Quadrilateral:

A quadrilateral is called cyclic when a circle can be drawn through its four vertices.



Important Points:

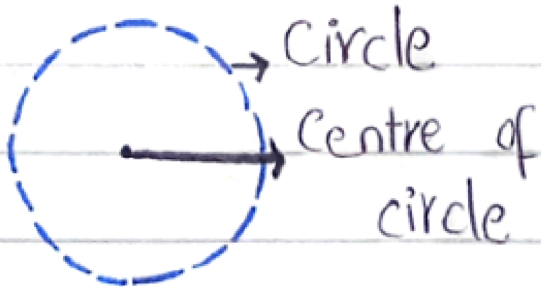
- If two arc of a circle (or of congruent circles are congruent, then the corresponding chords are equal.
- If two chords of a circle are equal then their corresponding arc (minor, major, semi-circular) are congruent.
- Equal chords of a circle subtend equal angles at the centre.
- If the angles subtended by two chords of a circle at the centre are equal, the chords are equal.

Unit # 13

Definitions

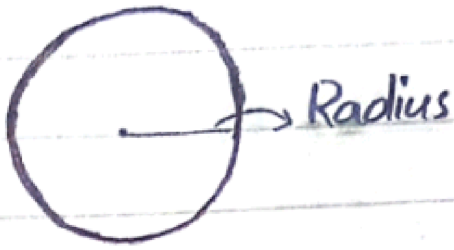
* Circle:

A "circle is locus of a moving point in a plane which is equidistant from a fixed point. The fixed point is called "centre" of the circle.



* **Radius:**

The distance from the centre of the circle to any point on the circle is called radius of the circle.

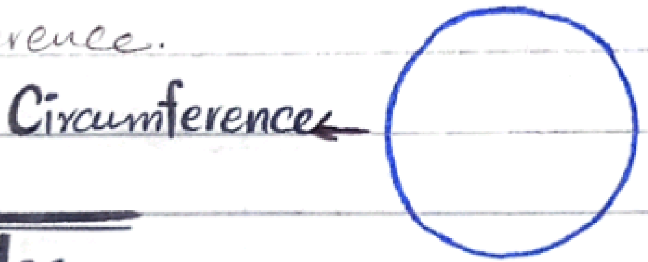


* **Perimeter:**

The perimeter of a closed geometric figure is the sum of its sides.

* **Circumference:**

The perimeter or length of the boundary of the circle is called the circumference.

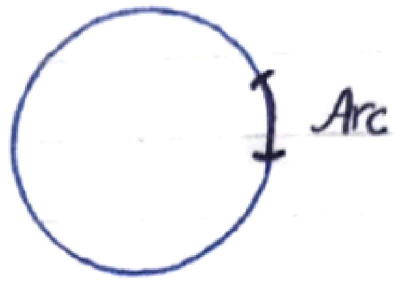


* **Diameter:**

The chord which passes through the centre of the circle is called diameter of circle.

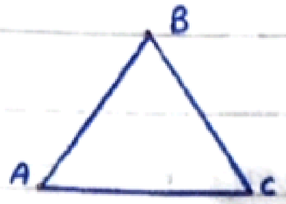
* **Arc:**

A part of circumference of a circle is called an arc.



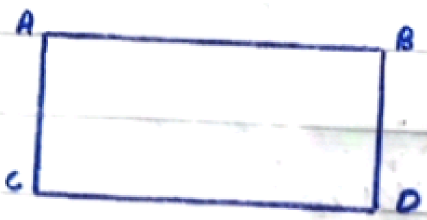
* **Triangle:**

A plane figure formed by three straight edges as its sides is called a triangle.



* **Polygon:**

A plane figure with three or more straight edges as its sides is called a polygon.

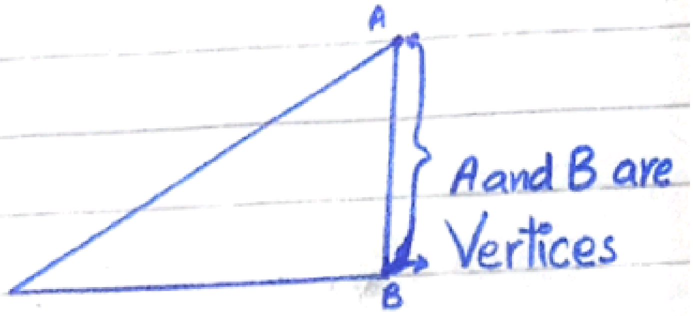


* **Regular polygon:**

A figure bounded by equal straight lines which has all its angles equal is called a regular polygon.

* Vertices:

The corners of a polygon are called its vertices

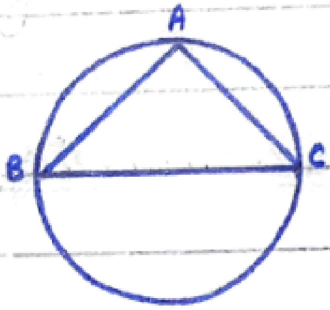


* Locus:

The path of an object moving accordi to some rule, is the locus of the object.

* Circumscribed circle: (Circum circle)

The circle passes through all the three vertices of triangle is called circum-circle.

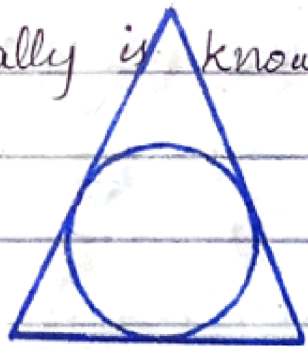


⇒ It's center is called circum-center.

⇒ It's radius is called circum-radius.

* Inscribed circle: (In circle) :

A circle which touches the three sides of a triangle internally is known as in-circle.



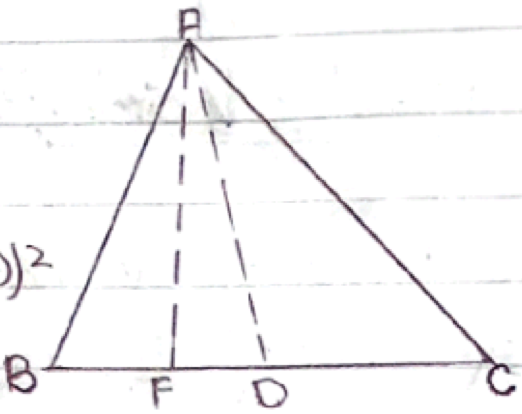
⇒ It's center is called In-center.

It's radius is called In-radius.

* Apollonius theorem:

In any triangle, the sum of the squares on any two sides is equal to twice the square on half the third side together with twice the square on the median which bisects the third side.

$(AB)^2 + (AC)^2 = 2(BD)^2 + 2(AD)^2$

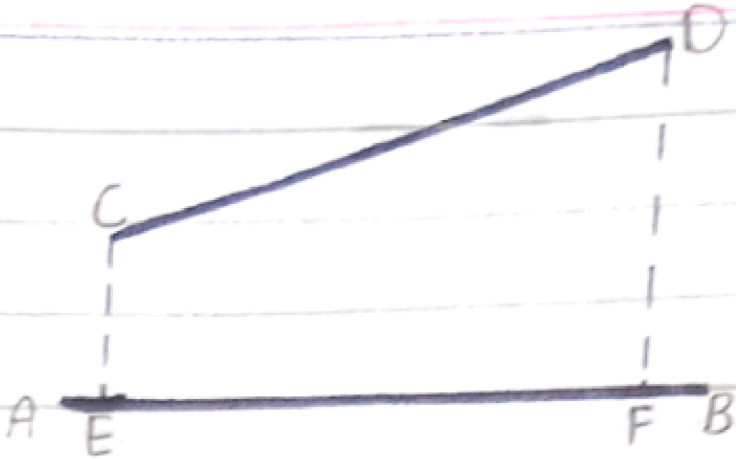


* Zero Dimension:

A point having no length, width and height is of zero dimension.

Examples:

Projection of a vertical line segment $\overline{CD}$ on a line segment $\overline{AB}$ is a point on $\overline{AB}$ which is of zero dimension.



Zone of Circle:-

The region bounded by two chords of circle is called zone of circle.

Example:-