National Curriculum of Pakistan 2022-23

Assessment Framework

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	**Real Numbers**	**[SLO: M-09-A-01]: Explain, with examples, that civilizations throughout history have systematically studied living things [e.g., the history of numbers from Sumerians and its development to the present Arabic system.**	**Formative**	**K**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	12
		[SLO: M-09-A-02]: 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.**	
		[SLO: M-09-A-03]: Demonstrate and verify the properties of equality and inequality of real numbers.	**Formative**	**K**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
		[SLO: M-09-A-04]: Apply laws of indices to simplify radical expressions.	Summative	A	**Question(s) will be asked in the annual examination.**	
		[SLO: M-09-A-05]: Express a number in scientific notations and vice versa.	Summative	U	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-06]: Describe logarithm of a number.	**Formative**	**K**	**Question(s) will not be asked in the annual examination;**	

					however, it will be part of regular teaching practice.	
		[SLO: M-09-A-07]: Differentiate between common and natural logarithm.	Summative	K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-08]: Apply laws of logarithm to real life situations such as growth and decay, loudness of sound.	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-09]: Apply concepts of rational numbers to real word problems (such as inventory (stock taking), temperature, banking, measures of gain and loss, sources of income and expenditure).	Summative	A	**Question(s) will be asked in the annual examination**	
	Sets and Functions	**[SLO: M-09-A-10]:** Describe mathematics as the study of pattern, structure, and relationships.	Summative	U	**Question(s) will be asked in the annual examination**	15
		[SLO: M-09-A-11]: Identify sets and apply operations on three sets (Subsets, overlapping sets and disjoint sets), using Venn diagrams	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-12]: Solve problems on classification and cataloguing by using Venn diagrams for Scenarios involving two sets and three sets. Further application of sets.	**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-13]: Verify and apply properties/laws of union and intersection of three sets through analytical and Venn diagram method.	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-14]: Apply concepts from set theory to real world problems (such as in demographic classification, categorizing products in shopping malls and music playlist by genre) Relation.	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-15]: Explain product, Binary Relations and its domain and range.	Summative	K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-16]: Recognize that a relation can be represented by table, order pair and graphs.	Summative	A	**Question(s) will be asked in the annual examination**	

	Factorization	**[SLO: M-09-A-17]: Identify common factors, trinomial factoring, concretely, pictorially and symbolically.**	**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-18]: Factorize quadratic and cubic algebraic expressions. • $a^4 + a^2b^2 + b^4$ or $a^4 + b^4$ • $x^2 + px + q$ • $ax^2 + bx + c$ • $(ax^2 + bx + c)(ax^2 + bx + d) + k$ • $(x + a)(x + b)(x + c) + k$ • $(x + a)(x + b)(x + c)(x + d) + kx^2$ • $a^3 + 3a^2b + 3ab^2 + b^3$ • $a^3 - 3a^2b + 3ab^2 - b^3$ • $a^3 \pm b^3$	Summative	U	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-19]: Find highest common factor and least common multiple of algebraic expressions and know relationship of LCM and HCF.	Summative	U/K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-20]: Find square root of algebraic expression by factorization and division.	Summative	U/K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-A-21]: Apply the concepts of factorization of quadratic and cubic algebraic expressions to real world problems (such as engineering, physics, and finance.)	Summative	A	**Question(s) will be asked in the annual examination**	
	Linear Equations and Inequalities in one variable	**[SLO: M-09-A-22]:** Solve linear equations and inequalities with rational coefficients and represent the solution set on a real line.	Summative	U	**Question(s) will be asked in the annual examination**	10

		[SLO: M-10-A-23]: Solve two linear inequalities with two unknowns simultaneously	Formative	U	**Question(s) will not be asked in the annual examination (This SLO will be taught in Class X)**	
Domain B: Geometry	**Coordinate Geometry**	**[SLO: M-09-B-01]:** Derive distance formula by locating the position of two points in coordinate plane	Summative	U	**Question(s) will be asked in the annual examination**	15
		[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 form $y = mx + c$	Summative	K	**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]: Apply distance and midpoint formulas to solve real life situations such as physical measurements or distances between locations.	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-B-07]: 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**	
		[SLO: M-09-B-08]: Derive equation of a straight line in slope-intercept form, point-slope form, two-point form, intercepts form, symmetric form, normal form.	Summative	U	**Question(s) will be asked in the annual examination**	

		[SLO: M-09-B-09]: Show that a linear equation in two variables represents a straight line and reduce the general form of the equation of a straight line to the other standard forms.	Summative	U	**Question(s) will be asked in the annual examination**	
	Angle Between Lines	**[SLO: M-09-B-10]:** Find the angle between two coplanar intersecting straight lines.	Summative	K	**Question(s) will be asked in the annual examination**	07
		[SLO: M-09-B-11]: Find the equation of the family of lines passing through the point of intersection of two given lines.	Summative	U/K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-B-12]: Calculate angles of the triangle when the slopes of the sides are given.	Summative	K	**Question(s) will be asked in the annual examination**	
	Logic	**[SLO: M-09-B-13]: Differentiate between a mathematical statement and its proof.**	**Formative**	**K**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	05
		[SLO: M-09-B-14]: Differentiate between an axiom, conjecture and theorem.	**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-15]: Formulate simple deductive proofs [algebraic proofs that require showing the LHS to be equal to the RHS. E.g., showing $(x-3)^2+5=x^2-6x$	**Formative**	**K**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	
	Similar Figures	**[SLO: M-09-B-16]:** Identify similarity of polygons. Area and Volume of Similar Figures	Summative	K	**Question(s) will be asked in the annual examination**	05
		[SLO: M-09-B-17]: Solve problems using the relationship between areas of similar figures and volume of different solids	Summative	U	**Question(s) will be asked in the annual examination**	
	Geometrical Properties of regular	**[SLO: M-09-B-18]:** Solve real life problems that involve the properties of regular polygons, triangles	Summative	A	**Question(s) will be asked in the annual examination**	10

	Polygons, Triangles and Parallelograms	and parallelograms (such as building architectural structures, fencing, tiling, painting, carpeting a room).				
	Loci	**[SLO: M-09-B-19]:** Solve real life problems using the following loci and the method of intersecting loci for sets of points in two dimensions which are: at a given distance from a given point, at a given distance from a given straight line, equidistant from two given points equidistant from two given intersecting straight lines.	Summative	A	**Question(s) will be asked in the annual examination**	05
	Trigonometry	**[SLO: M-09-B-20]:** Identify angles in standard position, expressed in degrees and radians.	Summative	K	**Question(s) will be asked in the annual examination**	10
		[SLO: M-09-B-21]: Apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to find a side or of an angle of a right-angled triangle.	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-B-22]: 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**	
	Trigonometric Identities	**[SLO: M-09-B-23]:** Prove the trigonometric identities and apply them to show different trigonometric relations.	Summative	K/A	**Question(s) will be asked in the annual examination**	05
		[SLO: M-09-B-24]: Solve real life problems involving trigonometric identities.	Summative	A	**Question(s) will be asked in the annual examination**	
	Bearing	**[SLO: M-09-B-25]:** Interpret and use three figure bearings.	Summative	K	**Question(s) will be asked in the annual examination**	07
		[SLO: M-09-B-26]: Solve problems involving bearing.	Summative	U	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-B-27]: Apply the concepts of trigonometry	Summative	A	**Question(s) will be asked in the annual examination**	
	Construction of Triangle	**[SLO: M-09-B-28]: Construct a triangle having given two sides and the included angle.**	**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-29]: Construct a triangle having given one side and two of the angles.	**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-30]: Construct a triangle having given two of its sides and the angle opposite to one of them (with all the three possibilities).	**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-31]: Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle and verify their concurrency.	Summative	U	**Question(s) will be asked in the annual examination**	
Domain C: Information Handling	**Frequency Distribution**	**[SLO: M-09-C -01]: Construct a grouped frequency table, histogram (with unequal class intervals) and frequency polygon.**	**Formative**	**K**	**Question(s) will not be asked in the annual examination; however, it will be part of regular teaching practice.**	05
	Measure of Central Tendency	**[SLO: M-09-C -02]:** Calculate the mean modal class and median of a grouped frequency distribution.	Summative	U	**Question(s) will be asked in the annual examination**	10
		[SLO: M-09-C -03]: Solve real life situations involving mean, weighted 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**	
	Probability	**[SLO: M-09-C -04]:** Calculate the probability of a single event and the probability of event not occurring	Summative	K	**Question(s) will be asked in the annual examination**	07
		[SLO: M-09-C -05]: Solve real life problems involving probability	Summative	A	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-C -06]: Calculate relative frequency as an estimate of probability.	Summative	K	**Question(s) will be asked in the annual examination**	05

	Relative and expected frequencies	**[SLO: M-09-C -07]:** Calculate expected frequencies.	Summative	U/K	**Question(s) will be asked in the annual examination**	
		[SLO: M-09-C -08]: Solve real life problems involving relative and expected frequencies.	Summative	A	**Question(s) will be asked in the annual examination**	

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

ROLL NUMBER					
0	0	0	0	0	0
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2	2	2	2	2	2
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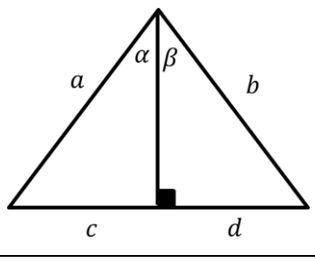
Section - A (Marks 15)

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.	The radical form of $x^{-\frac{3}{2}}$ is:	$\sqrt[3]{x^2}$	$\frac{1}{\sqrt{x^3}}$	$\sqrt{x^3}$	$\frac{1}{\sqrt[3]{x^2}}$	○	○	○	○
ii.	Which of the given options represents the scientific notation of 0.25^2 ?	625×10^{-4}	62.5×10^{-3}	6.25×10^{-2}	0.625×10^{-1}	○	○	○	○
iii.	If $A = \{2,4,6\}$ and $B = \{0,1\}$, then find number of elements in $A \times B$.	5	6	8	9	○	○	○	○
iv.	What is the least common multiple of $7x - 6xy$ and $5xy^3 - 3x^2$?	$(7-6y) \times (5x^3 - 3x)$	$(7x - 6xy) \times (5y^3x - 3x^2)$	$x(7-6y)$	$x(7-6y) \times (5y^3 - 3x)$	○	○	○	○
v.	Solution of inequality $-2x - \frac{1}{2} \leq \frac{3}{2}$ is:	$x > -1$	$x < -1$	$x \geq -1$	$x \leq -1$	○	○	○	○
vi.	What is the radian measure of $15^o50'$?	$\frac{19\pi}{216}$	$\frac{19\pi}{36}$	$\frac{19\pi}{180}$	$\frac{216\pi}{19}$	○	○	○	○
vii.	If a navigator gives bearing 0°, in which direction should he travel?	North	South	East	West	○	○	○	○
viii.	In the figure, if $\alpha = \beta$ then what is the value of b? 	$\frac{cd}{a}$	$\frac{c}{ad}$	$\frac{ad}{c}$	$\frac{ac}{d}$	○	○	○	○

ix.	What is the value of $-3-3\tan^2\theta$ in a single trigonometric function?	$3cosec^2\theta$	$-3\sec^2\theta$	$3\sec^2\theta$	$-3cosec^2\theta$	○ ○ ○ ○
x.	Which of the following points is the intersection of the angle bisectors of a triangle?	circumcenter	orthocenter	incentre	centroid	○ ○ ○ ○
xi.	Each of the internal angle of a regular hexagon is:	60^o	72^o	108^o	120^o	○ ○ ○ ○
xii.	Locus of points equidistant from $P(5,4)$ and $Q(5,-6)$ is:	$x=0$	$x=5$	$y=-1$	$y=1$	○ ○ ○ ○
xiii.	The mean of 11 numbers is 7. One of the numbers 13 is deleted. What is the mean of the remaining 10 numbers?	7.7	6.4	6.0	5.8	○ ○ ○ ○
xiv.	What is the probability of picking a king from well-shuffled 52 playing cards?	$\frac{1}{52}$	$\frac{1}{13}$	$\frac{4}{13}$	$\frac{1}{26}$	○ ○ ○ ○
xv.	A fair coin is tossed twice, then the frequency of appearing head twice is:	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{3}{4}$	○ ○ ○ ○

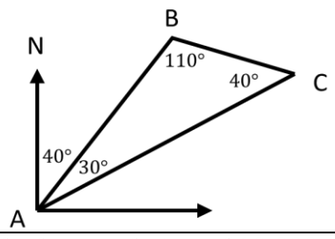
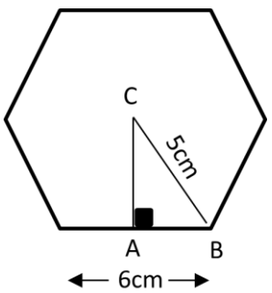
Federal Board SSC-I Examination
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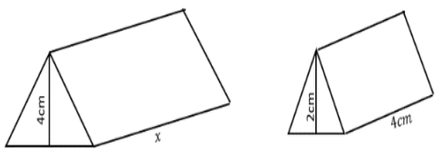
Time allowed: 2.40 hours | Total Marks: 60

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.	Simplify the expression $\left[(125)^{\frac{1}{3}} \times (25)^{\frac{1}{2}} + (64)^{\frac{2}{3}} \times 6 + (8)^{\frac{2}{3}}\right]^{\frac{-2}{3}}$	4	***OR***	If $X = \{1,3,9\}, Y = \{3,5,7\}$ and $Z = \{3,5,7,9,11\}$ then using Venn diagram, prove that $X \cup (Y \cap Z) = (X \cup Y) \cap (X \cup Z)$	4
ii.	The attached figure shows the position of three points A, B, and C. State the bearing of: B from A; A from B; B from C, and C from B. 	4	***OR***	For $A = \{1,2,3\}, B = \{3,4\}$ (a) List all the ordered pairs of the Cartesian Product $A \times B$, (b) List all the ordered pairs of a relation $R = \{(x,y) \mid x \epsilon A, y \epsilon B \wedge x < y\}$, (c) Find domain and range of the relation R.	4
iii.	Bani Gala had a population of 10,000 people in the year 2015. The population has been growing exponentially at a rate of 2.5% per year. Using the exponential growth formula $P(t) = P_o e^{rt}$, apply laws of logarithm to determine the year when population reaches up to 25,000.	4	***OR***	Find equation of the family of lines passing through a point $(5,2)$ and through the intersection of lines $x + 2y - 10 = 0$ and $2x + y - 2 = 0$.	4
iv.	Solve the linear equation $\frac{1}{3}(x-2) + \frac{2-3x}{2} = \frac{x+5}{6}$	4	***OR***	Simplify $\frac{5}{5+p-18p^2} - \frac{2}{2+5p+2p^2}$	4
v.	Prove that: $\frac{1}{1+cosx} + \frac{1}{1-cosx} = 2 + 2\cot^2 x$	4	***OR***	In the given figure, find area of a regular hexagonal roof of a building shown below. 	4

vi.	A hiking trail rises 500 meters over a horizontal distance of 2 kilometers. What is the slope of a trail? Express the slope in percentage.	4	***OR***	A decagonal die labeled 4,4,4,4,5,5,6,7,8,8 is rolled once. Find the probability of an odd number, an even number, and a factor of 12.	4
vii.	A triangular garden XYZ shows corners $X(-4,-4)$, $Y(12,0)$ and $Z(4,8)$ geometrically. Find locus of the corners equidistant from XZ and YZ.	4	***OR***	Given the equation of a line $y = 4x - 2$ and a point $(1, 2)$, how would you determine the equation of a line that passes through this point and is perpendicular to the given line? Express your final answer in the form $y = mx + c$	4
viii.	In the adjacent similar figures,  find the value of x and the ratio of volumes v_1 and v_2.	4	***OR***	A fair die is rolled 75 times and 5 appears up 20 times, what is the relative frequency of appearing any number up except 5.	4
ix.	Find the HCF of the polynomials $x^3 + 2x^2 - 4x - 8$ and $2x^3 + 7x^2 + 4x - 4$	4	***OR***	In a 50-over cricket match, average runs scored by Pakistani team for different sessions of the innings is given below: The score in 01 to 10 overs: 12 runs per over, 11 to 35 overs: 06 runs per over, 36 to 50 overs: 13 runs per over. Find average runs scored by the team in an innings.	4

SECTION – C (Marks 24)

$(3 \times 8 = 24)$

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

Q. No.	Question	Marks		Question	Marks
Q3	For what value of k, the expression $y^4 + 4y^2 + k + \frac{8}{y^2} + \frac{4}{y^4}$ becomes a perfect square.	8	***OR***	Slopes of the sides of a triangle ABC are given as $m_1 = \frac{3}{2}$, $m_2 = -\frac{3}{2}$ and $m_3 = 2$. Find interior angles of the triangle ABC.	8
Q4	The height H of the tide at a coastal location varies over a day, modeled by $H = H_o + A \cdot sin\left(\frac{2\pi t}{T}\right)$, with H_o: the average tide height, A: the amplitude of tidal variation, t: the time in hours, and T: the period of tidal cycle in hours. If $H_o = 2m, A = 1m, T = 24hours$ use trigonometry to find the tide's height at $t = 0, 6, 18$ hours.	8	***OR***	Transform $-2x + 5y = 10$ in the following: (i) Two points form (ii) Two Intercepts form (iii) Symmetric form and (iv) Normal form	8

<table>
<tr>
<td>Q5</td>
<td>Construct altitudes of triangle ABC with side measures $m\overline{AB} = 4.8cm$, $m\overline{BC} = 3.5cm, m\overline{AC} = 4cm$ and show that the altitudes are concurrent. Write down the construction steps also.</td>
<td>8</td>
<td>OR</td>
<td>The grouped data for a company’s monthly expense (in million rupees) is given as:
<table>
<tr><td>C-I</td><td>140 – 149</td><td>150 – 159</td><td>160 – 169</td><td>170 – 179</td></tr>
<tr><td>f</td><td>3</td><td>7</td><td>5</td><td>9</td></tr>
</table>
Calculate the median and mode expense for 24 months.</td>
<td>8</td>
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