

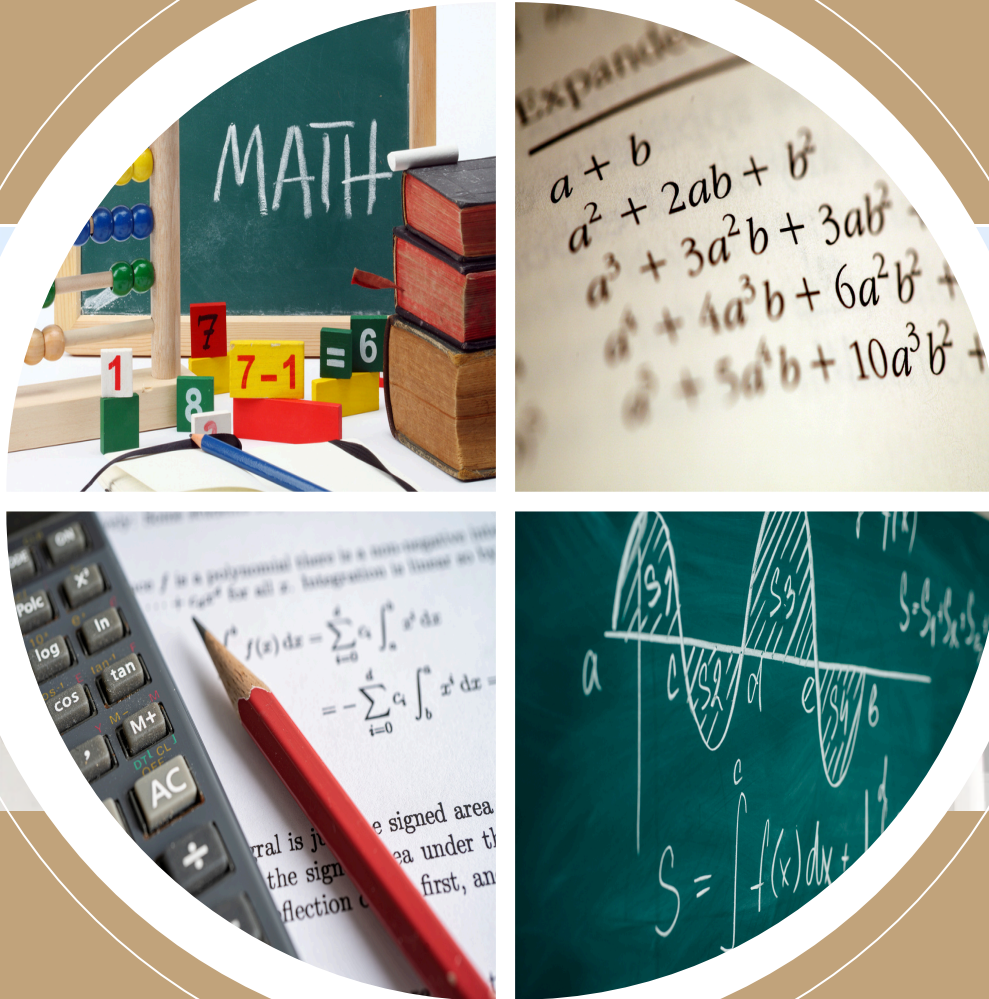
FUNCTIONAL MATHEMATICS

Grade IX

NATIONAL CURRICULUM
2025



INCLUSIVE SCHEME OF STUDIES 2024



FEDERAL BOARD OF
INTERMEDIATE AND
SECONDARY EDUCATION,
ISLAMABAD

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EXCELLENCE



**FEDERAL BOARD OF INTERMEDIATE AND
SECONDARY EDUCATION
H-8/4, ISLAMABAD**



**ASSESSMENT FRAMEWORK
FOR
FUNCTIONAL MATHEMATICS GRADE-IX
CURRICULUM 2025**

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 Functional Mathematics for Grade-IX. The primary objective of the AF is to optimize the current curriculum 2025. 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-IX Functional 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. Khalid Mehmood, Area Education Officer, Nilore Sector, Islamabad
2. Mr. Sharafat Ali Awan , Principal, Islamabad Model College for Boys Pakistan Town Islamabad
3. Mr. Anwar ul Haq, Assistant Professor, Bahria College, Naval Complex, E-8, Islamabad
4. Ms. Najma Yousaf, Education Officer, National Curriculum Council, Islamabad

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 AF.

MIRZA ALI
Director
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR FUNCTIONAL MATHEMATICS GRADE-IX, CURRICULUM 2025

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

FUNCTIONAL MATHEMATICS Grade-IX (SSC-I)

Details of Content Areas/ SLOs

Content Domain / Area	Topics	SLO No./ Description	Form of Assessment	Cognitive Level (Knowledge, Understanding, Application)	Remarks	Number of Periods required (1 period= 40 minutes)
Domain A: Numbers and Algebra	Business Mathematics	[SLO: M-09-A-01]: Solve real-life currency exchange problems by converting Pakistani currency to and from well-known international currencies, both manually and through appropriate apps.	Formative	A	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	10
		[SLO: M-09-A-02]: Calculate mentally and use appropriate formulae for finding cost price, selling price, profit, loss, discount and commission.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-03]: Apply the concept of profit, loss, discount and commission to real world problems.	Summative	A	Question(s) will be asked in the annual examination	
	Budgeting	[SLO: M-09-A-04]: Apply ratios and proportions to allocate income across different budget categories.	Summative	A	Question(s) will be asked in the annual examination	15
		[SLO: M-09-A-05]: Solve real-world problems involving unit rates, such as cost per item or hourly wages.	Summative	A	Question(s) will be asked in the annual examination	

		[SLO: M-09-A-06]: Use algebraic expressions to model financial situations, such as setting up equations for income and expenditure balance.	Summative	A	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-07]: Use percent increase and decrease to track changes in income or expenses over time.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-08]: Estimate future expenses and income using simple linear projections.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-09]: Apply logical reasoning to adjust a budget when expenses exceed income.	Formative	A	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	
	Zakat, Ushr and Inheritance	[SLO: M-09-A-10]: Calculate mentally and use appropriate formula for finding Zakat, Ushr and inheritance.	Summative	U	Question(s) will be asked in the annual examination	8
		[SLO: M-09-A-11]: Solve real world word problems involving Zakat, Ushr and inheritance.	Summative	A	Question(s) will be asked in the annual examination	
	Real Numbers	[SLO: M-09-A-12]: Describe the set of real numbers as a combination of rational and irrational numbers.	Formative	K	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	15
		[SLO: M-09-A-13]: Apply the properties of equality and inequality of real numbers.	Formative	A	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	

		[SLO: M-09-A-14]: Differentiate between radical form and exponential form of an expression.	Formative	U	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	
		[SLO: M-09-A-15]: Transform an expression given in radical form to an exponential form and vice versa.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-16]: Apply laws of indices to simplify radical expressions.	Summative	A	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-17]: Express a number in scientific notation and vice versa.	Summative	K	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-18]: Apply concepts of real numbers (such as inventory stock taking, temperature, banking, sources of income and expenditure).	Summative	A	Question(s) will be asked in the annual examination	
	Factorization and Algebraic Manipulation	[SLO: M-09-A-19]: Identify common factors of polynomials.	Summative	K	Question(s) will be asked in the annual examination	20
		[SLO: M-09-A-20]: Factorize quadratic and biquadratic algebraic expressions. Type-I: $x^2 + px + q$, $ax^2 + bx + c$ Type-II: $a^4 + a^2b^2 + b^4$, $a^4 + 4b^4$	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-21]: Find highest common factor and least common multiple of algebraic expressions by factorization and to know relation of LCM and HCF.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-22]: Find square root of algebraic expression by factorization.	Summative	U	Question(s) will be asked in the annual	

					examination	
		[SLO: M-09-A-23]: Apply the concepts of factorization of algebraic expressions to real world problems (such as engineering, business and finance.)	Summative	A	Question(s) will be asked in the annual examination	
	Linear Equations and Inequalities in One Variable	[SLO: M-09-A-24]: Solve linear equations in one variable manually and by using appropriate apps like 'Equation Solver'.	Summative	U	Question(s) will be asked in the annual examination	10
		[SLO: M-09-A-25]: Solve linear inequalities in one variable and represent the solution set on a real line.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-A-26]: Apply the concept of linear equations and linear inequalities to real world problems (such as cost and revenue analysis, construction and architecture, temperature conversion, predicting population growth etc.).	Summative	A	Question(s) will be asked in the annual examination	
Domain B: Geometry	Coordinate Geometry	[SLO: M-09-B-01]: Derive and apply distance formula by locating the position of two points in coordinate plane.	Summative	U	Question(s) will be asked in the annual examination	20
		[SLO: M-09-B-02]: Calculate the midpoint of a line segment.	Summative	K	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-03]: Find the gradient of a straight line when coordinates of two points are given.	Summative	K	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-04]: Find the equation of a straight line in the slope intercept form, point slope form and two-point form.	Summative	U	Question(s) will be asked in the annual examination	

		[SLO: M-09-B-05]: Find the gradient of parallel and perpendicular lines.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-06]: Find the angle between two coplanar intersecting straight lines.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-07]: Calculate angles of the triangle when the slopes of the sides are given.	Formative	U	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	
		[SLO: M-09-B-08]: Apply concepts from coordinate geometry to real world problems (such as, aviation and navigation, landscaping, map reading, longitude and latitude).	Summative	A	Question(s) will be asked in the annual examination	
	Area and Volume of Similar Figures	[SLO: M-09-B-09]: Convert standard units of area (m², cm², mm² and vice versa) and volume (m³, cm³, mm³ and vice versa) manually and by using appropriate Apps.	Formative	K	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	10
		[SLO: M-09-B-10]: Identify similarity of polygons.	Formative	K	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	
		[SLO: M-09-B-11]: Find the relation between area of similar figures.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-12]: Find the relation between volume of similar solids.	Summative	U	Question(s) will be asked in the annual examination.	

Information		[SLO: M-09-B-13]: Solve problems using the relation between areas of similar figures and volume of different solids (cube, cuboid, cone, cylinder and sphere).	Summative	A	Question(s) will be asked in the annual examination.	
	Construction of Triangles	[SLO: M-09-B-14]: Construct a triangle using ruler, protractor and pair of compasses. Case-I: Given two sides and the included angle. Case-II: Given one side and two of the angles. Case-III: Given two of its sides and the angle opposite to one of them (with all the three possibilities).	Summative	U	Question(s) will be asked in the annual examination	15
		[SLO: M-09-B-15]: Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle using ruler, protractor and pair of compasses and verify their concurrency.	Summative	U	Question(s) will be asked in the annual examination	
	Trigonometry	[SLO: M-09-B-16]: Identify angles in standard position, expressed in degrees.	Formative	K	Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.	15
		[SLO: M-09-B-17]: Find trigonometric ratios of acute angle in a right triangle.	Summative	K	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-18]: Apply Pythagoras' theorem and trigonometric ratios of acute angles to find unknown sides and angles of a right-angled triangle.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-B-19]: Solve real life trigonometric problems in two dimensions involving angles of elevation and depression.	Summative	A	Question(s) will be asked in the annual examination	
	Basic Statistics and Probability	[SLO: M-09-C-01]: Construct a grouped frequency table, histogram (with equal and unequal class intervals) and frequency polygon	Formative	U	Question(s) will not be asked in the annual examination; however, it	20

		(manually and by using appropriate apps like 'Histogram Maker' etc.)			will be part of regular teaching practice.	
		[SLO: M-09-C-02]: Calculate the mean (by direct method), median and mode of a grouped frequency distribution (manually and using appropriate apps like Microsoft Excel, Google Sheets, LibreOffice Calc etc.).	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-C-03]: Solve real life situations involving mean, median, and mode for given data (such as allocation of funds in different projects, forecasting future demographics, marketing, forecasting government budgets).	Summative	A	Question(s) will be asked in the annual examination	
		[SLO: M-09-C-04]: Calculate the probability of a single event and the probability of complementary event.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-C-05]: Calculate relative and expected frequencies as an estimate of probability.	Summative	U	Question(s) will be asked in the annual examination	
		[SLO: M-09-C-06]: Solve real life problems involving probability, relative and expected frequencies.	Summative	A	Question(s) will be asked in the annual examination	
					Total	158



Federal Board SSC-I Examination
Functional Mathematics
(Curriculum 2025) Scheme of Studies 2024

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.

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
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2	2	2	2
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4	4	4	4
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6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Candidate's Sign. _____

Invigilator's Sign. _____

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

Q#	Question	A	B	C	D	A	B	C	D
i.	A currency converter charges 2% commission on an exchange amount of Rs. 50,000; what is the amount of commission?	Rs. 500	Rs. 1,000	Rs. 1,500	Rs. 2,000	☐	☐	☐	☐
ii.	The ratio 1 : 50 is equal to:	5kg : 100g	1kg : 50g	10g : 500g	50kg : 1g	☐	☐	☐	☐
iii.	Usher is paid on:	ornaments	salary	households	crops	☐	☐	☐	☐
iv.	The sides of two similar squares are in the ratio 3:5. What is the ratio of their areas?	3:5	9:25	27:125	6:10	☐	☐	☐	☐
v.	The radical form of $p^{\frac{3}{7}}$ is:	$\sqrt[7]{p^3}$	$\sqrt[3]{p^7}$	$\sqrt[3]{p^3}$	$\sqrt{p^3}$	☐	☐	☐	☐
vi.	Factors of $-2 - a + a^2$ are:	$(a-2)(a-1)$	$(a+2)(a+1)$	$(a+2)(a-1)$	$(a-2)(a+1)$	☐	☐	☐	☐
vii.	What is the positive square root of $36x^6y^{16}$?	$6x^6y^{16}$	$6x^3y^8$	$6xy$	$18x^3y^8$	☐	☐	☐	☐
viii.	The solution of $5x - 3 > 2x + 9$ is:	$x > 2$	$x > 4$	$x < 2$	$x > 6$	☐	☐	☐	☐
ix.	The point P (2, -3) lies on/in:	x-axis	y-axis	quad-II	quad-IV	☐	☐	☐	☐
x.	Areas of two similar figures are in ratio 16:25, What is the ratio of their corresponding sides	4: 5	16: 25	8: 10	5: 4	☐	☐	☐	☐
xi.	Right bisectors of a right-triangle meet at:	hypotenuse	base	perpendicular	any vertex	☐	☐	☐	☐
xii.	In which quadrant, terminal arm of angle θ lies if $\sin \theta > 0$ and $\cos \theta < 0$?	I	II	III	IV	☐	☐	☐	☐

xiii.	Identify the gradient of a line perpendicular to gradient 3.	-3	$-\frac{1}{3}$	$\frac{1}{3}$	3	☐ ☐ ☐ ☐
xiv.	Which measure of central tendency is determined from the highest frequency in a grouped frequency distribution?	mean	median	mode	range	☐ ☐ ☐ ☐
xv.	If $P(A) = 0.3$, what is the probability of the complementary event A'?	0.3	0.7	1.3	0	☐ ☐ ☐ ☐



Federal Board SSC-I Examination Functional Mathematics (Curriculum 2025) Scheme of Studies 2024

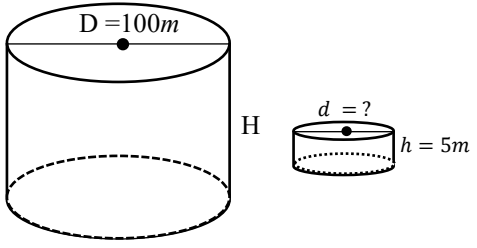
Time allowed: 2.40 hours

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 × 4 = 36)

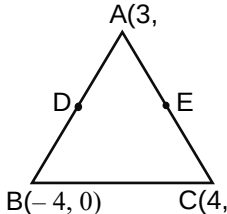
Q.2	Question	Marks	Question	Marks
i.	A store gives 20% discount for each cash payment. A man paid Rs. 12,600 for a dress. What was the marked price of the dress?	4	OR Using laws of indices, prove that: $\left(\frac{x^p}{x^q}\right)^{p+q} \times \left(\frac{y^q}{y^r}\right)^{q+r} \times \left(\frac{z^r}{z^p}\right)^{r+p} = 1$	4
ii.	Divide a property of worth Rs. 900,000 among two sons, a daughter and a widow after paying the funeral expenditures of Rs. 50,000.	4	OR A trader bought a table for Rs.6,000. He spent Rs. 1,500 for its transportation, then sold it for Rs. 7,000. Find his profit or loss percent.	4
iii.	Farwa gets a 10% raise in his Rs.90,000 monthly salary. What is her new salary?	4	OR Factorize: $m^4 + m^2 + 1$	4
iv.	Solve the following linear inequality and represent the solution on a real line. $\frac{1}{2}x + 3 \geq \frac{1}{4}x + 2 ; x \in R$	4	OR Find the value of k such that the line through the points $P(-1, -2)$ & $Q(4, 7)$ is perpendicular to the line through the points $R(2, k)$ & $S(7, 10)$.	4
v.	Construct a triangle if its two sides are 5.7 cm and 7.5 cm are long and angle of 105° is opposite to the side of length 7.5 cm.	4	OR Find the square root by factorization: $\left(x^2 - \frac{1}{x^2}\right)^2 + 4\left(x^2 - \frac{1}{x^2}\right) + 4$	4
vi.	Find the equation of a straight line that passes through a point $(5, -1)$ and is perpendicular to a line whose slope is $\frac{1}{2}$.	4	OR Solve the absolute value equation: $\frac{ 10 - x }{5} = \frac{ 2x - 5 }{2}$	4
vii.	Using usual notations, solve the $\triangle ABC$ when $\angle C = 90^\circ$, $\angle A = 30^\circ$ and $a = 6$ cm.	4	OR Five students out of a section of 30 students are expected to be absent every day in a summer camp. What number of students is expected absent every day from 12 such sections of the same strength?	4
viii.	Triangles ABC and ADC with bases 3cm and 7cm respectively have a common height 6cm. Prove that $\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle ADC} = \frac{\text{Base of } \triangle ABC}{\text{Base of } \triangle ADC}$	4	OR A kite has 100 m of string attached to it when it flies at an angle of elevation of 60° . How far is the kite above the hand holding it if the string is taut?	4

ix.	Find the arithmetic mean from the following data of the number of detergent packs sold against their mass in kg.					4	OR	Given solids are similar. (i) Find diameter (d) of the smaller solid. (ii) Find ratio of the volume of bigger solid to the smaller solid. 	4
	Classes (kg)	1-9	10-18	19-27	28-36				
	No. of packs	10	15	18	15				

SECTION – C (Marks 24)

(3 × 8 = 24)

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

Q. No.	Question	Marks	Question	Marks																		
Q.3	Mr. Jaffar budgets Rs.15,000 for food and Rs.9,000 for transportation. What is the ratio of food to transportation expenses? If he increases his food budget by 20%, what will be the new ratio?	8	OR Construct a triangle ABC such that $AB = 4.7\text{ cm}$, $BC = 4.5\text{ cm}$ and $AC = 4.6\text{ cm}$. Draw bisectors of $\angle A$, $\angle B$ and $\angle C$. Are they concurrent?	8																		
Q.4	At an old age house, there are people of different age groups as given below: <table border="1"><tr><td>C-I</td><td>4</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>0-50</td><td>50-60</td><td>60-70</td><td>70-80</td><td>80-90</td></tr><tr><td>f</td><td>3</td><td>8</td><td>11</td><td>5</td><td>4</td></tr></table> Find an average median age of people residing in that old age house.	C-I	4						0-50	50-60	60-70	70-80	80-90	f	3	8	11	5	4	8	OR Look at the triangle ABC in the adjoining figure.  a) Find the coordinates of midpoints D and E of AB and AC respectively. b) Find the gradients of DE and BC. c) What is the relation Between BC and DE?	8
C-I	4																					
	0-50	50-60	60-70	70-80	80-90																	
f	3	8	11	5	4																	
Q.5	Find HCF of the following: $ax^2 + 7ax + 12a$, $ax^2 - 5ax - 24a$, $2ax^2 + 5ax - 3a$	8	OR A house is bought for Rs. 5 million. The property agent charged 2.5% commission from both parties. Find the amount earned by the agent. Also find the amount paid by the buyer and the amount received by the seller.	8																		

Alignment of Questions with Student Learning Outcomes

SECTION A

Q. No. (Part no.)	Content Area/ Domain	Student Learning Outcomes	Cognitive Level *	Allocated Marks
Q1(i)	Domain A	[SLO: M-09-A-02]: Calculate mentally and use appropriate formulae for finding cost price, selling price, profit, loss, discount and commission.	U	1
Q1(ii)	Domain A	[SLO: M-09-A-06]: Apply ratios and proportions to allocate income across different budget categories.	K	1
Q1(iii)	Domain A	[SLO: M-09-A-10]: Estimate future expenses and income using simple linear projections.	K	1
Q1(iv)	Domain B	[SLO: M-09-B-11]: Find the relation between area of similar figures.	U	1
Q1(v)	Domain A	[SLO: M-09-A-15]: Transform an expression given in radical form to an exponential form and vice versa.	U	1
Q1(vi)	Domain A	[SLO: M-09-A-20]: Factorize quadratic and biquadratic algebraic expressions. Type-I: $x^2 + px + q$, $ax^2 + bx + c$ Type-II $a^4 + a^2b^2 + b^4a^4 + 4b^4$	A	1
Q1(vii)	Domain A	[SLO: M-09-A-22]: Find square root of algebraic expression by factorization.	A	1
Q1(viii)	Domain A	[SLO: M-09-A-25]: Solve linear inequalities in one variable and represent the solution set on a real line.	U	1
Q1(ix)	Domain B	[SLO: M-09-B-01]: Derive and apply distance formula by locating the position of two points in coordinate plane.	U	1
Q1(x)	Domain B	[SLO: M-09-B-11]: Find the relation between area of similar figures	U	1
Q1(xi)	Domain B	[SLO: M-09-B-15]: Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle using ruler, protector and pair of compasses and verify their concurrency.	A	1
Q1(xii)	Domain B	[SLO: M-09-B-17]: Find trigonometric ratios of acute angle in a right triangle.	K	1
Q1(xiii)	Domain B	[SLO: M-09-B-05]: Find the gradient of parallel and perpendicular lines.	U	1
Q1(xiv)	Domain C	[SLO: M-09-C-02]: Calculate the mean (by direct method), median and mode of a grouped frequency distribution.	K	1
Q1(xv)	Domain C	[SLO: M-09-C-04]: Calculate the probability of a single event and the probability of complementary event.	K	1

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
Q2(i)	Domain A	[SLO: M-09-A-03]: Apply the concept of profit, loss, discount and commission to real world problems.	A	OR	Domain A	[SLO: M-09-A-16]: Apply laws of indices to simplify radical expressions.	U	4
Q2(ii)	Domain A	[SLO: M-09-A-11]: Solve real world word problems involving Zakat, Ushr and inheritance.	K	OR	Domain A	[SLO: M-09-A-03]: Apply the concept of profit, loss, discount and commission to real world problems.	A	4
Q2(iii)	Domain A	[SLO: M-09-A-07]: Use percent increase and decrease to track changes in income or expenses over time.	U	OR	Domain A	[SLO: M-09-A-20]: Factorize quadratic and biquadratic algebraic expressions. Type-I: $x^2 + px + q$, $ax^2 + bx + c$ Type-II: $a^4 + a^2b^2 + b^4$, $a^4 + 4b^4$	U	4
Q2(iv)	Domain A	[SLO: M-09-A-25]: Solve linear inequalities in one variable and represent the solution set on a real line.	U	OR	Domain B	[SLO: M-09-B-05]: Find the gradient of parallel and perpendicular lines.	K	4
Q2(v)	Domain B	[SLO: M-09-B-14]: Construct a triangle using ruler, protector and pair of compasses. Case-I: Given two sides and the included angle. Case-II: Given one side and two of the angles. Case-III: Given two of its sides and the angle opposite to one of them (with all the three possibilities).	U	OR	Domain A	[SLO: M-09-A-22]: Find square root of algebraic expression by factorization.	K	4
Q2(vi)	Domain B	[SLO: M-09-B-04]: Find the equation of a straight line in the slope intercept form, point slope form and two-point form.	U	OR	Domain A	[SLO: M-09-A-24]: Solve linear equations in one variable manually and by using appropriate apps like 'Equation Solver'.	U	4

Q2(vii)	Domain B	[SLO: M-09-B-18]: Apply Pythagoras' theorem and trigonometric ratios of acute angles to find unknown sides and angles of a right-angled triangle.	U	OR	Domain C	[SLO: M-09-C-05]: Calculate relative and expected frequencies as an estimate of probability.	U	4
Q2(viii)	Domain B	[SLO: M-09-B-11]: Find the relation between area of similar figures.	U	OR	Domain B	[SLO: M-09-B-19]: Solve real life trigonometric problems in two dimensions involving angles of elevation and depression.	A	4
Q2(ix)	Domain C	[SLO: M-09-C-02]: Calculate the mean (by direct method), median and mode of a grouped frequency distribution.	U	OR	Domain B	[SLO: M-09-B-12]: Find the relation between volume of similar solids.	A	4
Q3	Domain A	[SLO: M-09-A-06]: Apply ratios and proportions to allocate income across different budget categories.	U	OR	Domain B	[SLO: M-09-B-15]: Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle using ruler, protector and pair of compasses and verify their concurrency.	U	8
Q4	Domain C	[SLO: M-09-C-02]: Calculate the mean, median and mode of a grouped frequency distribution.	U	OR	Domain B	[SLO: M-09-B-02]: Calculate the midpoint of a line segment. [SLO: M-09-B-05]: Find the gradient of parallel and perpendicular lines.	K	8
Q5	Domain A	[SLO: M-09-A-21]: Find highest common factor and least common multiple of algebraic expressions by factorization and know relationship of LCM and HCF.	U	OR	Domain A	[SLO: M-09-A-03]: Apply the concept of profit, loss, discount and commission to real world problems.	A	8

*Cognitive Levels: K: Knowledge U: Understanding A: Application

Table of Specification

Model Question Paper Functional Mathematics – Grade IX (SSC-I)

Domain Title/ Content Area	Domain A Numbers and Algebra	Domain B Geometry	Domain C Information Handling	Total Marks	Percentage of Cognitive Level
Cognitive Level					
Knowledge	Q1(ii), Q1(iii), Q2(ii/f), Q2(v/s). (10 marks)	Q1(xii), Q2(iv/s), Q4(s). (13 marks)	Q1(xv), Q1(xiv). (2 marks)	25	19%
Understanding	Q1(viii), Q1(v), Q1(i), Q2(i/s), Q2(iii/f), Q2(iii/s), Q2(iv/f), Q2(vi/s), Q3(f), Q5(f) (39 marks)	Q1(iv), Q1(ix), Q1(x), Q1(xiii), Q2(v/f), Q2(vi/f), Q2(vii/f), Q2(viii/f), Q3(s). (28 marks)	Q2(vii/s), Q2(ix/f), Q4(f). (16 marks)	83	61%
Application	Q1(vii), Q1(vi), Q2(i/f), Q2(ii/s), Q5(s). (18 marks)	Q1(xi), Q2(viii/s), Q2(ix/s). (9 marks)	 (0 mark)	27	20%
Total Marks	67	50	18	135	-
Total Percentages	50%	37%	13%	-	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 $\pm 5\%$ 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 should be different



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