

Secondary School Certificate
Examination Syllabus

MATHEMATICS

Class X examination in 2011 and onwards

SSC Part-II (Class X)

15. Algebraic Manipulation:

15.1.1 Find highest common factor (H.C.F) and least common multiple (L.C.M) of algebraic expressions.

15.1.2 Apply factor or division method to determine H.C.F and L.C.M

15.1 Highest Common Factor and Least Common Multiple:

15.1.3 Define the relationship between H.C.F and L.C.M and apply H.C.F, L.C.M and their relation in solving problems

15.2 Basic Operations on Algebraic Fractions:

15.2.1 Use highest common factor and least common multiple to reduce fractional expressions involving

15.3 Square Root of Algebraic Expression:

15.3.1 Calculate square root of algebraic expression by factorization and division

16. Partial Fractions:

16.1 Proper, Improper and Rational Fraction

16.1.1 Define and differentiate proper and improper rational fraction

16.2 Resolution of Fraction into Partial Fractions:

16.2.1 Resolve an algebraic fraction into partial fractions when its denominator consists of

- Non-repeated linear factors
- repeated linear factors
- Non-repeated quadratic factors
- repeated quadratic factors

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17. Linear Equations and Inequalities:

17.1.1 Define linear equation in one variable

17.1.2 Solve linear equation with *real* coefficient

17.1.3 Convert equations, involving radicals, to simple linear form and find their solutions and its verification

17.1 Linear Equations:

17.1.4 Solve word problems based on linear equation and verify solutions

17.2 Equation Absolute Value:

17.2.1 Define absolute value involving

17.2.2 Solve the equation, involving absolute value, in one variable

17.3 Linear Inequalities:

17.3.1 Define inequalities ($>$, $<$) and (\geq , \leq)

17.3.2 Recognize and identify properties of inequalities (i.e. trichotomy, transitive, additive and multiplicative)

17.4 Solving Linear Inequalities:

17.4.1 Solve linear inequalities with rational coefficient, in one variable, and represent their solution on the number line;

17.4.2 Solve linear inequalities, involving absolute value, in one variable and represent the solution of the following cases on the number line

• $|x| < 0$ • $|x| > 0$ • $|x| < 1$ • $|x| > 1$

• $|x \pm a| < 0$ where a is an integer • $|x \pm a| > 0$, where a is an integer

18. Linear Graphs and Their Application:

18.1.1 Identify pair of real numbers as an ordered pair

18.1.2 Describe rectangular or Cartesian plane consisting of two number lines (x-axis and y-axis) intersecting at right angles at the point O (origin)

18.1.3 Locate an ordered pair (a, b) as point in the rectangular plane and recognize:

• **a** as the **x-coordinate (or abscissa)** • **b** as the **y-coordinate (or ordinate)**

18.1.4 Draw different geometrical shapes (e.g., line segment, triangle and rectangle etc) by joining a set of given points

18.1.5 Construct a table for pairs of values satisfying a linear equation in two variables

18.1.6 Choose an appropriate scale to draw a graph

18.1.7 Plot the pairs of points to obtain the graph of a given linear expression

• $y = m x$ • $y = m x + c$ • $ax + by + c = 0$

18.1.8 Draw the graph of an equation of the form

• $y = c$ • $x = a$

18.1.9 Draw the graph from a given table of (discrete) values

18.1 Cartesian Plane and Linear Graphs:

18.1.10 solves related problems based on above concepts

18.2.1 Interpret conversion graph as a linear graph relating to two quantities which are in direct proportion

18.2 Conversion Graphs:

18.2.2 Read a given graph to know one quantity corresponding to another

18.2.3 Read the graph for conversions of

• **Miles and kilometer** • **Acres and hectares** • **Degree Celsius and degree Fahrenheit** • **Pakistani currency and another currency etc**

18.3 Graphics Solution of Equations in two Variables:

18.3.1 Solve simultaneous linear equations in two variables using graphical method.

19. Quadratic Equations:

19.1 Quadratic Equation (in one variable)

19.1.1 Define Quadratic equation, differentiate between quadratic equation and other equations and write quadratic equation in standard form;

19.2 Solution of Quadratic Equations:

19.1.2 Solve quadratic equations involving real roots in one variable by

• **Factorization.**

• **Completing square**

19.3.1 Apply method of completing square to derive quadratic formula

19.3.2 Apply quadratic formula to solve quadratic equations involving real and complex roots

19.3 Quadratic Formula:

19.3.3 Solve word problems based on quadratic equation and verify and validate solutions(e.g. negative value of dimension is not acceptable)

19.4.1 Solve equations, reducible to quadratic form, of the type $ax^4 + bx^2 + c = 0$, by factorization using middle term breaks method

19.4.2 Solve the equations of the type $P(x) + \frac{b}{p(x)} = C$

19.4.4 Solve exponential equations in which the variables occur in exponents

19.4 Equations Reducible to Quadric Form:

19.4.5 Solve equations of the type $(x+a)(x+b)(x+c)(x+d) = k$, where $a + b = c + d$

19.5 Radical Equations:

19.5.1 solve equation of the type $\sqrt{ax+b} = cx + d$ $\sqrt{x+a} + \sqrt{x+b} = \sqrt{x+c}$

• $\sqrt{x^2 + px + m} + \sqrt{x^2 + px + n} = q$

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20. Introduction to Coordinate Geometry:

20.1.1 Describe coordinate geometry

20.1.2 Derive distance formula to calculate distance between two points given in Cartesian plane

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20.1 Distance Formula:

20.1.3 Apply distance formula to find distance between two given points

20.2.1 Define collinear points and distinguish between collinear and non-collinear points

20.2.2 Use distance formula to show that given three (or more) points are collinear

20.2 Collinear Points:

20.2.3 Use distance formula to show that the given three non-collinear points form

- **An equilateral triangle**
- **An isosceles triangle**
- **A right angled triangle**
- **A scalene triangle**

20.2.4 Apply the distance formula to show that given four non-collinear points form

- **Parallelogram**
- **Square**
- **Rectangle**

20.3 Mid-Point Formula:

20.3.1 Recognize and apply the formula to find the midpoint of the line segment joining two given points

21. Introduction to Trigonometry:

21.1.1 Explain sexagesimal system (degree, minute and second)

21.1.2 Convert an angle given in D°M'S" form into a decimal form and vice versa

21.1 Measurement of an Angle:

21.1.3 Define a radian (measure of an angle in circular system)

21.2.1 Derive and apply the rule $l = r \theta$ where r is the radius of the circle, l is the length of circular arc and θ is the central angle measured in radians;

21.2.2 Prove the relationship between radians and degree

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21.2 Sector of a Circle:

21.2.2 Write and apply the formula for area of a sector of a circle $\frac{1}{2} r^2 \theta$

21.3.1 Define and identify general angle (e.g. $\pm 30^\circ$, $\pm 45^\circ$, $\pm 60^\circ$, $\pm 90^\circ$, $\pm 120^\circ$, $\pm 180^\circ$, $\pm 360^\circ$, $\pm 390^\circ$, $\pm 450^\circ$ etc)

21.3.2 Recognize quadrants and quadrantal angles

21.3.3 Define trigonometric ratios and their reciprocals with the help of unit circle

21.3.4 Calculate the values of trigonometric ratios for 45° , 30° , and 60°

21.3.5 Recognize signs of trigonometric ratios in different quadrants

21.3 Trigonometry Ratios:

21.3.6 Find the values of remaining trigonometric ratios if one trigonometric ratio is given

21.3.7 Write the values of trigonometric ratios for 0° , 90° , 180° , 270° , 360° ;

21.4 Trigonometry Identities:

21.4.1 Prove the fundamental trigonometric identities and apply them to prove different trigonometric relations

(a) $\sin^2\theta + \cos^2\theta = 1$ (b) $1 + \tan^2\theta = \sec^2\theta$ (c) $1 + \cot^2\theta = \operatorname{cosec}^2\theta$

21.5 Angle of Elevation and Depression:

21.5.1 Illustrate and calculate angle of elevation and depression

21.5.2 Solve problems involving angle of elevation and depression in a right angle triangle.

22. Pythagoras' Theorem:

22.1 Pythagoras' Theorem:

22.1.1 Apply the following theorems along with corollaries to solve related problems

- in a right-angled triangle, the square of the length to hypotenuse is equal to the sum of the

- squares of the lengths of the other two sides.(Pythagoras' theorem)

- if the square of one side of a triangle is equal to the sum of the squares of the other two sides

- then the triangle is a right angled triangle (converse to Pythagoras' theorem).

23. Theorems Related with Area:

23.1 Theorems Related with Area:

23.1.1 Apply the following theorems along with corollaries to solve related problems

- Parallelograms on the same base and lying between the same parallel lines (or of the same altitude) are equal in area

- Parallelograms on equal bases and having the same altitude are equal in area.

- Triangles on the same base and of the same altitude are equal in area.

- Triangles on equal bases and of the same altitude are equal in area.

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24. Chords of a Circle:

24.1 Chords of a Circle

24.1.1 Apply the following theorems along with corollaries to solve related problems

- One and only one circle can pass through three non-collinear points
- A straight line drawn from the centre of a circle to bisect a chord which is not a diameter is perpendicular to the chord
- Perpendicular from the centre of a circle on a chord bisects it
- If two chords of a circle are congruent then they will be equidistant from the centre
- Two chords of a circle which are equidistant from the centre are congruent.

25. Tangent to a Circle:

25.1 Tangent to a circle:

25.1.1 Apply the following theorems along with corollaries to solve related problems

- If a line is drawn perpendicular to a radial segment of a circle at its outer end point it is tangent to the circle at that point
- The tangent to a circle and the radial segment joining the point of contact and the centre is perpendicular to each other
- 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 between their centers is respectively equal to the sum or difference of their radii

26. Chords and Arcs:

26.1 Chords and Arcs:

26.1.1 Apply the following theorems along with corollaries to solve related problems

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

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27. Angle in a Segment of a Circle:

27.1 Angle in a segment of a circle:

27.1.1 Apply the following theorems along with corollaries to solve related problems

- The measure of a central angle of a minor arc of a circle, is double that of the angle subtended by the corresponding major arc
- Any two angles in the same segment of a circle are equal.
- The angle in a semi – circle is a right angle

- The angle in a segment greater than a semi circle is less than a right angle
- The angle in a segment less than a semi – circle is greater than right angle
- The opposite angles of any quadrilateral inscribed in a circle are supplementary

28. Practical Geometry Circles:

28.1 Construction of circle:

- 28.1.1 Locate the centre of a given circle and verify it
- 28.1.2 Draw a circle passing through three given non – collinear points
- 28.2.1 Draw a circumscribe circle about a given triangle
- 28.2.2 Draw an inscribe circle in a given triangle
- 28.2.3 Draw and escribe circle to a given triangle
- 28.2.4 Circumscribe an equilateral triangle about a given circle
- 28.2.5 Inscribe an equilateral triangle in a given circle
- 28.2.6 Circumscribe a square about a given circle
- 28.2.7 Inscribe a square in a given circle
- 28.2.8 Circumscribe a regular hexagon about a given circle

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28.2 Circles attached to Polygons:

- 28.2.9 Inscribe a regular hexagon in a given circle
- 28.3.1 Draw a tangent to a given circle from a point P when P lies on the circumference
 - Outside the circle
- 28.3.2 Draw two tangents to a circle meeting each other at a given angle
- 28.3.3 Draw
 - Direct common tangent or external tangent,
 - Transverse common tangent or internal tangent to two equal circles
 - Transverse common tangent or internal tangent to two unequal circles
- 28.3.4 Draw a tangent to
 - Two unequal touching circles,
 - Two unequal intersecting circles
- 28.3.5 draw a circle which touches
 - Both arms of a given angle
 - Two converging lines and passes through a given point between them

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Allocation of Marks for the Objective Test and Constructed Response Paper
Class: X

Topic	Topics No.	Marks Distribution		Total Marks
15	Algebraic Manipulation	MCQ's 3 @1 Mark *CRQ's 2 @ 5 Marks Choose any ONE from TWO		8
16	Partial Fraction	MCQ's 1 @ 1 Mark CRQ's 1 @ 3 Marks		4
17	Linear Equations and Inequalities	MCQ's 4 @1 Mark *CRQ's 2 @ 5 Marks Choose any ONE from TWO		9
18	Linear Graphs and their applications	MCQ's 3 @1 Mark CRQ's 1 @ 5 Marks		8
19	Quadratic Equations	MCQ's 3 @ 1 Mark *CRQ's 2 @ 4 Marks Choose any ONE from TWO		7
20	Introduction to Coordinate Geometry	MCQ's 3 @ 1 Mark *CRQ's 2 @ 3 Marks each Chose any ONE from TWO		6
21	Introduction to Trigonometry	MCQ's 4 @ 1 Mark *CRQ's 2 @ 4 Marks each Choose any ONE from TWO		8
22	Pythagoras Theorem	MCQ's3 @ 1 Mark *CRQ's 2 @ 4 Marks Choose any ONE from TWO		7
23	Theorems related to Area			
24	Chords of a Circle	MCQ's 3 @ 1 Mark CRQ's 1 @ 4 Marks		7
25	Tangent to a Circle			
26	Chords and Arcs	MCQ's 3 @ 1 Mark CRQ's 1 @ 4 Marks		7
27	Angle in a Segment of a Circle			
28	Practical Geometry–Circles	CRQ 1 @ 4 Marks		4
	Total Marks	MCQ's 30	CRQ's 45	75

Class X Number of Student Learning Outcomes by Cognitive Level

Topic No	Topics	No. of Sub-topics	SLO's		Total	
			K	U	A	
15	Algebraic Manipulation	3	1	1	5	7
16	Partial Fraction	2	1	1	1	3
17	Linear Equations and Inequalities	4	3	3	6	12
18	Linear Graphs and their applications	3	5	7	8	20
19	Quadratic Equations	3	1	1	9	11
20	Introduction to Coordinate Geometry	3	3	6	4	13
21	Introduction to Trigonometry	5	10	8	7	25
22	Pythagoras Theorem	1	0	1	1	2
23	Theorems related to Area	1	0	1	1	2
24	Chords of a Circle	1	0	1	1	2
25	Tangent to a Circle	1	0	1	1	2
26	Chords and Arcs	1	0	1	1	2
27	Angle in a Segment of a Circle	1	0	1	1	2
28	Practical Geometry–Circles	3	0	1	16	17
	Total	32	24	34	62	120
	Percentage		20	30	50	100