

## Chapter #1

### Quadratic equation

#### Quadratic equation:

An equation that contains the square of the unknown (variable) quantity, but not higher power is called a quadratic equation or an equation of the second degree. Standard form of quadratic equation is  $ax^2+bx+c=0$ .

#### Pure Quadratic equation:

If  $b=0$  in quadratic equation  $ax^2+bx+c=0$  then it is called a pure quadratic equation.  
i.e  $ax^2+0x+c=0$  e.g.  $x^2-16=0$ .

#### Methods to solve the quadratic equation:

To find solution set of a quadratic equation following methods are used:  
Factorization, completing square, quadratic formula.

#### Reciprocal equation:

An equation is said to be a reciprocal equation if it remains unchanged, when  $x$  is replaced by  $\frac{1}{x}$  for example  $x + \frac{1}{x} = 2$ .

#### Exponential equation:

An equation in which variable occurs in exponent is called exponential equation.  $2^x-1=0$ ,  $2^{1+x}+5^{2x}-8=0$ .

#### Radical equation:

An equation involving expression of the variable under radical sign is called radical equation. For example  $\sqrt{x+1}=2$ .

#### Extraneous equation:

A root of an equation which does not satisfy the original equation is called extraneous root.

## Chapter# 2

### Theory of quadratic equation

#### Discriminant:

The nature of the roots of quadratic equation depends on the value of the expression ' $b^2-4ac$ ' which is called the discriminant of the quadratic equation or the quadratic expression  $ax^2+bx+c=0$

#### Nature of the roots of a quadratic equation through discriminant:

The roots of the quadratic equation  $ax^2+bx+c=0$  ( $a \neq 0$ ) are  $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$  and its discriminant is  $b^2-4ac$ .

The  $b^2-4ac > 0$  and is a perfect square then the roots are rational (real) and unequal.

The  $b^2-4ac>0$  and is not a perfect square then the roots are irrational (real) and unequal.

If  $b^2-4ac=0$  then the roots are rational (real) and equal.

If  $b^2-4ac<0$  then the roots are imaginary (complex conjugates) and unequal.

**Sum and product of the roots:**

The sum and the product of the roots of a equation  $\alpha + \beta = -\frac{b}{a}$  ,  $\alpha\beta = \frac{c}{a}$

**Synthetic division:**

Synthetic division is the process of finding the quotient and remainder when the polynomial is divided by a linear polynomial.

**Chapter # 3**

**Variations**

**Ratio:**

A relation between two quantities of the same kind is called ratio. If a and b are two quantities of the same kind and b is not zero then ratio of a and b is written as a:b or in fraction  $\frac{a}{b}$ .

**Proportion:**

A proportion is a statement which is expressed as equivalence of two ratios. If two ratio a:b and c:d are equal then we can write a:b= c:d

**Direct variation:** If two quantities are related in such a way that when one changes in any ratio so does the other is called direct variation.

**Inverse variation:**

If two quantities are related in such a way that when one quantity increase the other decrease is called Inverse variation.

**Joint variation:**

A combination of direct and inverse variations of one or more than one variation forms joint variation.

**Chapter # 4**

**Partial fraction**

**Fraction:**

The quotient of two numbers or algebraic expressions is called fraction the quotient is indicated by (-).

**Rational fraction:**

An expression of the form  $\frac{N(x)}{D(x)}$  where N(x) and D(x) are polynomials in x with real coefficient is called a rational fraction. For example  $\frac{x^2+3}{(x+1)^2(x+2)}$  and  $\frac{2x}{(x-1)(x+2)}$  are rational fraction.

**Proper Fraction:**

A rational fraction  $\frac{N(x)}{D(x)}$  with  $D(x) \neq 0$  is called a proper rational fraction if degree of the polynomial N(x), in the numerator is less than the degree of the polynomial D(x) in the denominator for example.  $\frac{2}{x+1}$  ,  $\frac{2x-3}{x^2+4}$

**Improper fraction:**

A rational fraction  $\frac{N(x)}{D(x)}$  with  $D(x) \neq 0$  is called an improper fraction if the degree of the polynomial is  $N(x)$ , in the numerator is greater or equal to the degree of the polynomial  $D(x)$  in the denominator. For example  $\frac{5x}{x+2}$ ,  $\frac{6x^4}{x^3+6}$

**Partial fraction:**

Every proper fraction  $\frac{N(x)}{D(x)}$  with  $D(x) \neq 0$  can be resolved into an algebraic sum of component fractions these components fraction of a resultant fraction are called its partial fraction.

**Chapter# 5****Sets and functions****Set:**

A collection of well defined distinct object is called set. It is denoted by capital letters A, B, C e.g  $A = \{1, 2, 3, 4, 5\}$

**Union of set:**

Union of two sets A and B denoted by  $A \cup B$  is the set containing elements which either belong to A or to B or to both.

**Intersection of set:** Intersection of two sets A and B written as  $A \cap B$  (read as A intersection B) is the set consisting of all the common element of A and B

**Difference of sets:**

The set difference of B and A denoted by  $B - A$  is the set of all those elements of B but do not belong in to A

**Compliment of sets:**

If U is a universal set and A is a subset of U then the complement of A is the set of those elements of U which are not contained in A and is denoted by  $A'$  or  $A^c$

**Venn diagram:**

British mathematician John Venn (1834-1923) introduce rectangle for a universal set U and its subsets A and B as closed figures inside this rectangle.

**Binary relation:**

In mathematics a binary relation on a set A is a collected of ordered pairs of elements of A. in other words, it is a subset of the Cartesian product  $A^2 = A \times A$ , more generally a binary relation between two sets A and B is a subset of  $A \times B$

**Function:**

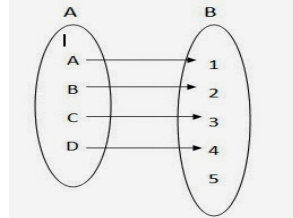
Suppose A and B are two non empty sets then relation  $f: A \rightarrow B$  is called a function if 1)  $\text{Dom } f = A$  2) every  $X \in A$  appears in one and only one ordered pair in f.

**Domain and range of a function:**

Domain  $f$  is the set consisting of all first element of each ordered pair in  $f$  and range  $f$  in the set consisting of all second elements of each ordered pair in  $f$ .

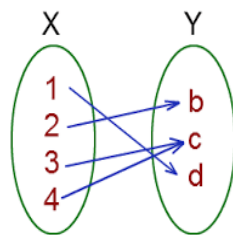
$$f = \{(0,1), (1,2), (2,3), (3,4)\} \quad \text{Dom } f = \{0,1,2,3\} \quad \text{Range } f = \{1,2,3,4\}$$

**Into function:** A function  $f; A \rightarrow B$  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  $f \subsetneq$  set  $B$

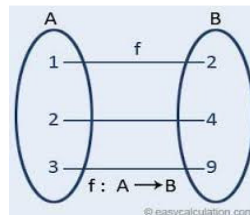


**Onto or surjective function:**

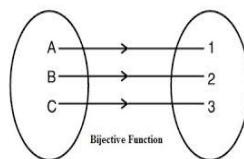
A function  $f; A \rightarrow B$  is called an onto function if every element of set  $B$  is an image of at least one element of set  $A$  i.e , Range of  $f = B$



**One—one function:** A function  $f: A \rightarrow B$  is called one—one function, if all distinct elements of  $A$  have distinct images in  $B$ , i.e



**Bijjective function:** A rule  $f: A \rightarrow B$  is called bijjective function if function is one —one and onto.



**Constant function:** A function  $f: A \rightarrow A$  is called constant function if  $\forall x \in A$ . there is an element  $C \in B$  such that  $f(x)=c$

**Chapter#6**

**Basic Statistics**

**Frequency distribution:**

A frequency distribution is a tabular arrangement for classifying data into different groups.

**Grouped data:**

the data presented in the form of frequency distribution is called group data.

**Un grouped data:**

When the data is collected any source and record as it stand is known as called ungrouped data Example. If the number of student collected from each class of a school ,10,15,20,14,15,18

### **Class Limits:**

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

### **Mid point or class mark:**

The average of each class is obtained by dividing the sum of lower and upper class limits by 2 is called mid point or class mark.

### **Histogram:**

A histogram is a graph of adjacent rectangle constructed on XY-plane. It is a graph of frequency distribution.

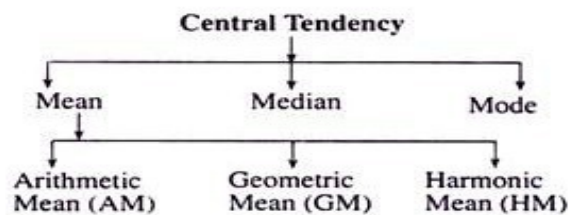
### **Deviation:**

A deviation is define as a difference of any value of the variable from any constant  $D=x_i-A$

### **Measure of central tendency:**

The measure or technique that are used to determine this central value are called measure of central tendency.

*Let us classify the measures of central tendency in the following format :*



### **Arithmetic mean:**

Arithmetic mean or simply mean is measure by dividing the sum of all values of the variable by their number of observation. We denoted Arithmetic mean by  $\bar{X}$ .

$$\bar{X} = \frac{\sum x}{n} = \frac{\text{Sum of all value of observation}}{\text{No of values}}$$

### **Geometric mean:**

Geometric mean of a variable X is the  $n^{\text{th}}$  positive root of the product of the  $x_1, x_2, x_3, \dots, x_n$  observations. Mathematically

$$G.M = (x_1, x_2, x_3, \dots, x_n)^{\frac{1}{n}}$$

### **Harmonic mean:**

Harmonic mean refers to the value obtained by reciprocation the mean of the reciprocal of the  $x_1, x_2, x_3, \dots, x_n$  observations. Mathematically

$$H.M = \frac{n}{\sum \frac{1}{x}}$$

### **Mode:**

Mode is define as the most frequent occurring observation in the data.

$$\text{Mode} = L + \frac{f_m + f_1}{f_m - f_1 - f_2} \times h$$

**Median:**

Median is the middle most observation in an arranged data set. It divides the data set into two equal parts.

$$\text{Median} = L + \frac{h}{f} \left\{ \frac{n}{2} - c \right\}$$

**Dispersion:**

Dispersion means the spread or scatterness of observation in a data set.

**Measure of dispersion:**

The measure that are used to determine the degree or extent of variation in a data set are called measure of dispersion.

**Range:**

the difference between largest value and the small values is called range

OR

Range measures the extent of variation between two extreme observation of a data set. Its formula is

$$\text{Range} = X_{max} - X_{min}$$

**Variance:**

Variance is defined as the mean of the square deviation of  $x_i$  ( $i=1,2,3,\dots,n$ ) observation from their arithmetic mean.

$$\text{Variance of } X = \text{var}(X) = S^2 = \frac{\sum(x - \bar{x})^2}{n}$$

**Standard deviation:**

Standard deviation is defined as the positive square root of variance

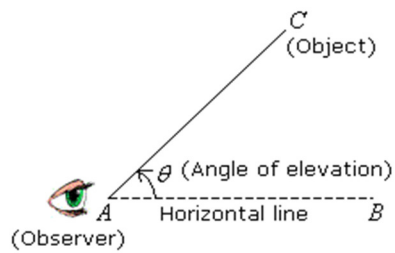
$$\text{Standard deviation} = \text{Var}(X) = S^2 = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

**Chapter#7****Introduction to trigonometry****Angle:**

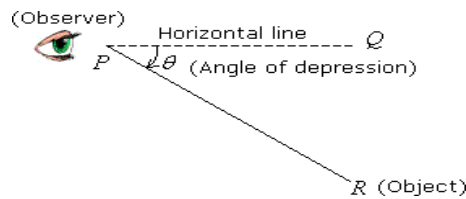
An angle is defined as the union of two non-collinear rays with some common end point. The rays are called arms of the angle and the common end point is known as vertex of the angle.

**Angle of elevation:**

The angle made between the horizontal line through eye and a line from the eye to the object above the horizontal line called an angle of elevation.



**Angle of Depression:** The angle made between the horizontal line through eye and a line from the eye to the object below the horizontal line called an angle of elevation.



**Degree:**

If we divide the circumference of a circle into 360 equal arcs. Then the angle subtended at the center of the circle by one arc is called one degree and is denoted by  $1^\circ$

**Radian:**

The angle subtended by the centre of the circle by an arc, whose length is equal to the radius of the circle is called one radian.

**Coterminal angle:**

Two or more than two angles with the same initial and terminal sides are called coterminal angles.

**Quadrantal angle:**

An angle is called a quadrantal angle, if its terminal side lies on the x-axis or y-axis.

**Standard position:**

A general angle is said to be in standard position if its vertex is at the origin and its initial side is directed along the positive direction on the x-axis of a rectangular coordinate system.

**Trigonometric ratios:** There are six fundamental trigonometric ratios (function) called sine, cosine, tangent, cotangent, secant, and cosecant,

**Relationship between radian and degree measure:**

$$1^\circ = \frac{\pi}{180} \text{ radian} \approx 0.0175 \text{ radian} \text{ and } 1 \text{ radian} = \left(\frac{180}{\pi}\right)^\circ = 57.295 \text{ degree}$$

**Trigonometric identities**

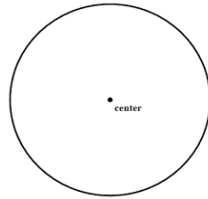
- $\cos^2\theta + \sin^2\theta = 1$
- $\sec^2\theta - \tan^2\theta = 1$
- $\csc^2\theta - \cot^2\theta = 1$

**Chapter# 9**

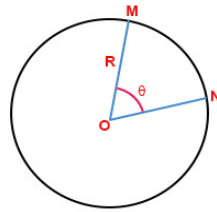
**Chord of the circle**

**Circle:**

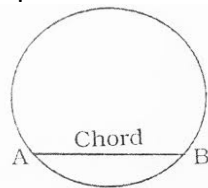
A circle is the locus of a moving point in a plane which is equidistant from a fixed point. The fixed point is called centre of the circle.

**Central angle:**

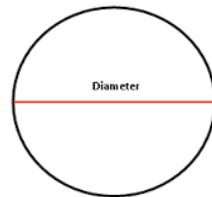
An angle whose vertex is at the centre of the circle and its arms meet at the end points of an arc is called central angle.

**Chord of a circle:**

The line segment joining any two points of the circle with each other is called chord of the circle.

**Diameter:**

The chord passing through the centre of the circle is called diameter of the circle.

**Segment of the circle:**

The circular region bounded by an arc and a corresponding chord is called segment of the circle. Evidently any chord divides a circle into two segments.

There are two types of segments: Major segment and minor segment.

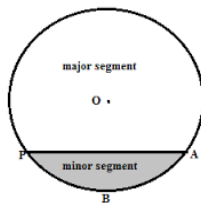
**Major segments:**

The circular region bounded by a major arc and a corresponding chord is called major segment.

**Minor segment:**

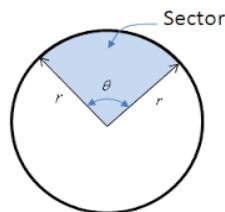
The circular region bounded by a minor arc and a corresponding chord is called minor segment.





**Sector of the circle:**

A sector of a circle is the plane figure bounded by two radii and the arc intercepted between them.

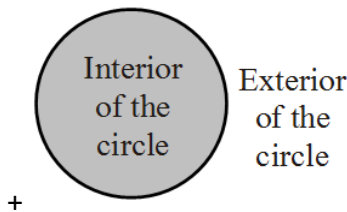


**Interior :**

The set of all the points lying inside the boundary of a circle is called interior of a circle.

**Exterior:**

The set of all the points lying outside the boundary of a circle is called exterior of a circle.



**Circular Area:**

Area of region enclosed by the boundary of circle is called circular area.

Circular area is calculated by the formula  $A = \pi r^2$

**Collinear points:**

Two or more than two points lying on the same line are called collinear points.

**Non collinear points:**

Two or more than two point not lying on the same line are called non collinear points.

**Circumference of the circle:**

The length of the boundary traced by a moving point in a circular path is called circumference of the circle. Circumference is calculated  $C=2\pi r$  here r is a radius and  $\pi$  is an irrational number.



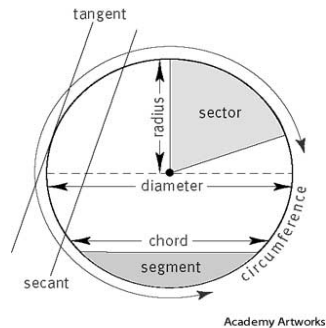
**Radial segment of the circle:**

The line segment joining the centre of a circle to any point of the circle is called radial segment .

**Circumcircle:**

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

### Parts of a circle

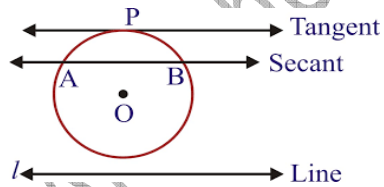


### Chapter #10

#### Tangent to a circle

##### Secant Line of a circle:

A secant is a straight line which cuts the circumference of a circle in two distinct points. In the figure the line cuts the circle at two distinct points A and B.



##### Tangent Line of a circle:

A tangent to a circle is the straight line which touches the circumference at a single point only.

##### Length of a tangent segment.

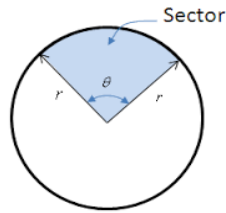
The distance between the given point outside the circle and point of tangent is called length of tangent segment.

### Chapter #12

#### Angle is a segment of a circle

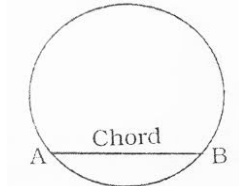
##### Sector of the circle:

A sector of a circle is the plane figure bounded by two radii and the arc intercepted between them.



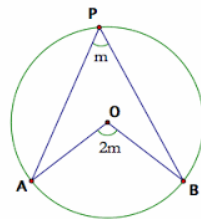
**Chord of a circle:**

The line segment joining any two points of the circle with each other is called chord of the circle.



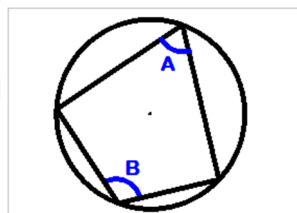
**Circum angle:**

A circum angle is subtended between any two chords of a circle having common point on its circumference. in the figure *angle* ABP is the circum angle.



**Cyclic quadrilateral:**

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



**In centre:** in –centre of a triangle is the centre of a circle inscribe in a triangle.

Chapter#13

**Practical geometry**

**Geometry:**

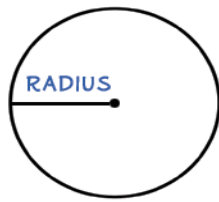
The word geometry is derived from two Greek words namely Geo (earth) and Metron (measurement). geometry is the branch of mathematics , which deal with the shape size and position of geometric figures.

**Polygon:**

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

**Radius:**

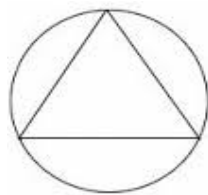
The distance from the centre of the circle to any point on the circle is called the radius of the circle.



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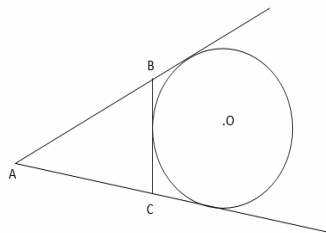
**Circumscribed circle:**

The circle passing through the three vertices of a triangle ABC is known as circumscribe circle its radius is called circum radius and center is called circum radius.



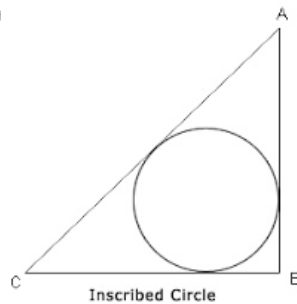
**Escribed circle:**

The circle touching one side of a triangle externally and other two produced sides internally is called escribed circle.



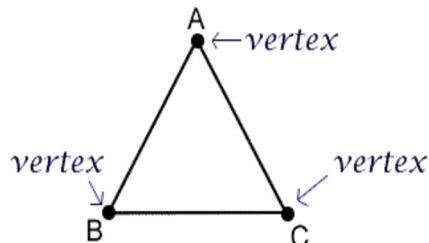
**Inscribed circle:**

A circle which touches the three sides of a triangle internally is known as inscribed circle, its radius is called in-radius and centre is called in-centre.



**Vertices:**

The corners of a polygon are called its vertices.



**Locus:**

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

**Perimeter:**

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

**Triangle:**

A plane figure with three or more straight edges as its sides is called a triangle. A triangle has six elements i.e. ... three sides and three angles.

**Regular polygon:**

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

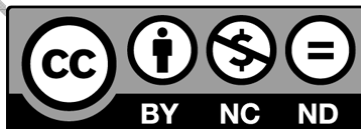
SCHEME BISE LAHORE

| Mathematics 10th 2017-18 paper pattern |     |       |               |   |    |
|--|-----|-------|---------------|---|----|
| Ch, No                                 | MCQ | Sh. Q | Long Question |   |    |
|  |     |       | Q no          | A | B  |
| 1                                      | 1   | 2     |               |   |    |
| 2                                      | 2   | 4     | 5             | 1 | 2  |
| 3                                      | 2   | 3     | 6             | 3 | 4  |
| 4                                      | 1   | 2     | 7             | 5 | 6  |
| 5                                      | 2   | 4     | 8             | 7 | 13 |
| 6                                      | 1   | 3     | 9             | 9 | 12 |
| 7                                      | 1   | 3     |               |   |    |
| 8                                      | 0   | 0     |               |   |    |
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| 10                                     | 1   | 1     |               |   |    |
| 11                                     | 1   | 1     |               |   |    |
| 12                                     | 1   | 1     |               |   |    |
| 13                                     | 1   | 1     |               |   |    |

**Reference:** Mathematics 10 (Science Group) written by Muhammad Habib, Ch Asghar Ali, Prof. Abdul Rauf Khan and Muhammad Moeen and published by Ilmi Kitab Khana, Urdu Bazar Lahore, Pakistan.

These notes are written by Amir Shehzad

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