Secondary School Certificate (SSC)

Examination syllabus

MATHEMATICS IX

Based on Provincial revised curriculum (Sindh)

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PREFACE

Ziauddin University Examination Board (ZUEB) was established by the Sindh ACT XLI 2018, with the aim of improving the quality of education. The Board administers examinations for the Secondary School Certificate (SSC) and Higher Secondary School Certificate (HSSC) based on the latest Reviewed National Curriculum by Directorate Curriculum Assessment and Research (DCAR) Sindh. ZUEB has a mandate by Ordinance to offer such examination services to English /Urdu and Sindhi medium candidates for SSC and HSSC from private schools in Sindh. This examination syllabus exemplifies ZUEB's commitment to provincial educational goals

The Examination Board has prepared with the help of subject professors, subject wise syllabus. It is important to make the difference between syllabus and curriculum. The syllabus of a subject is considered as a guide for the subject teacher as well as the students. It helps the students understand the subject in detail. It also helps students to anticipate what is expected from them while preparing for the exams.

This examination syllabus brings together all those cognitive outcomes of the Provincial Curriculum statement which can be reliably and validly assessed. While the focus is on the cognitive domain, particular emphasis is given to the application of knowledge and understanding.

The examination syllabus is uploaded on the ZUEB website. This is done to help affiliated schools in planning their teaching. It is the syllabus, not the prescribed textbook which is the basis of the ZUEB examinations. In addition, the ZUEB examination syllabus is used to develop learning support materials for students and teachers. The examination board stand committed to all students who have embarked upon the SSC, and HSSC courses in facilitating their learning outcomes. Our examination syllabus document ensures all possible support.

On the Ziauddin University Examination Board website a tab e –resource is made available which provides resource material in all subjects both in text form in line with the curriculum and also videos on topics to give students access to learn at their own pace and own time. These 15 to 20 minutes videos are prepared around subject concept / topics. These videos are available to the students for revisiting a lesson taught by their teacher or watch it prior to the lesson and as a reinforcement strategy. The work on videos is in progress and new titles will be uploaded.

 Please look out for the videos on the given website

Humbly Yours;
Shahbaz Nasim
Academic Head

RATIONALE FOR THE REVIEWED PROVINCIAL CURRCIULUM

The process of revising the National Curriculum 2006 was initiated in August 2004 when newly elected government of Pakistan decided to introduce education reform in the country. The education reform process included the announcement of new National Education Policy. National Education Census and changing the curricula (Ministry of Education, 2009)

In reality, change in secondary school curriculum was initiated in 2006 and as result, scheme of studies for classes I to XII was reviewed and curriculum of 25 compulsory subjects.

The 18th Amendment to the constitution of Pakistan has reconfigured the federal and provincial relationship by abolishing the "concurrent legislative list". The Act (2010) provides the provinces with strong legislative and financial autonomy in education, health, and other social sectors. Major implication of the 18th Amendment for education is that the curriculum, syllabus, planning, policy, centres of excellence and standards of education will fall under the purview of the provinces. This was a big step forward for education.

In Sindh the Curriculum review team was assigned a task by the School Education Department, Government of Sindh to review the National Curriculum 2006 for all subjects and prepare a revised version that best suits the needs of the students teachers and meets the spirit of the 18th amendment.
Subject wise curriculum review committees were formed. Curriculum review team critically examined the contextual and textual parts and aligned the different sections horizontally and vertically of the Curriculum. The Bureau of Curriculum (BOC) played vital role in organizing the workshops and meetings at Hyderabad for the completion of task. The positive support from a number of educationists, researchers and teachers helped in completing the mammoth task of curriculum revision.
On the DCAR website http://dcar.gos.pk/BoC_Other_Pages/curriculum_dev.html the national curriculum as well as the revised curriculums are all placed for easy reference.

The Ziauddin University Examination Board Examination syllabi for SSC and HSSC are prepared with the Sindh Revised curriculum. Up till now following subject text books have been developed as per the revised curriculum.

RATIONALE
Mathematics Examination Scheme Part 1 (Grade IX, Science Group)

This examination scheme provides test designers with a framework to design an achievement test in order to gather evidence of students' learning and to ensure that the judgment about their achievement is valid and fair. In the limited time of formal examination setting, teachers and examiners cannot measure students' achievement level for each single topic and/ learning outcomes.

This document provides a roadmap to ensure that the mathematics examination is designed in consideration of the broader concepts and key learning outcomes as mentioned in the national curriculum. The test specification is designed with a review of student learning outcomes and the content weightage given in the national curriculum in order to establish constructive alignment between examination, learning outcomes and teaching.

This framework suggests teachers to share this examination scheme with their students so that they can recognise the broad concepts, key learning outcomes and the relationship between learning outcomes and assessment smoothly and easily. Open discussion and frequent negotiation of these aspects can encourage higher levels of understanding among students, developing study skills as well as reduce any additional fear of being examined. A review of student learning outcomes, indicated in this document, suggests students to develop conceptual understanding of mathematics topics and skills for them to be able to apply these concepts in related situations.

A review of cognitive level addressed in the students' learning outcomes indicates that the greatest emphasis is on students' developing their application skills, which includes applying mathematical concepts to solving problems, verifying and proving related mathematical relationships. Teachers are, therefore, encouraged to use a variety of strategies – such as problem solving, investigation, discussions as well as available and easily accessible electronic materials and other textbooks, in addition to the government prescribed textbook – so as to help students achieve the learning outcomes. This document comprises of the following components:
- Description of Units and SLOs – to derive approximate average of cognitive levels
- Table of Specification

AIMS AND OBJECTIVES:

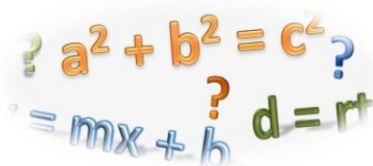**Curriculum of mathematics is comprised of five standards**

1- Numbers and Operations

The students will be able to:
- Identify numbers, ways of representing numbers and effects of operations in various situations,
- Compute fluently with fractions, decimals and percents,
- Manipulate different types of sequence and apply operations on matrices.

2 - Algebra

The students will be able to:
- Analyze number patterns and interpret mathematical situations by manipulating algebraic expressions and relations.
- Model and solve contextualized problems, interpret functions, calculate rate of change of functions.
- Integrate analytically and numerically. determine orthogonal trajectories of a family of curves and solve non-linear equations numerically

3 - Measurements and Geometry

The students will be able to:
- Identify measurable attributes of objects, construct angles and two-dimensional figures.
- Analyze characteristics and properties of geometric shapes and develop arguments about their geometric relationships.
- Recognize trigonometric identities, analyze conic sections, draw and interpret graphs of functions.
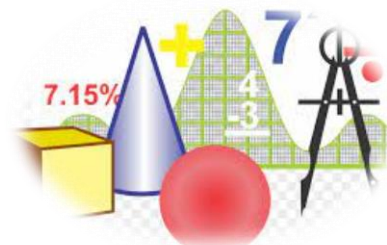
4 - Information Handling

The students will be able to:
- collect, organize, analyze, display and interpret data/ information

5 - Reasoning and Logical Thinking

The students will be able to:
- Use patterns, known facts, properties and relationships to analyze mathematical situations.
- Examine real life situations by identifying, mathematically valid arguments and drawing conclusion to enhance their mathematical thinking.

EXAMINATION SYLLABUS WITH SCHEME OF ASSESSMENT

UNIT 1: REAL AND COMPLEX NUMBER

Unit Titles	SLOs	K	U	A	TOS		
					MCQS	CRQ	ERQ
1.1 Real Number	• Explain the set of real numbers as a union of sets of rational and irrational numbers • Locate numbers on the number line • Differentiate terminating and non-terminating recurring decimals • Convert rational and irrational numbers into decimal numbers		* * * 	 *	1	1	-
1.2 Properties of Real Numbers	• Describe the properties of real numbers		*				
1.3 Radicals and Radicands	• Explain the concept of radicals and radicands • Identify radical and exponential form of an expression • Convert radical form in to exponential form and vice versa		* *	 *			
1.4 Laws of Exponents /indices	• Identify base, exponent and value • Apply the laws of exponents to simplify expression with real exponents	*		 *			

Topics	SLOs	K	U	Ap	MCQ	CRQ	ERQ
1.5 Complex Numbers	• Define complex number z represented by an expression of form z = a + ib, where a and b are real numbers and I = • Identify a as real part and b as imaginary part of z = a + ib • Find conjugate of a complex number • Explain the condition for equality of complex number	* *	 *	 *			
1.6 Basic Operations on complex Numbers	Apply the basic operations (addition, subtraction, multiplication and division) on complex numbers			*			
Total number of SLOs = 15		3	7	5			

Unit 2: RATIO AND PROPORTION

Topics	SLOs	K	U	Ap	TOS MCQ	CRQ	ERQ
2.1 Ratio and Proportion	• Examine the following theorems along with their corollaries a) A line parallel to one side of a triangle, intersecting the other two sides, divides them proportionally. b) If a line segment intersects the two sides of a triangle in the same ratio, then it is parallel to the third side. c) The internal bisector of an angle of a triangle divides the side opposite to it in the ratio of the sides containing the angle. d) If two triangles are similar, the measures of their corresponding sides are proportional. Apply the theorems to solve allied problems.		*	 *	1	-	1
Total Number of SLOs = 2		**-**	**1**	**1**			

Unit 3 ALGEBRAIC EXPRESSION AND ALGEBRAIC FORMULAS

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
3.1 Algebraic Expressions	• Describe that a rational expression behaves like a rational number.	*			1	-	2
	• Express a rational expression as a quotient (x) (x) of two polynomials $p(x)$ and $q(x)$, where $q(x)$, is not the zero polynomial.		*				
	• Examine whether a given algebraic expression is a ☐ Polynomial or not, ☐ Rational expression or not.		*				
	• Describe $\frac{p(x)}{q(x)}$ as a rational expression in its lowest term, if $p(x)$ and $q(x)$ are polynomials with integral coefficients and having no common factor.	*					
	• Examine whether a given rational algebraic expression is in its lowest form or not.		*	*			
	• Reduce a given rational expression to its lowest form.			*			
	• Find the sum, difference and the product of rational expressions.			*			
	• Divide a rational expression by another rational expression and			*			

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	express the result in its lowest form. • Find the values of the algebraic expressions at some particular real number.						
3.2 Algebraic Formulas	• Describe the formulas $(a + b)^2 + (a − b)^2 = 2(a^2 + b^2)$, $(a + b)^2 − (a − b)^2 = 4ab$. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$ $(a + b)^3 = a^3 + 3ab(a + b) + b^3$ $(a − b)^3 = a^3 − 3ab(a − b) − b^3$ $a^3 \pm b^3 = (a \pm b)(a^2 \pm ab + b^2)$ • Find the values of $a^2 + b^2$ and of ab when the values of $a + b$ and $a − b$ are known. • Find the values of $a^2 + b^2 + c^2$ when the values of $a + b + c$ and $ab + bc + ca$ are given. • Find the value of $a + b + c$ when the values of $a^2 + b^2 + c^2$ and $ab + bc + ca$ are given. • Find the value of ab + bc + ca when the values of $a^2 + b^2 + c^2$ and $a + b + c$ are given. • Find the values of $a^3 \pm b^3$ when the values of $a \pm b$ and ab are given. • Find the values of $x^3 \pm 1$, when the value of $x \pm 1$ is given.		*				

	• Find the product of $x + \frac{1}{x}$ and $x^2 + \frac{1}{x2} + 1$			*			
	• Find the product of $x - \frac{1}{x}$ and $x + \frac{1}{x2} - 1$			*			
				*			
				*			
	• Find the product of $(x - 1)x$ and $(x^2 + x + 1)$			*			
	• Find the continued product of $(x + y)(x - y)(x^2 + xy + y^2)(x^2 - xy + y^2)$.						
3.3 Surds and their applications	• Define the surds of the second order.	*					
	• Use basic operations on surds of second order to rationalize the denominators and to evaluate them.			*			
3.4 Rationalization	• Explain rationalization (with precise meaning) of real numbers of the types $\frac{1}{a + b\sqrt{x}}$ and $\frac{1}{\sqrt{x} + \sqrt{y}}$ and their combinations, where x and y are natural numbers and a and b and are integers.			*			
Total Numbers of SLOs = 23		3	4	16			

Unit 4 FACTORIZATION

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
4.1 Factorization	• Factorize algebraic expressions of the following types. $ka + kb + kc$, (Common factors in all the terms) $ac + ad + bc + bd$,(Common factors in pairs of terms) $a^2 \pm 2ab + b^2$, (Perfect squares) $a^2 – b^2$(Difference of two squares) $a^2 \pm 2ab + b^2 – c^2$. $(\sqrt{a})^2 – (\sqrt{b})^2$ Factorize the expressions of the following types: $a^4 + a^2 b^2 + b^4$ and $a^4 + 4b^4$ $x^2 + px + q$ $ax^2 + bx + c$ $(ax^2 + bx + c)(ax^2 + bx + d) +k$, $(x + a)(x + b)(x + c)(x + d) + k$, $(x + a)(x + b)(x + c)(x + d) + kx^2$ $a^3 + 3a^2b +3ab^2 + b^3$ $a^3 – 3a^2 b +3ab^2 – b^3$ $a^3 \pm b^3$			* *	2	1	1
4.2 Reminder and Factor Theorems	• Prove remainder theorem through examples. • Find remainder (without dividing) when a polynomial is divided by a linear polynomial. • Define zero of a polynomial. • Prove factor theorem	*		* * *			
3.3 Factorization of Cubic Polynomial	• Use factor theorem to factorize a cubic polynomial.			*			
Total Numbers of SLOs= 7		1	-	6			

Unit 5 LINEAR EQUATIONS AND INEQUALITIES

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
5.1 Linear Equations	• Describe linear equations in one variable • Solve linear equations with rational coefficients • Reduce equations, involving radicals, to simple linear form and find their solutions.	*		* *	1	2	
5.2 Equations involving absolute values	• Define absolute value • Solve the equations, involving absolute values in one variable	*		*			
5.3 Linear Inequalities	• Define inequalities (>, <) and (≥ , ≤) • State properties of inequalities (i.e., trichotomy, transitive, additive and multiplicative).	*	*				
5.4 Solving Linear Inequalities	• Solve linear inequalities with rational coefficients.			*			
Total Number of SLOs = 8		3	1	4			

Unit 6   SETS AND FUNCTIONS

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
6.1. Operations on Sets	• Describe the sets denoted by $\mathbb{N}, \mathbb{W}, \mathbb{Z}, \mathbb{E}, \mathbb{O}, \mathbb{P}, \mathbb{Q}$ and $\mathbb{R}$ • Define type of sets and representation of sets	* *			1	1	1

	• Apply following operations on sets	14					
	☐ Union, ☐ Intersection, ☐ Difference, ☐ Complement.			*			
6.2 Properties of Union and Intersection	• Provide formal proof of the following fundamental properties of union and intersection of two or three sets.			*			
	☐ Commutative property of union, ☐ Commutative property of intersection, ☐ Associative property of union, ☐ Associative property of intersection, ☐ Distributive property of union over intersection, ☐ Distributive property of intersection over union, ☐ De Morgan's laws. • Verify the fundamental property of given sets.			*			
6.3 Venn Diagrams	• Demonstrate the following operations through Venn		*				
	☐ Union and intersection of sets, ☐ Complement of a set. ☐ Symmetric difference of two sets. • Use Venn diagram to verify			*			
	☐ Commutative property of union over intersection of sets, ☐ De Morgan's laws, ☐ Associative laws, ☐ Distributive laws.						
6.4 Ordered Pairs and Cartesian Products	• Recognize order pairs.		*				
	• Form Cartesian products.		*				

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Topics	SLOs	K	U	Ap			
6.5 Binary Relations	Define a binary relation and identify its domain and range.	*					
6.6 Functions	• Define a function and identify its domain, co-domain and range. • Demonstrate the following: Into and one-one function (injective function), Onto function (subjective function), One-one and onto function (bijective function). • Examine whether a given relation is a function or not. • Differentiate between one-one correspondence and one-one function.	*	* * *				
Total Number of SLOs =14		**4**	**6**	**4**			

Unit 7 BASIC STATISTICS

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
7.1 Frequency Distribution	• Construct a group frequency table. • Construct histograms with equal class intervals. • Construct histograms with unequal class intervals. • Construct a frequency polygon.			* * * *	1	-	1
7.2 Cumulative Frequency Distribution	• Construct a cumulative frequency table. • Draw a cumulative frequency polygon.			* *			

7.3 Measures of Central Tendency	• Calculate for (ungrouped and grouped data): ☐ Arithmetic mean by definition and using deviations from assumed mean, ☐ Median, mode, geometrical mean and harmonic mean, • Recognize properties of arithmetic mean. • Calculate weighted mean and moving averages. • Estimate median, quartiles and mode, graphically.		*	* * *			
7. 4 Measures of Dispersion	Find range, variance and standard deviation			*			
Total Number of SLOs =11			**1**	**10**			

Unit 8 LINEAR GRAPHS AND THEIR APPLICATIONS

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
8.1 Cartesian Plane and Linear Graphs	• Identify pair of real numbers as an ordered pair. • Recognize an ordered pair through different examples; for instance an ordered pair (2,3) to represent a seat, located in an examination hall, at the intersection of 2nd row and 3rd column. • Describe rectangular and Cartesian plane consisting of two number lines intersecting at right angles at a point O. • Identify origin O and coordinate axes (Horizontal and Vertical axis or x-axis and y-axis	* *	* *		1	1	1

	respectively) in rectangular plane.		*				
	• Locate an ordered pair (*a,b*) as a geometrical point in the rectangular plane and recognize:						
	☐ *a* as the *x*-coordinate (or abscissa), ☐ *b* as the *y*- coordinate (or ordinate).			*			
	• Draw different geometrical shapes (e.g., line segment, triangle and rectangle etc.) by joining a set of given points.			*			
	• Construct a table for pairs of values satisfying a linear equation in two variables.						
8.2 Conversion Graphs	• Interpret conversion graph as a linear graph relating to two quantities which are in direct proportions.		*				
	• Deduce a given graph to know one quantity corresponding to another.		*				
	• Examine the graph for conversion of the forms:		*				
	☐ Miles and kilometers, ☐ Acres and hectares, ☐ Degrees Celsius and Fahrenheit, ☐ Pakistani currency and other currencies, etc.						
8.3 Graphic Solution of Equations in two variables	• Solve simultaneous linear equations in two variables by graphical method.			*			
Total Number of SLOs = 11		**2**	**6**	**3**			

Unit 9 Pythagoras theorem

Topic	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
9.1 Pythagoras' Theorem	• Deduce the following theorem along with its corollaries, a) In a right-angled triangle, the square of the length of hypotenuse is equal to the sum of the squares of the lengths of the other two sides. (Pythagoras' Theorem). b) 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). • Apply the theorem to solve related problems.		* 	 *	1	-	-
Number of SLOs = 2			1	1			

Unit 10 Congruent Triangles

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
10. 1 Congruent Triangles	• Explain the following theorems along with them corollaries a) In any correspondence of two triangles, if one side and any two angles of one triangle are congruent to the corresponding sides and angles of the other, the two triangles are congruent. b) If two angles of a triangle are congruent then the sides opposite to them are also congruent. c) In the correspondence of the two triangles, if three sides of one triangle are congruent to the corresponding three sides of the other, the two triangles are congruent.		*		1	1	-

Topics	SLOs	K	U	Ap			
d) If in the correspondence of two right angled triangles, the hypotenuse and one side of one are • Apply the theorems to solve related problems.				\ *			
Total number of SLOs = 2			**1**	**1**			

Unit 11 Parallelograms and Triangles

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
11.1 Parallelograms and Triangles	• Explain the following theorems along with their corollaries a) In a parallelogram: • The opposite sides are congruent, • The opposites angles are congruent, • The diagonals bisect each other. b) If two opposite sides of a quadrilateral are congruent and parallel, it is a parallelogram. c) The line segments joining the midpoints of two sides of a triangle, is parallel to the third side and it is equal to one half of its length. d) The medians of a triangle are concurrent and their point of concurrency is the point of trisection of each median. e) If three or more parallel lines make congruent intercepts on the transversal, they also intercept congruent segments on any other line that cuts them. • Apply the theorems to solve related problems.		* *		1	-	1
Total Number of SLOs =2			**1**	**1**			

Unit 12 LINE BISECTORS AND ANGLE BISECTOR

Topic	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
12.1 Line Bisectors and Angle Bisectors	Explain the following theorems along with their corollaries a) Any point on the right bisector of a line segment is equidistant from its end points. b) Any point equidistant from the points of a line segment is on its right bisector. c) The right bisectors of the sides of a triangle are concurrent. d) Any point on the bisector of an angle is equidistant Apply the theorems to solve related problems.		* *		1	1	
No of SLOs = 2			**1**	**1**			

Unit 13 SIDES AND ANGLES OF A TRIANGLE

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
13 .1 Sides and Angles of a Triangle	• Explain the following theorems along with their corollaries a) If two sides of a triangle are unequal in length, the longer side has an angle of greater measure opposite to it. b) If two angles of a triangle are unequal in measure, the side opposite to the greater angle is longer than the side opposite to the smaller angle. c) The sum of the lengths of any two sides of a triangle is greater than the length of the third side. d) From a point, out-side a line, the perpendicular is the shortest distance from the point to the line. • Apply the theorems to solve related problems.		* *		1	1	1

No of SLOs = 2		1	1			

Unit 14 Projection of a side of a Triangle

Topic	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
14 .1 Projection of a side of a Triangle	• Deduce the following theorems along with their corollaries a) In an obtuse–angled triangle, the square on the side opposite to the obtuse angle is equal to the sum of the squares on the sides containing the obtuse angle together with twice the rectangle contained by one of the sides, and the projection on it of the other. b) In any triangle, the square on the side opposite to an acute angle is equal to the sum of the squares on the sides containing that acute angle diminished by twice the rectangle contained by one of those sides and the projection on it of the other. c) 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, (Apollonius' theorem). • Apply the theorems to solve allied problems.		* 	 *	1		1
No of SLOs = 2			1	1			

Unit 15 PRACTICAL GEOMETRY – TRIANGLES

Topics	SLOs	K	U	Ap	TOS		
					MCQ	CRQ	ERQ
15.1 Construction of Triangle	Construct a triangle having given: ☐ Two sides and the included angle, ☐ One side and two of the angles, ☐ Two of its sides and the angle opposite to one of them, (with all the three possibilities) • Draw the following of a given triangle and verify their given concurrency. ☐ Angle bisectors, ☐ Altitudes, ☐ Perpendicular bisectors, ☐ Medians			* *	-	1	
15.2 Figures with Equal Areas	• Construct a triangle equal in area to a given quadrilateral. • Construct a rectangle equal in area to a given triangle. • Construct a square equal in area to a given rectangle. • Construct a triangle of equivalent area on a base of given length.			* * * *			
No of SLOs =6		0	0	6			

Unit #	Topics	Content %	Number of Item (35X% of content)	MCQs = Number of Item (25X% of content	Constructed Response Items = Number of Item (10 X% of content	Marks allocated to each topic= 75 % of content	Total items and their marks
1	Real and Complex Numbers	12	4	3	1	9	3 MCQs @ 1mark each 1SRQ @ 5 marks
2	Ratio and Proportions	3	1	1	0	2	1 MCQs @ 1mark each
3	Algebraic expressions and Inequalities	20	7	5	2	15	5 MCQs @ 1mark each 2 SRQs @ 5 marks
4	Factorization	6	2	2	1	5	2 MCQs @ 1mark each 1 SRQ@ 5 mark
5	Linear Equation and Inequalities	6	2	1	1	5	1 MCQ @ 1mark 1 SRQ @ 5 mark
6	Sets and Functions	12	4	3	1	9	3 MCQs @ 1mark each 1 SRQ @ 5 mark
7	Basic Statistics	9	3	2	1	7	2 MCQs @ 1mark each 1 SRQ @ 5 mark
8	Linear Graphs and their Application	9	3	2	1	7	2 MCQs @ 1mark each 1 SRQ @ 5 mark
9	Pythagoras theorem	2	1	1	0	2	2 MCQs @ 1mark each
10	Congruent Triangles	3	1	1	0	2	1 SRQ @ 5 marks
11	Parallelograms and Triangles	4	1	0	1	3	
12	Line Bisectors & Angle Bisectors	3	1	1	0	2	4 MCQ@ 1mark
13	Sides and Angles of Triangles	3	1	1	0	2	5 each 1 SRQ @ 5 marks
14	Projection of a side of a triangle	3	1	1	0	2	
15	Practical Geometry Triangle	5	2	1	1	3	
	Total	100%		=25	=10	=75	25+50=75

Note:
As per the cognitive level weightage the examination paper must include   05   questions to assess knowledge, 11 questions to assess understanding of the concepts and 19 questions to assess students' skills to apply mathematics.

DEFINITIONS OF COGNITIVE LEVELS

Remember

Remembering is the act of retrieving knowledge and can be used to produce things like definitions or lists. The student must be able to recall or recognise information and concepts. The teacher must present information about a subject to the student, ask questions that require the student to recall that information and provide written or verbal assessment that can be answered by remembering the information learnt.

Question Stems

- Can you name all the …?
- Describe what happens when …?
- How is (are) …?
- How would you define …?
- How would you identify …?
- How would you outline …?
- How would you recognise…?
- List the … in order.
- What do you remember about …?
- What does it mean?
- What happened after?
- What is (are) …?
- What is the best one?
- What would you choose …?
- When did …?
- Where is (are) …?
- Which one …?
- Who spoke to …?
- Who was …?
- Why did …?

Understand

The next level in the taxonomic structure is Understanding, which is defined as the construction of meaning and relationships. Here the student must understand the main idea of material heard, viewed, or read and interpret or summarise the ideas in their own words. The teacher must ask questions that the student can answer in their own words by identifying the main idea.

Question Stems

- Can you clarify…?
- Can you illustrate …?
- Condense this paragraph.
- Contrast …
- Does everyone think in the way that … does?
- Elaborate on …
- Explain why …
- Give an example
- How can you describe
- How would you clarify the meaning
- How would you compare …?
- How would you differentiate between …?
- How would you describe…?
- How would you generalise…?
- How would you identify …?
- Is it valid that …?
- Is this the same as …?
- Outline …
- Select the best definition
- State in your own words
- This represents …
- What are they saying?
- What can you infer from …?
- What can you say about …?
- What could have happened next?
- What did you observe?

- What does this mean?
- What expectations are there?

	- What information can you infer from…? - What is the main idea of …? - What restrictions would you add? - What seems likely? - What seems to be …? - What would happen if …? - What would happen if …? - Which are the facts? - Which statements support …?

Apply	**Analyse**
The third level in Bloom's taxonomy, Applying, marks a fundamental shift from the pre-Bloom's learning era because it involves remembering what has been learnt, having a good understanding of the knowledge, and applying it to real-world exercises, challenges or situations. Students must apply an abstract idea in a concrete case to solve a problem or relate it to prior experience. The teacher must provide opportunities for students to use theories and problem-solving techniques in new situations and review and check their work. Assessment questions should be provided that allow students to define and solve problems.	Analysing is the cognitive level where students can take the knowledge they have remembered, understood and applied, then delve into that knowledge to make associations, discernments or comparisons. Students should break down a concept or idea into parts and show relationships between these parts. Teachers must give students time to examine concepts and their requisite elements. Students are required to explain why they chose a solution.
Question Stems	**Question Stems**
- Can you group by characteristics such as …? - Choose the best statements that apply - Clarify why … - Do you know of another instance where …? - Draw a story map - Explain why a character acted in the way that he did - From the information given, can you develop a set of instructions about …? - How could you develop …? - How would you change …? - How would you demonstrate…? - How would you develop … to present ? - How would you explain …? - How would you modify …? - How would you present…? - How would you solve … ? - Identify the results of …	- Can you distinguish between …? - Can you explain what must have happened when …? - Determine the point of view, bias, values, or intent underlying the presented material - Discuss the pros and cons of … - How can you classify … according to …? - How can you compare the different parts? - How can you sort the different parts…? - How is … connected to …? - How is … similar to …? - How would you categorise…? - How would you explain ? - If … happened, what might the ending have been? - State the point of view of … - What are some of the problems of …? - What assumptions …? - What can you infer about…? - What can you point out about ? - What conclusions …?

- Illustrate the …
- Judge the effects of … What would result …?
- Predict what would happen if …
- Tell how much change there would be if …
- Tell what would happen if …
- What actions would you take to perform …?
- What do you think could have happened next?
- What examples can you find that ?
- What other way would you choose to …?
- What questions would you ask of …?
- What was the main idea …?
- What would the result be if …?
- Which factors would you change if …?
- Who do you think…?
- Why does this work?
- Write a brief outline …
- Write in your own words …
- What do you see as other possible outcomes?
- What does the author assume?
- What explanation do you have for …?
- What ideas justify the conclusion?
- What ideas validate…?
- What is the analysis of …?
- What is the function of …?
- What is the problem with …?
- What motive is there?
- What persuasive technique is used?
- What statement is relevant?
- What was the turning point?
- What were some of the motives behind …?
- What's fact? Opinion?
- What's the main idea?
- What's the relationship between?
- Which events could not have happened?
- Why did … changes occur?
- Why do you think ?

BLOOMS TAXONOMY WITH EXAMPLES

Conclusion

If you are a teacher looking for ways to engage your students in learning, this LIST of questions might be interesting for your classroom practice. Bloom's Taxonomy question stems can help elicit higher-order thinking skills and promote critical thinking among learners at different taxonomy levels. These question stems can also encourage students to think about their knowledge through reflection before answering questions.

ACTION WORDS FOR COGNITIVE LEVELS

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	appraise	criticize	compose
describe	interpret	illustrate	judge	evaluate	create
label	paraphrase	modify	support	order	plan
list	summarize	use	compare	compare	combine
name	classify	calculate	decide	classify	formulate
state	compare	change	discriminate	contrast	invent
match	differentiate	choose	recommend	distinguish	hypothesize
recognize	discuss	demonstrate	summarize	infer	substitute
select	distinguish	discover	assess	separate	write
examine	extend	experiment	choose	explain	compile
locate	predict	relate	convince	select	construct
memorize	associate	show	defend	categorize	develop
quote	contrast	sketch	estimate	connect	generalize
recall	convert	complete	grade	differentiate	integrate
reproduce	demonstrate	construct	measure	divide	modify
tabulate	estimate	dramatize	predict	order	organize
tell	express	interpret	rank	prioritize	prepare
Copy	identify	manipulate	score	survey	produce
discover	indicate	paint	select	calculate	rearrange
duplicate	infer	prepare	test	conclude	rewrite
enumerate	relate	teach	argue	correlate	adapt

listen	restate	act	conclude	deduce	anticipate
observe	select	collect	consider	devise	arrange
omit	translate	compute	critique	diagram	assemble
read	ask	explain	debate	dissect	choose
recite	cite	list	distinguish	estimate	collaborate
record	discover	operate	editorialize	evaluate	facilitate
repeat	generalize	practice	justify	experiment	imagine
retell	group	simulate	persuade	focus	intervene
visualize	illustrate	transfer	rate	illustrate	make
	judge	write	weigh	organize	manage
	observe			outline	originate
	order			plan	propose
	report			question	simulate
	represent			test	solve
	research				support
	review				test
	rewrite				validate
	show				

SSC PART I EXAMINATION
MARKS BREAKUP GRID FOR EXAMINATION 2023

SCIENCE GROUP:

SUBJECT	THEORY	PRACTICAL	TOTAL
ENGLISH	100	-	100
URDU NORMAL / SINDHI NORMAL	75		75
ISLAMIAT/ETHICS	75	-	75
PHYSICS	60	15	75
CHEMISTRY	60	15	75
BIOLOGY	60	15	75
MATHEMATICS	75	-	75
TOTAL	505	45	550

COMPUTER SCIENCE GROUP:

SUBJECT	THEORY	PRACTICAL	TOTAL
ENGLISH	100	-	100
URDU NORMAL/SINDHI NORMAL	75	-	75
ISLAMIAT/ETHICS	75	-	75
PHYSICS	60	15	75
CHEMISTRY	60	15	75
COMPUTER STUDIES	60	15	75
MATHEMATICS	75	-	75
TOTAL	505	45	550

GENERAL GROUP:

SUBJECT	THEORY	PRACTICAL	TOTAL
ENGLISH	100	-	100
URDU NORMAL / SINDHI NORMAL	75	-	75
ISLAMIAT/ETHICS	75	-	75
GENERAL SCIENCE	75	-	75
GENERAL MATH	75	-	75
EDUCATION	75	-	75
ECONOMICS	75	-	75
CIVICS	75	-	75
ISLAMIC STUDIES	75	-	75
TOTAL	550	-	550

ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

Class: IX
Time Allowed: 20minutes

MODEL PAPER FOR 2024
SUBJECT: MATHEMATICS

Q1: (SECTION "A") **Marks: 15**

Note: Attempt all questions from section 'A'. Each question carries **ONE** mark.

i. The degree of the equation $3x^2y + 5y^4 - 10$ is:

    A. 4   B. 5   C. 6   D. 10

ii. A triangle having all 2 sides congruent is called:

    A. Scalene   B. Right angle   C. Equilateral   D. Isosceles

iii. The point (2, -2) lies in:

    A. 1st quadrant   B. 2nd quadrant   C. 3rd quadrant   D. 4th quadrant

iv. $(5+\sqrt{15})(5-\sqrt{15})$ is equal to:

    A. 10   B. 15   C. 25   D. 30

v. $(5i)(-2i) = $ _____.

    A. -10   B. 10   C. $10i$ D. $-10i$

vi. The additive inverse of $\sqrt{5}$ is:

    A. $-\sqrt{7}$ B. $1/\sqrt{7}$ C. $\sqrt{-7}$ D. -7

vii. If $\log_{10} x = 4$, then the value of x is:

    A. 510   B. 100   C. 1000   D. 10000

viii. The factors of $a^2 + a - 12$ are:

    A. (a + 4) (a - 6)   B. (a - 4) (a + 6)   C. (a + 3) (a - 8)   D. (a + 3)(a + 3)

ix. The solution set of $\left|\dfrac{5y}{3}\right| = 5$ is:

    A. {3}   B. {-5, 5}   C. {3, -3}   D. {-3}

x. $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$ is equal to:

    A. $(a + b - c)^2$ B. $(a + b + c)^2$ C. $(a - b + c)^2$ D. $(a + b + c)^2$

xi. The characteristics of log 54.58 is:

    A. 0   B. 1   C. 2   D. 4

xii. $\text{Log} xyz = $ _____.

    A. Logx logy logz   B. Log x + log y + log z   C. Log $(xy)^z$ D. Logx – logy - logz

xiii. If A = (3, 0) and B = (0, 3) are any two points in the plane then $|\overline{AB}| = $

    A. 6   B. $6\sqrt{2}$ C. $3\sqrt{2}$ D. $2\sqrt{3}$

xiv. The point of intersection of all the three internal trisectors of the angle is called:

    A. Centroid   B. In centre   C. Ortho centre   D. Circumcenter

xv. How many maximum roots of a linear equation are:

    A. 1   B. 2   C. 3   D. 4

END OF SECTION A

Class: IX   **MODEL PAPER FOR EXAMINATION 2024**
Time: 2 hours 40 minutes   SUBJECT: MATHEMATICS (SECTION "B" AND SECTION "C")   Total Marks 60
SECTION "B" (SHORT ANSWER QUESTIONS)   30 Marks

Note: Answer any **SIX** questions from this section.

Q2. Find the square root of the expression $25x^4 + 40x^3 + 26x^2 + 8x + 1$ by division method.

Q3. Find the solution set of the following equation and also verify the answer. $\sqrt{4x+5} = \sqrt{3x-7}$

Q4. Solve the equation by using quadratic formula $x^2 - 2x = 12$

Q5. If two angles of a triangle are congruent, then the sides opposite to them are also congruent. Prove it.

Q6. If two opposite sides of a quadrilateral are congruent and parallel, it is a parallelogram, prove it.

Q7. If $z_1 = 2-5i$ and $z_2 = 2 + 3i$ verify that $\overline{\left(z_1/z_2\right)} = \overline{z_1}/\overline{z_2}$

Q8. Find the value of $a^3 + b^3$, when $a + b = 4$ and $ab = 3$. OR $\dfrac{\sqrt[3]{(125)^2} \, x8}{\sqrt{(2x32)^2}}$

Q9. Find the value by using logarithms: $\dfrac{99.87}{(8.369)(0.785)}$.

Q10. Find the factors by using factor theorem $6x^3 + 7x^2 - x - 2$.

Q11. Construct ΔPQR such that $m\overline{PQ} = m\overline{QR} = 4.6cm \ and \ m \angle Q = 35°$.

SECTION "C" (DETAILED ANSWER QUESTIONS)   30 Marks

Q12. The line segment joining the mid points of two sides of a triangle is parallel to the third side and it is equal to one half of its length. Prove it.

Q13. Using distance formula, find the perimeter of the triangle formed by the point A $(0, 0)$, B $(4, 0)$ and C. $(2,2\sqrt{3})$

Q14. Factorize the following (any four)
(i) $36x^4 + 12x^2 + 1$ (ii) $4t^4 + 625$ (iii) $x^6 + 1$
(iv) $16x^2 - 25y^2$ (v) $x^8 + x^4 + 1$ (vi) $x^2 + 13xy - 30y^2$

Q15. Find the solution set of the following simultaneous equations by graphical method.
$2x = y + 5$
$x = 2y + 1$

Q16. In the correspondence of two right angled triangles, the hypotenuse and onside of one are congruent to the hypotenuse and the corresponding side of the other, then the triangle are congruent. Prove it.

END OF PAPER