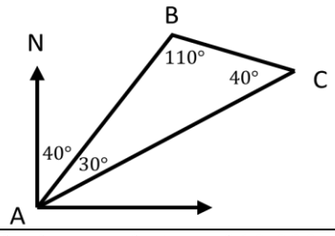
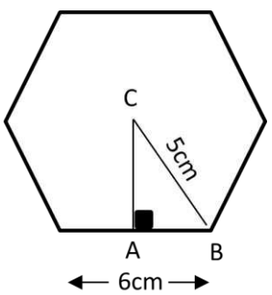
Federal Board SSC-I Examination
Model Question Paper Mathematics
(Curriculum 2022-23)

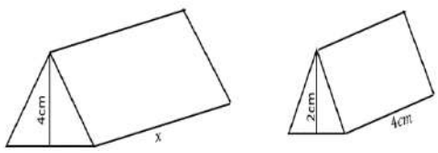
Time allowed: 2.40 hours | Total Marks: 60

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.	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>
</tr>
</table>

Federal Board SSC-I Examination

Mathematics Model Question Paper

(Curriculum 2022-23)

Alignment of Questions with Student Learning Outcomes

OBJECTIVE PART
SECTION A

Q. No. (Part no.)	Content Area/ Domain	Student Learning Outcomes	Cognitive Level *	Allocated Marks
Q1(i)	Domain A	**[SLO M-09-A-04]:** Apply laws of indices to simplify radical expressions.	**K**	1
Q1(ii)	Domain A	**[SLO: M-09-A-05]:** Express a number in scientific notations and vice versa.	**K**	1
Q1(iii)	Domain A	**[SLO M-09-A-15]:** Explain product, Binary Relations and its domain and range.	**U**	1
Q1(iv)	Domain A	**[SLO: M-09-A-19]:** Find highest common factor and least common multiple of algebraic expressions and know relationship of LCM and HCF.	**K**	1
Q1(v)	Domain A	**[SLO: M-09-A-22]:** Solve linear equations and inequalities with rational coefficients and represent the solution set on a real line.	**U**	1
Q1(vi)	Domain B	**[SLO: M-09-B-20]:** Identify angles in standard position, expressed in degrees and radians.	**K**	1
Q1(vii)	Domain B	**[SLO: M-09-B-26]:** Solve problems involving bearing.	**A**	1
Q1(viii)	Domain B	**[SLO: M-09-B-16]:** Identify similarity of polygons. Area and volume of similar figures.	**U**	1
Q1(ix)	Domain B	**[SLO: M-09-B-23]:** Prove the trigonometric identities and apply them to show different trigonometric relations.	**K**	1
Q1(x)	Domain B	**[SLO: M-09-B-31]:** Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle and verify their concurrency.	**K**	1
Q1(xi)	Domain B	**[SLO: M-09-B-18]:** Solve real life problems that involve the properties of regular polygons, triangles and parallelograms (such as building architectural structures, fencing, tiling, painting, carpeting a room).	**A**	1
Q1(xii)	Domain B	**[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.	**A**	1
Q1(xiii)	Domain C	**[SLO: M-09-C -02]:** Calculate the mean modal class and median of a grouped frequency distribution.	**K**	1
Q1(xiv)	Domain C	**[SLO: M-09-C -04]:** Calculate the probability of a single event and the probability of event not occurring.	**K**	1

Q1(xv)	Domain C	**[SLO: M-09-C -06]:** Calculate relative frequency as an estimate of probability.	**U**	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
Q2(i)	**Domain A**	**[SLO: M-09-A-04]** Apply laws of indices to simplify radical expressions.	**U**	***OR***	**Domain A**	**[SLO: M-09-A-13]** Verify and apply properties/laws of union and intersection of three sets through analytical and Venn diagram method.	**K**	**4**
Q2(ii)	**Domain B**	**[SLO: M-09-B-26]** Solve problems involving bearing.	**K**	***OR***	**Domain A**	**[SLO: M-09-A-15]** Explain product, Binary Relations and its domain and range.	**K**	**4**
Q2(iii)	**Domain A**	**[SLO: M-09-A-08]** Apply laws of logarithm to real life situations such as growth and decay, loudness of sound.	**K**	***OR***	**Domain B**	**[SLO: M-09-B-11]** Find the equation of the family of lines passing through the point of intersection of given two lines.	**K**	**4**
Q2(iv)	**Domain A**	**[SLO: M-09-A-22]** Solve linear equations and inequalities with rational coefficients and represent the solution set on a real line.	**U**	***OR***	**Domain A**	**[SLO: M-09-A-18]** Factorize quadratic and cubic algebraic expressions.	**K**	**4**
Q2(v)	**Domain B**	**[SLO: M-09-B-23]** Prove the trigonometric identities and apply them to show different trigonometric relations.	**U**	***OR***	**Domain B**	**[SLO: M-09-B-18]** Solve real life problems that involve the properties of regular polygons, triangles and parallelograms (such as building architectural structures, fencing, tiling, painting, carpeting a room).	**A**	**4**
Q2(vi)	**Domain B**	**[SLO: M-09-B-03]** Find the	**A**	***OR***	**Domain C**	**[SLO:M-09-C-04]** Calculate the	**K**	**4**

		gradient of a straight line when coordinates of two points are given.				probability of a single event and the probability of event not occurring.		
Q2(vii)	**Domain B**	**[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.	**A**	***OR***	**Domain B**	**[SLO: M-09-B-04]** Find the equation of a straight line in the form $y = mx + c$.	**K**	**4**
Q2(viii)	**Domain B**	**[SLO: M-09-B-17]** Solve problems using the relationship between areas of similar figures and volume of different solids.	**U**	***OR***	**Domain C**	**[SLO: M-09-C-06]** Calculate relative frequency as an estimate of probability.	**U**	**4**
Q2(ix)	**Domain A**	**[SLO:M-09-A-19]** Find highest common factor and least common multiple of algebraic expressions and know relationship of LCM and HCF.	**U**	***OR***	**Domain C**	**[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).	**A**	**4**
Q3	**Domain A**	**[SLO: M-09-A-20]** Find square root of algebraic expression by	**U**	***OR***	**Domain B**	**[SLO: M-09-B-12]** Calculate angles of the triangle when the slopes	**U**	**8**

		factorization and division.				of the sides are given.		
Q4	**Domain B**	**[SLO: M-09-B-22]** Solve real life trigonometric problems in two dimensions involving angles of elevation and depression.	**U**	***OR***	**Domain B**	**[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.	**U**	**8**
Q5	**Domain B**	**[SLO: M-09-B-31]** Draw angle bisectors, perpendicular bisectors, medians, altitudes of a given triangle and verify their concurrency.	**U**	***OR***	**Domain C**	**[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).	**A**	**8**

*Cognitive Level

K: Knowledge
U: Understanding
A: Application

Table of Specification

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

Domain Title/ Content Area Cognitive Level	Domain A Numbers and Algebra	Domain B Geometry	Domain C Information Handling	Total Marks	Percentage of Cognitive Level
Knowledge	Q1(i)1, Q1(ii)1, Q1(iv)1, Q2(i/s)4, Q2(ii/f)4, Q2(iii/f)4, Q2(ii/s)4 (19 marks)	Q1(vi)1, Q1(ix)1, Q1(x)1, Q2(iii/s)4, Q2(vi/f)4, Q2(vii/s)4 (15 marks)	Q1(xiii)1, Q1(xiv)1, Q2(vi/s)4 (06 marks)	40	30%
Understanding	Q1(iii)1, Q1(v)1, Q2(i/f)4, Q2(iv/f)4, Q2(iv/s)4, Q3(f)8 (22 marks)	Q1(viii)1, Q2(v/f)4, Q2(ix/f)4, Q3(s)8, Q4(f)8, Q4(s)8, Q5(f)8 (41 marks)	Q1(xv)1, Q2(viii/s)4 (05 marks)	68	50%
Application		Q1(vii)1, Q1(xi)1, Q1(xii)1, Q2(v/s)4, Q2(vii/f)4, Q2(viii/f)4, (15 marks)	Q2(ix/s)4 Q5(s)8 (12 marks)	27	20%
Total Marks	41	71	23	135	-
Total Percentages	30%	53%	17%	-	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 Short Response Questions (SRQs) and Extended Response Questions (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