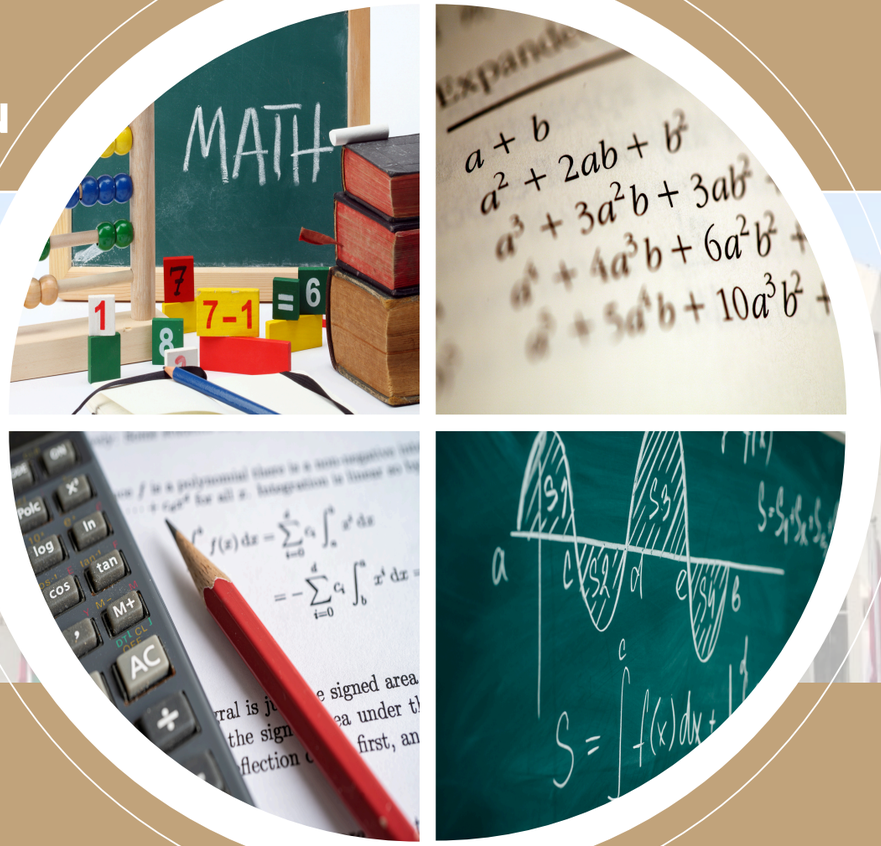
ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

MATHEMATICS

Grade X

NATIONAL CURRICULUM OF PAKISTAN
2022-23



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ASSESSMENT FRAMEWORK

FOR

MATHEMATICS GRADE-X

CURRICULUM 2022-23

ACKNOWLEDGEMENT

It is a great honour that we, at the Federal Board of Intermediate and Secondary Education, have developed the Assessment Framework (AF) for the subject of Mathematics for Grade-X. The primary objective of the AF is to optimize the current curriculum 2022-23. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes for Grade-X Mathematics curriculum. They evaluated these outcomes in terms of their scope, cognitive level, and progression across the grade.

This significant undertaking was the result of a series of extensive meetings and collaborative efforts of the subject and assessment experts. Their dedication and expertise have been instrumental in bringing this framework to fruition.

The Assessment Framework will serve as a guiding document for students, teachers and paper setters. Students will receive clear directions for preparing themselves for the annual examination. Similarly, teachers will use it as a guide to understand what to teach in class and to prepare students for the final examinations accordingly. Similarly paper setters will also seek guidance from this document.

Following subject as well as assessment experts/committee members remained constantly engaged in the development of the AF:

1. Dr. Javed Iqbal, Principal, OPF Boys College, H-8, Islamabad
2. Dr. Muhammad Anwar Assistant Professor, Islamabad Model College for Boys, G-10/4, Islamabad
3. Mr. Anwar ul Haq, Assistant Professor, Bahria College, Naval Complex, E-8, Islamabad
4. Mr. Ali Raza, Assistant Professor, Islamabad Model College for Boys, F-8/4, Islamabad
5. Ms. Zohra Yousaf, HOD Math, Army Public School & College, Hamza Camp Rawalpindi

The whole work was successfully accomplished under the able supervision and guidance of Dr. Ikram Ali Malik, Chairman, FBISE and due to the hard work and dedication of the staff of Research Section of FBISE, in particular, Syed Zulfiqar Shah, Deputy Secretary, Research and Academics who played a pivotal and leading role in finalizing the Assessment Framework.

MIRZA ALI
Director (Test Development)
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR MATHEMATICS GRADE-X, CURRICULUM 2022-23

To ensure clarity and precision in assessment, the learning outcomes have been categorized into two distinct groups: formative and summative. This classification helps in effectively measuring student progress and understanding. Each Student learning outcome (SLO) has been carefully marked as either formative or summative within the newly developed Assessment Framework. SLOs of Summative Assessment Format will be part of the Final Examination while SLOs of Formative Assessment will although be part of the teaching-learning activity but they will **NOT** be part of Final Examinations. Estimated cognitive levels i.e Knowledge (K), Understanding (U) and Application (A) of all the SLOs have also been indicated. It may be noted that all the higher cognitive levels have been collectively accumulated in the cognitive level of 'Application'. In subjects involving Practicals (Lab work), it has been mentioned categorically whether an SLO is summative for theory or summative for Practical Based Assessment (PBA). If an SLO is summative for PBA, it means that Laboratory work is required in the teaching-learning activity and it will be part of the Practical Examination/ Practical Based Assessment.

The Assessment Framework will act as a comprehensive guide for students, teachers and paper setters. Students will have clear instructions on how to prepare for the annual examinations. Teachers will use the framework to understand the curriculum and effectively prepare their students for the final examination. Additionally, paper setters will refer to this document for guidance in setting examination papers.

A model question paper has also been developed to provide a clear structure and format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of what to expect in their examinations. By aligning the paper with the Student Learning Outcomes (SLOs) of the curriculum, we ensured that the questions accurately reflect the skills and knowledge that students are expected to acquire.

A detailed Table of Specifications (ToS) has been created to ensure equitable coverage of cognitive levels and content domains in order to generate a balanced question paper. The ToS serves as drawing scale and action plan for the question paper, ensuring that all important areas of the curriculum are adequately and proportionately assessed.

FORMATIVE ASSESSMENT: AN ESSENTIAL COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a pivotal element in the educational process, distinguished by its role in providing ongoing feedback to both students and educators. Unlike summative assessments, which evaluate student learning at the end of an instructional period, formative assessments are integrated into the learning process to monitor student understanding and guide instructional decisions.

The primary objective of formative assessment is to identify learning gaps and misunderstandings as they occur, enabling timely interventions. This dynamic approach allows teachers to adjust their teaching strategies to better meet the needs of their students. For instance, if a teacher notices through a quick quiz or class discussion that a significant portion of the class struggles with a particular concept, they can revisit that topic, providing additional explanations or alternative methods of instruction. This adaptability is crucial for fostering a deeper understanding of the material.

Formative assessments come in various forms, ranging from informal methods like classroom discussions, observations, and questioning, to more structured approaches such as quizzes, peer assessments, and self-reflections. These methods are not limited to paper-and-pencil tasks but can include digital tools that provide instant feedback. The versatility of formative assessments allows educators to cater to diverse learning styles and preferences, ensuring that all students are engaged and supported in their learning journey.

Formative assessment plays a significant role in creating a supportive classroom environment. It shifts the focus from merely achieving grades to understanding the learning process. This approach reduces the pressure on students, as they perceive assessments not as a final judgment of their abilities but as a part of their learning journey. Consequently, formative assessment can lead to increased student motivation and engagement.

In conclusion, formative assessment is a powerful tool that, when effectively implemented, can significantly enhance the learning experience. It provides invaluable insights for both teachers and students, promotes a growth-oriented learning environment, and supports the continuous development of essential skills. As education evolves, the role of formative assessment will undoubtedly continue to be central in fostering successful and meaningful learning experiences.

SUMMATIVE ASSESSMENT: EVALUATING LEARNING OUTCOMES IN THE FORM OF TERMINAL/FINAL EXAMINATION

Summative assessment is a fundamental component of the educational process, designed to evaluate student learning at the conclusion of an instructional period. Unlike formative assessment, which provides ongoing feedback during the learning process, summative assessment serves as a final measure of what students have learned. Typically administered at the end of a unit, course, or academic year. Summative assessment aims to determine the extent to which educational objectives have been achieved.

The primary purpose of summative assessment is to assess the overall effectiveness of instruction and learning. It provides a conclusive evaluation of student performance, often in the form of tests, final projects, or standardized exams. These assessments generate grades or scores that reflect a student's achievement in a given subject area over a specific period or time duration.

Summative assessment is often used to make critical decisions regarding student progression, certification, or placement in subsequent educational levels. Additionally, summative assessments provide valuable data that inform curriculum development and instructional strategies. By analyzing summative assessment results, educators can identify trends, strengths, and weaknesses within their instructional approaches, allowing for improvements in future teaching.

In conclusion, summative assessment plays a critical role in the educational process by providing a final evaluation of student learning. While it differs from formative assessment in its focus and application, it is an essential tool for measuring academic achievement. When balanced with formative assessments, summative assessments contribute to a well-rounded and effective approach to evaluating and supporting student learning.

National Curriculum of Pakistan 2022- 23

Assessment Framework

MATHEMATICS Grade – X (SSC-II)

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
A: Numbers and Algebra	**Complex Numbers**	**[SLO: M-10-A-01]:** Identify complex numbers, complex conjugate, absolute value or modulus of a complex number.	Summative	Knowledge	Question(s) will be asked in the annual examination	15
		[SLO: M-10-A -02]: Apply algebraic properties and perform basic operations on complex numbers.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-03]: Demonstrate additive identity and multiplicative identity for the set of complex numbers	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-10-A-04]: Find additive inverse and multiplicative inverse of a complex number z.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-05]: Demonstrate the following properties of a complex number z.	Summative	Knowledge	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		$\lvert z\rvert=\lvert -z\rvert=\lvert \bar{z}\rvert=\lvert \bar{\bar{z}}\rvert$, $\bar{z}=z$, $z\bar{z}=\lvert z\rvert^2$, $\overline{z_1+z_2}=\bar{z}_1+\bar{z}_2$, $\overline{z_1z_2}=\bar{z}_1\bar{z}_2$, $\overline{\left(\frac{z_1}{z_2}\right)}=\frac{\bar{z}_1}{\bar{z}_2}$, $z_2\neq 0$.				
		SLO: M-10-A-06]: Find real and imaginary parts of complex numbers of the type (i) $(x+iy)^n\ \forall n\in Z$ (ii) $\left[\frac{x_1+iy_1}{x_2+iy_2}\right]^n$ for $(x_2+iy_2)\neq 0$, Where $n=\pm 1$ and ± 2	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-07]: Explain, with examples, how mathematical models and equations are often used to make predictions and test hypotheses in science. [e.g., In physics, mathematical equations are used to describe the motion of objects and the behavior of energy and matter. In chemistry, mathematical models are used to predict the behavior of chemical reactions and the properties of molecules. In biology, mathematical models are used to predict the growth and spread of populations and the spread of disease.]	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-08]: Solve the simultaneous linear equations with complex coefficients.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-09]: Apply the Geometric interpretation of a complex number.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-10]: Apply the geometric interpretation of the modulus of a complex number.	**Formative**	**Application**	**Question(s) will not be asked in the annual examination;**	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					however, it will be part of regular teaching practice.	
		[SLO: M-10-A-11]: Apply the geometric interpretation of algebraic operations.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-12]: Solve quadratic equations of the form $pz^2+qz+r=0, \forall p,q,r \in R$ and $z \in C$ by factorization, quadratic formula, completing square and graphs.	Summative	Knowledge	Question(s) will be asked in the annual examination	
	Quadratic Equations-I	**[SLO: M-10-A-13]:** Draw the graphs of the quadratic function. $y=ax^2+bx+c,\ a \neq 0$.	Summative	Understanding	Question(s) will be asked in the annual examination	12
		[SLO: M-10-A-14]: Establish relationship between roots and coefficients of quadratic equations.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-15]: Form a quadratic equation when roots are given.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-16]: Find discriminant of a given quadratic equation.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-17]: Identify the nature of roots of a quadratic equation through discriminant.	Summative	Understanding	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					in the annual examination	
		[SLO: M-10-A-18]: Solve a pair of linear and quadratic equations simultaneously.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-19]: Solve word problems involving quadratic equations.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-20]: Solve quadratic inequalities in one unknown.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-21]: Apply the concept of quadratic equations, and quadratic inequalities, to real world problems (such as in physics, engineering, and finance, i.e., calculating max and min heights in projectile motion, determining the max price on a company's budget, stability of population, growth of business, the relationship between hours worked and amount earned etc.).	Summative	Application	Question(s) will be asked in the annual examination	
	Matrices and Determinants	**[SLO: M-10-A-22]:** Display information in the form of matrix of order 2.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	10
		[SLO: M-10-A-23]: Solve situations involving sum, difference, and product of two matrices.	Summative	Knowledge	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					in the annual examination	
		[SLO: M-10-A-24]: Calculate the product of the scalar quantity and a matrix.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-10-A-25]: Evaluate the determinant and inverse of a matrix of order 2×2.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-26]: Solve the simultaneous linear equations in two variables using matrix inversion method and Cramer's rule.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-27]: Explain, with examples, how mathematics plays a key role in the development of new scientific theories and technologies. [e.g., Mathematical models and simulations are used to design and optimize new materials and drugs, and to understand the behavior of complex systems such as the human brain.]	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-A-28]: Apply concepts of matrices to real world problems (such as engineering, economics, computer graphics, and physics).	Summative	Application	Question(s) will be asked in the annual examination	
	Functions and Graphs	**[SLO: M-10-A-29]:** Recognize notation and determine the value of a function.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	06
		SLO: M-10-A-30]: Identify types of functions (into, onto, one-to-one, injective, surjective and bijective) by using Venn diagrams.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-31]: Explain operations on, and compositions of, functions.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-32]: Find the inverse of a given function.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-33]: Formulate composite functions as defined by $gf(x) = f(g(x))$.	Summative	Knowledge	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-A-34]: Apply concepts from functions to real world problems (such as finance, transportation, and sales).	Summative	Application	Question(s) will be asked in the annual examination	
	Graphs of basic Functions	**[SLO: M-10-A-35]:** Plot graphs of constant function, identity function, linear function and absolute valued functions.	Summative	Understanding	Question(s) will be asked in the annual examination	06
		[SLO: M-10-A-36]: Solve absolute value equations and inequalities in one variable and express the solution as a range of values on a number line.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-37]: Apply concepts of absolute valued functions to real-world problems (such as to calculate energy wave, magnitude and distance).	Summative	Application	Question(s) will be asked in the annual examination	
		SLO: M-10-A-38]: Apply concepts from functions to real world problems (such as finance, transportation, and sales).	Summative	Application	Question(s) will be asked in the annual examination	
	Algebraic Fractions	**[SLO: M-10-A-39]:** Describe rational expressions.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	04
		[SLO: M-10-A-40]: Factorize and simplify rational expressions.	Summative	Understanding	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					in the annual examination	
		[SLO: M-10-A-41]: Demonstrate manipulation of algebraic fractions.	Summative	Understanding	Question(s) will be asked in the annual examination	
		SLO: M-10-A-42]: Perform operations on rational expressions (limited to numerators and denominators that are monomials, binomials, or trinomials).	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-43]: Apply the concept of rational equations (limited to numerators and denominators that are monomials, binomials, or trinomials) to real world problems (such as the amount of work a person can do in certain amount of time, rates, and work).	Summative	Application	Question(s) will be asked in the annual examination	
	Linear Inequalities in Two Variables	**[SLO: M-10-A-44]:** Solve two linear inequalities with two unknowns simultaneously.	Summative	Understanding	Question(s) will be asked in the annual examination	04
		[SLO: M-10-A-45]: Interpret and Identify regions in plane bounded by two linear inequalities in two unknowns.	Summative	Application	Question(s) will be asked in the annual examination	
	Quadratic Equations-II	**SLO: M-10-A-46]:** Solve quadratic equations by using the methods of factorization, completing squares and quadratic formula.	Summative	Understanding	Question(s) will be asked in the annual examination	06
		[SLO: M-10-A-47]: Solve problems of “changing the subject of formula”.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination;**	

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					however, it will be part of regular teaching practice.	
		[SLO: M-10-A-48]: Solve fractional equations that can be reduced to quadratic equations.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-49]: Solve real world situations by formulating a quadratic equation.	Summative	Application	Question(s) will be asked in the annual examination	
	Plotting and Interpreting Graphs	**[SLO: M-10-A-50]:** Draw graphs of functions of the form $y = ax^n$ (Including the sums of few of these taking n as a rational number).	Summative	Understanding	Question(s) will be asked in the annual examination	06
		[SLO: M-10-A-51]: Solve a system of one linear and one quadratic equation graphically and interpret the solution.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-52]: Discover exponential growth/decay of a practical phenomenon through its graph.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-53]: Determine the gradients of curves through tangents.	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of**	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					regular teaching practice.	
	Curves Sketching	**[SLO: M-10-A-54]:** Identify, sketch and interpret graphs of the linear functions.	Summative	Knowledge	Question(s) will be asked in the annual examination	07
		[SLO: M-10-A-55]: Identify, sketch and interpret graphs of the non-linear functions such as quadratic, cubic, reciprocal, and exponential functions.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-56]: Sketch graph of the function $y = x^n$ where n is a $+ve$ integer, $-ve$ integer, rational number for $x > 0$	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-A-57]: Apply concepts of sketching and interpreting graph to real life problems (such as in tax payment, income and salary problems and cost and profit analysis).	Summative	Application	Question(s) will be asked in the annual examination	
B: Geometry	**Vectors in Plane**	**[SLO: M-10-B-01]:** Introduce rectangular coordinate system in plane	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	06
		[SLO: M-10-B-02]: Represent vectors as directed line segment**.**	**Formative**	**Knowledge**	**Question(s) will not be asked in the**	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					annual examination; however, it will be part of regular teaching practice.	
		[SLO: M-10-B-03]: Express a vector in terms of two non-zero and non-parallel coplanar vectors.	Summative	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-10-B-04]: Express a vector in terms of position vector.	Summative	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-10-B-05]: Express translation by a vector**.**	Summative	Understanding	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-B-06]: Find the magnitude of a vector.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-07]: Add and subtract vectors.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-08]: Multiply a vector by a scalar**.**	**Formative**	**Knowledge**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-10-B-09]: Solve geometrical problems involving the use of vectors.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-10]: Apply concepts from geometrical problems involving the use of vectors (such as parallel and perpendicular lines in geometrical shapes, vector projectile motion, crosswinds aviation, military usage, designing roller coasters).	Summative	Application	Question(s) will be asked in the annual examination	
	Applications of Trigonometry	**[SLO: M-10-B-11]:** Extend sine and cosine functions to angles between 90° and 180°.	Summative	Understanding	Question(s) will be asked in the annual examination	10
		[SLO: M-10-B-12]: Solve problems using the laws of sine, cosine and the area formulas for any triangle.	Summative	Application	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					in the annual examination	
		[SLO: M-10-B-13]: Solve simple trigonometric problems in three dimensions.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-14]: Apply concepts of trigonometry to real life world problems (such as video games, flight engineering, navigation, sound waves).	Summative	Application	Question(s) will be asked in the annual examination	
	Chords and Arcs of a Circle	**[SLO: M-10-B-15]:** Solve problems by using the property of circle: One and only one circle can pass through three non- collinear points.	Summative	Understanding	Question(s) will be asked in the annual examination	10
		[SLO: M-10-B-16]: Solve problems by using the property of circle: A straight line, drawn from the centre of a circle to bisect a chord (which is not a diameter) is perpendicular to the chord.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-17]: Solve problems by using the property of circle: Perpendicular from the centre of a circle on a chord bisects it.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-18]: Solve problems by using the property of circle: If two chords of a circle are congruent then they will be equidistant from the centre.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-19]: Solve problems by using the property of circle: Two chords of a circle which are equidistant from the centre are congruent.	Summative	Understanding	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-B-20]: Solve problems by using the property of circle: If two arcs of a circle (or of congruent circles) are congruent then the corresponding chords are equal.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-21]: Solve problems by using the property of circle: If two chords of a circle (or of congruent circles) are equal, then their corresponding arcs (minor, major or semi-circular) are congruent.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-22]: Solve problems by using the property of circle: Equal chords of a circle (or of congruent circles) subtend equal angles at the centre (at the corresponding centres).	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-23]: Solve problems by using the property of circle: If the angles subtended by two chords of a circle (or congruent circles) at the centre (corresponding centres) are equal, the chords are equal.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-24]: Apply concepts of chords and arcs of a circle to real life world problems (such as decorative features, rainbow, bridges, roller coaster track).	Summative	Application	Question(s) will be asked in the annual examination	
	Tangent and Angles of a Circle	**[SLO: M-10-B-25]:** Solve problems by using the property of circle: If a line is drawn perpendicular to a radial segment of circle at its outer end point, it is tangent to the circle at that point.	Summative	Understanding	Question(s) will be asked in the annual examination	10
		[SLO: M-10-B-26]: Solve problems by using the property of circle: The tangent a circle and the radial segment joining the point of contact and the centre are perpendicular to each other.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-27]: Solve problems by using the property of circle: The two tangents drawn to a circle from a point outside it, are equal in length.	Summative	Understanding	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-B-28]: Solve problems by using the property of circle: If two circles touch externally or internally, the distance between their centres is respectively equal to the sum or difference of their radii.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-29]: Solve problems by using the property of circle: The measure of a is central angle of a minor arc of a circle double that of the angle subtended by the corresponding major arc.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-30]: Solve problems by using the property of circle: Any two angles in the same segment of a circle are equal.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-31]: Solve problems by using the property of circle: 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 semi-circle is greater than a right angle.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-32]: Solve problems by using the property of circle: The opposite angles of any quadrilateral inscribed in a circle are supplementary.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-33]: Apply concepts of tangents and angles of a circle to real life world problems (such as architecture, monuments, pyramids).	Summative	Application	Question(s) will be asked in the annual examination	
	Practical Geometry of Circles	**[SLO: M-10-B-34]:** Locate the centre of a given circle.	Summative	Understanding	Question(s) will be asked in the annual examination	05
		[SLO: M-10-B-35]: Draw a circle passing through three given noncollinear points.	Summative	Understanding	Question(s) will be asked in the annual examination	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		[SLO: M-10-B-36]: Complete the circle: • by finding the center, • without finding the center, when a part of its circumference is given.	Summative	Understanding	Question(s) will be asked in the annual examination	
	Tangent to the Circle	**[SLO: M-10-B-37]:** Draw a tangent to a given arc, without using the centre, through a given point P when P is • the middle point of the arc, • at the end of the arc, • outside the arc.	Summative	Understanding	Question(s) will be asked in the annual examination	05
		[SLO: M-10-B-38]: Draw a tangent to a given circle from a point P when P lies • on the circumference • outside the circle	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-39]: Draw two tangents to a circle meeting each other at a given angle.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-B-40]: Apply concepts of practical geometry of a circle to real life world problems (such as athletic tracks, recreational parks, Ferris wheels, mechanical machines).	Summative	Application	Question(s) will be asked in the annual examination	
C: Information Handling	**Cumulative Frequency Distribution**	**[SLO: M-10-C-01]:** Construct cumulative frequency table, cumulative frequency polygon or Ogive.	Summative	Understanding	Question(s) will be asked in the annual examination	08
		[SLO: M-10-C-02]: Interpret the median, quartiles, deciles, percentiles, and inter quartile range from cumulative frequency curve.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-C-03]: Interpret and analyze box and whisker plots Correlation.	Summative	Understanding	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
					in the annual examination	
		[SLO: M-10-C-04]: Construct and interpret data from scatter diagrams and also draw lines of best fit.	Summative	Knowledge	Question(s) will be asked in the annual examination	
		[SLO: M-10-C-05]: Measure correlation using scatter diagram.	Summative	Knowledge	Question(s) will be asked in the annual examination	
	Measures of Dispersion	**[SLO: M-10-C-06]:** Calculate the range, standard deviation and variance for grouped data.	Summative	Knowledge	Question(s) will be asked in the annual examination	06
		[SLO: M-10-C-07]: Use the mean and standard deviation to compare two sets of data.	Summative	Understanding	Question(s) will be asked in the annual examination	
		[SLO: M-10-C-08]: Solve real-life situations involving variance, and standard deviation for grouped data.	Summative	Application	Question(s) will be asked in the annual examination	
		[SLO: M-10-C-09]: Apply concepts from measures of dispersion to solve real life situations (such as determining the consistency of data, checking variability in forecasting, manufacturing, finance, economics).	Summative	Application	Question(s) will be asked in the annual examination	
	Probability of Combined Events	**[SLO: M-10-C-10]:** Calculate the probability of combined events using, where appropriate: sample space diagrams, possibility diagram, tree diagrams, Venn diagrams.	Summative	Understanding	Question(s) will be asked in the annual examination	05
		[SLO: M-10-C-11]: Apply addition law of probability to solve problems involving mutually exclusive events (such as left and right	Summative	Application	Question(s) will be asked	

Content Domain/ Area	Topics	SLO Number/ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period = 40 minutes)
		hand turns, tossing a coin, even and odd numbers on a die, winning and losing a game)			in the annual examination	
		[SLO: M-10-C-12]: Apply the Multiplication law of probability to solve problems involving independent and dependent events (trading, flipping a coin, such as 2 cards being drawn 1 by 1 with replacement and without replacement etc.)	Summative	Application	Question(s) will be asked in the annual examination	
					Total	140

Federal Board SSC-II Examination
Model Question Paper Mathematics
(Curriculum 2022-23)

ROLL NUMBER					
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

Version No.			
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Section - A (Marks 15)

Time Allowed: 20 minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. *Do not use lead pencil.*

Candidate Sign. _____ **Invigilator Sign. _____**

Q1. Fill the relevant bubble against each question. Each part carries one mark.

Sr no.	Question	A	B	C	D	A	B	C	D
i.	If $3-3i=(m-2)i+3$, then the value of m is:	-1	1	-5	5	○	○	○	○
ii.	If α,β are the roots of $2x^2-4x-8=0$ then value of the product $\alpha\beta$ is:	-4	-2	2	4	○	○	○	○
iii.	What is the value of y, if $\begin{bmatrix}3 & 5\\ 8 & y+9\end{bmatrix}\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=\begin{bmatrix}3 & 5\\ 8 & -2y\end{bmatrix}$?	3	-3	-9	9	○	○	○	○
iv.	If $f(x)=\frac{1}{2}x$, then what is the value of $f^2(x)$?	$\frac{1}{2}x$	$\frac{1}{4}x$	$\frac{1}{4}x^2$	$\frac{4}{x^2}$	○	○	○	○
v.	If $\lvert x-5\rvert=-3$, then the value of x is:	8	-8	2	ϕ	○	○	○	○
vi.	The discriminant of $x^2-3x-4=0$ is:	9	12	16	25	○	○	○	○
vii.	A projectile is launched at an angle of 30° with an initial velocity of 20 m/s. What is the horizontal component of its velocity?	$10\ m/s$	$17.3\ m/s$	$20\ m/s$	$0\ m/s$	○	○	○	○
viii.	In triangle ABC if $a=10$, $b=15$ and $\alpha=32^\circ$, then value of β is:	42.5°	46.5°	52.6°	62.8°	○	○	○	○

ix.	To create a realistic rainbow effect, which type of the curves is the most appropriate for arcs?	Straight line	Parabola	Circular arc	Spiral	○ ○ ○ ○
x.	Two circles having radii 4cm and 5cm respectively, touch externally. The distance between the centers of the circles is:	$1cm$	$4.5cm$	$9cm$	$20cm$	○ ○ ○ ○
xi.	The probability of getting two tails when two coins are tossed is:	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{6}$	○ ○ ○ ○
xii.	Line of best fit is given by the equation:	$y = x^2$	$y = mx^2 + c$	$y = mx + c$	$x = y^2$	○ ○ ○ ○
xiii.	If a line is tangent to a circle at point P, what is the angle formed between the tangent line and the radius drawn to point P?	30°	45°	90°	180°	○ ○ ○ ○
xiv.	The simplified form of the expression $\frac{2x^2-2x}{x+1}\times\frac{2x^2+2x}{x-1}$ is:	$2x$	$2x^2$	$4x$	$4x^2$	○ ○ ○ ○
xv.	If $2x+3y=2$, then $y-$intercept is:	1	$\frac{2}{3}$	$\frac{3}{2}$	2	○ ○ ○ ○

Federal Board SSC-II Examination
Model Question Paper Mathematics
(Curriculum 2022-23)

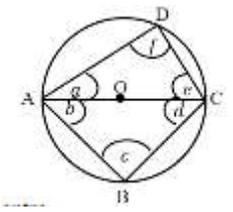
Time allowed: 2.40 hours Total Marks: 60

Note: Answer all parts from Section 'B' and all questions from Section 'C' on the **E-sheet**. Write your answers on the allotted/given spaces.

SECTION – B (Marks 36)

$(9 \times 4 = 36)$

Q.2	Question	Marks		Question	Marks
i.	Express $\frac{(2+3i)}{(3-2i)^2}$ in the form $a+bi$	4	***OR***	Square of two times a number is equal to the difference of four times the number and 1. Find the number.	4
ii.	If $T=\begin{bmatrix}1 & -2\\ 3 & 3\end{bmatrix}$, then a. Find T^{-1} b. Show that $TT^{-1}=I$	4	***OR***	If $f(x)=2x+1$, $g(x)=(3x-1)^2$ then find a. $fog(x)$ b. $gof(x)$.	4
iii.	For an absolute function $f(x)=\|x-2\|$ a. Construct table of values b. Plot the graph	4	***OR***	Two workers, Saqib and Aqib, are hired to clean a large warehouse. Saqib can clean the entire warehouse in 5 hours, while Aqib can clean it in 7 hours. They start cleaning together, but after two hours, Saqib leaves, and Aqib continuous cleaning alone. How long will it take Aqib to finish cleaning the warehouse after Saqib leaves?	4
iv.	Solve the inequality: $\left\|\frac{2-5x}{4}\right\| \geq \frac{2}{3}$	4	***OR***	Sketch and interpret the graph of an exponential function $f(x)=4^x$	4
v.	Shade the solution region bounded by a pair of linear inequalities: $x+y\leq 50$; $x-y\geq 10$; $x\geq 0$; $y\geq 0$	4	***OR***	Given two points A (2,3) and B (6,8), a vector $\vec{v}=[4,5]$ translates point A to a new point C. a. Determine the coordinates of point C after the translation. b. Verify if the same vector $\vec{v}$ can also translate point B to the point D (10,13). Justify your answer.	4
vi.	Three points A, B and C in the plane are given by the position vectors: $\overrightarrow{OA}=[2,1]$, $\overrightarrow{OB}=[5,-2]$, $\overrightarrow{OC}=[1,-3]$ with O (0, 0) as reference point. a. Find $\overrightarrow{AB}$ and $\overrightarrow{AC}$. b. Determine if A, B and C are collinear	4	***OR***	Find the solution set of the equation: $\frac{1}{x}-\frac{11}{\sqrt{x}}=-18$.	4
vii.	A balloon is floating at a height of 60 meters. From two points on the ground, 80 meters apart along a straight line, the angles of elevation to the balloon are 30° and 45°, respectively. Calculate the horizontal	4	***OR***	If two congruent chords of a circle are 12cm long and equidistant from the center, calculate the perpendicular distance from the center to each chord if the radius is 10cm.	4

	distance from the balloon to the closer point, when points lie on the opposite side of balloon.				
viii.	A magician takes out two cards from a deck of cards, one after the other, without replacement. What is the probability of getting an ace of spade, and a card of heart, as the first and second card, respectively?	4	***OR***	Solve the fractional equation $\frac{2x}{x-3}+\frac{4}{x+2}=\frac{10}{x^2-x-6}$	4
ix.	In the adjoining figure, ABCD is a cyclic quadrilateral inscribed in a circle having center at O. If $a=30°,\ d=45°$ then find the values of b, c, e and f. 	4	***OR***	Draw a tangent from a point at a distance of $8cm$ from the center of the circle of radius $4cm$.	4

SECTION – C (Marks 24)

$(3 \times 8 = 24)$

Note: Attempt all questions. Marks of each question are given along with each question.

Q. No.	**Question**	**Marks**	**Question**		**Marks**
Q.3	Area of a rectangular park is 1500 square metres and perimeter is 160 metres. Find the length and width of the park.	8	***OR***	Find the solution of following simultaneous linear equations with complex coefficients: $3ix+2iy=1,\ \ (2+i)x-(3-i)y=-1.$	8
Q.4	A military drone is flying at a velocity of 150 m/s at an angle of 60° above the horizontal when it releases a package. Due to a wind blowing from east at 40 m/s, the trajectory of the package changes. a. Represent the drone's initial velocity vector and the wind velocity vector in component form. b. Calculate the resultant velocity vector of the package at the moment of release. c. If the package is dropped from a height of 500 m, determine the horizontal displacement of the package before it hits the ground. Ignore air resistance.	8	***OR***	The following table represents the marks obtained by 50 students in a mathematics test. a. Construct a cumulative frequency table. b. Draw a cumulative frequency polygon for the data Marks Obtained: 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 No. of Students: 5 | 8 | 12 | 10 | 9 | 6	8
Q.5	Solve $f(x)=2x+5$, and $g(x)=2x^2+1$ graphically.	8	***OR***	Draw two tangents to a circle of radius $4cm$ meeting each other at 45°.	8

Federal Board SSC-II Examination

Mathematics Model Question Paper

(Curriculum 2022-23)

Alignment of Questions with Curriculum Student Learning Outcomes

OBJECTIVE PART
SECTION A

Section: Q. No. (Part no.)	Content Domain / Area	Student Learning Outcomes	Cognitive Level *	Marks Allocated
A: Q1(i)	Domain Numbers and Algebra	[SLO: M-10-A -02]: Apply algebraic properties and perform basic operations on complex numbers.	U	1
A: Q1(ii)	Domain Numbers and Algebra	[SLO: M-10-A-14]: Establish relationship between roots and coefficients of quadratic equations.	K	1
A: Q1(iii)	Domain Numbers and Algebra	[SLO: M-10-A-23]: Solve situations involving sum, difference, and product of two matrices.	U	1
A: Q1(iv)	Domain Numbers and Algebra	[SLO: M-10-A-31]: Explain operations on, and compositions of, functions.	U	1
A: Q1(v)	Domain Numbers and Algebra	[SLO: M-10-A-36]: Solve absolute value equations and inequalities in one variable and express the solution as a range of values on a number line.	U	1
A: Q1(vi)	Domain Numbers and Algebra	[SLO: M-10-A-16]: Find discriminant of a given quadratic equation.	K	1
A: Q1(vii)	Domain Geometry	[SLO: M-10-B-03]: Express a vector in terms of two non-zero and non-parallel coplanar vectors.	U	1
A: Q1(viii)	Domain Geometry	[SLO: M-10-B-12]: Solve problems using the laws of sine, cosine and the area formulas for any triangle.	U	1
A: Q1(ix)	Domain Geometry	**[SLO: M-10-B-24]:** Apply concepts of chords and arcs of a circle to real life world problems (such as decorative features, rainbow, bridges, roller coaster track).	U	1
A: Q1(x)	Domain Geometry	**[SLO: M-10-B-28]:** Solve problems by using the property of circle: If two circles touch externally or internally, the distance between their centres is respectively equal to the sum or difference of their radii.	A	1
A: Q1(xi)	Domain Information Handling	**[SLO: M-10-C-10]:** Calculate the probability of combined events using, where appropriate: sample space diagrams, possibility diagram, tree diagrams, Venn diagrams.	A	1
A: Q1(xii)	Domain Information Handling	**[SLO: M-10-C-04]:** Construct and interpret data from scatter diagrams and also draw lines of best fit.	A	1
A: Q1(xiii)	Domain Geometry	**[SLO: M-10-B-26]:** Solve problems by using the property of circle: The tangent to a circle and the radial segment joining the point of contact and the centre are perpendicular to each other.	K	1
A: Q1(xiv)	Domain Numbers and Algebra	**[SLO: M-10-A-40]:** Factorize and simplify rational expressions.	K	1
A: Q1(xv)	Domain Numbers and Algebra	**[SLO: M-10-A-54]:** Identify, sketch and interpret graphs of the linear functions.	A	1

SUBJECTIVE PART
SECTION B & C

Q. No. (Part No.)	Content Area/ Domain	Description of Student Learning Outcomes	Cognitive Level *	***OR***	Content Area/ Domain	Description of Student Learning Outcomes	Cognitive Level *	Allocated Marks
B: Q2(i)	Domain Numbers and Algebra	**[SLO:M-10-A-02]:** Apply algebraic properties and perform basic operations on complex numbers.	A	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-19]:** Solve word problems involving quadratic equations.	U	4
B: Q2(ii)	Domain Numbers and Algebra	**[SLO:M-10-A-25]:** Evaluate the determinant and inverse of a matrix of order 2×2.	U	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-33]: Formulate composite functions as defined by** $gf(x) = f(g(x))$**.**	K	4
B: Q(iii)	Domain Numbers and Algebra	**[SLO:M-10-A-35]:** Plot graphs of constant function, identity function, linear function and absolute valued functions.	U	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-43]:** Apply the concept of rational equations (limited to numerators and denominators that are monomials, binomials, or trinomials) to real world problems (such as the amount of work a person can do in certain amount of time, rates, and work).	A	4
B: Q(iv)	Domain Numbers and Algebra	**[SLO:M-10-A-36]:** Solve absolute value equations and inequalities in one variable and express the solution as a range of values on a number line.	U	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-55]:** Identify, sketch and interpret graphs of the non-linear functions such as quadratic, cubic, reciprocal, and exponential functions.	U	4
B: Q(v)	Domain Numbers and Algebra	**[SLO:M-10-A-45]:** Interpret and Identify regions in plane bounded by two linear inequalities in two unknowns.	K	***OR***	Domain Geometry	**[SLO: M-10-B-05]:** Express translation by a vector**.**	U	4
B: Q(vi)	Domain Geometry	**[SLO:M-10-B-09]:** Solve geometrical problems involving the use of vectors.	U	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-48]:** Solve fractional equations that can be reduced to quadratic equations.	U	4
B: Q(vii)	Domain Geometry	**[SLO:M-10-B-13]:** Solve simple trigonometric problems in three dimensions.	U	***OR***	Domain Geometry	**[SLO: M-10-B-17]:** Solve problems by using the property of circle: Perpendicular from the centre of a circle on a chord bisects it.	U	4
B: Q(viii)	Domain Information Handling	**[SLO:M-10-C-12]:** Apply the Multiplication law of probability to solve problems involving independent and dependent events (trading, flipping a coin, such as 2 cards being drawn 1 by 1 with replacement and without replacement etc.)	A	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-41]:** Demonstrate manipulation of algebraic fractions.	K	4

B: Q(ix)	Domain Geometry	**[SLO:M-10-B-32]:** Solve problems by using the property of circle: The opposite angles of any quadrilateral inscribed in a circle are supplementary.	U	***OR***	Domain Geometry	**[SLO: M-10-B-38]:** Draw a tangent to a given circle from a point P when P lies • on the circumference outside the circle	U	4
C: Q3	Domain Numbers and Algebra	**[SLO:M-10-A-21]:** Apply the concept of quadratic equations, and quadratic inequalities, to real world problems (such as in physics, engineering, and finance, i.e., calculating max and min heights in projectile motion, determining the max price on a company's budget, stability of population, growth of business, the relationship between hours worked and amount earned etc.).	A	***OR***	Domain Numbers and Algebra	**[SLO: M-10-A-08]:** Solve the simultaneous linear equations with complex coefficients.	K	8
C: Q4	Domain Geometry	**[SLO:M-10-B-10]:** Apply concepts from geometrical problems involving the use of vectors (such as parallel and perpendicular lines in geometrical shapes, vector projectile motion, crosswinds aviation, military usage, designing roller coasters).	A	***OR***	Domain Information Handling	**[SLO: M-10-C-01]:** Construct cumulative frequency table, cumulative frequency polygon or Ogive.	U	8
C: Q5	Domain Numbers and Algebra	**[SLO:M-10-A-51]:** Solve a system of one linear and one quadratic equation graphically and interpret the solution.	A	***OR***	Domain Geometry	**[SLO: M-10-B-39]:** Draw two tangents to a circle meeting each other at a given angle.	U	8

*Cognitive Level

K: Knowledge

U: Understanding

A: Application

Table of Specification

Model Question Paper Mathematics – Grade X SSC-II

Domain Title/ Content Area Cognitive Domain	**Domain A:** Numbers and Algebra	**Domain B:** Geometry	**Domain C:** Information Handling	Total Marks	**Percentage of Cognitive Level**
Knowledge	Q1(ii)1, Q1(iii)1 Q1(vi)1, Q1(xv)1 Q2(ii/s)4, Q2(v/f)4, Q2(viii/s)4, Q3(s)8 (24 marks)	Q1(vii)1 (01 mark)	Q1(xii)1 (01 mark)	26	**19%**
Understanding	Q1(iv)1, Q1(v)1, Q1(xiv)1, Q2(ii/f)4, Q2(iii/f)4 Q2(iv/f)4, Q2(iv/s)4, Q2(vi/s)4, Q2(i/s)4 (27 marks)	Q1(x)1, Q1(xiii)1, Q2(v/s)4, Q2(vi/f)4, Q2(vii/f)4, Q2(vii/s)4, Q2(ix/f)4, Q2(ix/s)4, Q5(s)8 (34 marks)	Q1(xi)1, Q4(s)8 (09 marks)	70	**52%**
Application	Q1(i)1 Q2(i/f)4, Q2(iii/s)4, Q3(f)8, Q5(f)8 (25 marks)	Q1(viii)1, Q1(ix)1, Q4(f)8 (10 marks)	Q2(viii/f)4 (4 marks)	39	**29%**
Total Marks	76	45	14	**135**	**-**
Total Percentages	56%	33%	11%	**-**	**100%**

Note:

1 This ToS does not reflect policy, but it is particular to this model question paper.
2 Proportionate / equitable representation of the content areas may be ensured.
3 The percentage of cognitive level is 20%, 50%, and 30% for knowledge, understanding, and application, respectively with ± **5%** variation.
4 While selecting alternative questions for SRQs and ERQs, it must be kept in mind that:
- Difficulty levels of both questions should also be same
- SLOs of both the alternative questions must be different

Key: Question Number (part/ first choice) marks example: **Q2 (i / f) 4**
Question Number (part/ second choice) marks example: **Q2 (i / s) 4**

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