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FBISE Mathematics Class 11
Topical workbook - Volume 1 of 3

140 questions arranged by official framework topic.
National Curriculum 2022-23; supported examinations from 2027.

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Complex Numbers

Domain A: Numbers and Algebra

FBISE model paper | Section A Q1 | 0.75 marks

1.	The linear factors of the polynomial $4z^2 + 9y^2$ are:	$(2z - 3yi)^2$	$(2z + 3yi)^2$	$(2z + 3y)(2z - 3y)$	$(2z + 3yi)(2 - 3yi)$

FBISE model paper | Section A Q2 | 0.75 marks

2.	What is the principal argument of $-i - \sqrt{3}$?	$-\frac{4\pi}{3}$	$\frac{4\pi}{3}$	$-\frac{\pi}{3}$	$\frac{\pi}{3}$

FBISE model paper | Section A Q3 | 0.75 marks

3.	If $z = r\cos\theta + ir\sin\theta$ then z^{-1} is equal to:	$\frac{\cos\theta - i\sin\theta}{r}$	$\frac{-\cos\theta + i\sin\theta}{r}$	$\frac{-\cos\theta - i\sin\theta}{r}$	$\frac{\cos\theta + i\sin\theta}{r}$

FBISE model paper | Section A Q41 | 0.75 marks

Scenario for MCQs (41-44)	**Given a complex polynomial $z^2 + 4$, where z is a complex number.**

41.	The complex polynomial $z^2 + 4$ is:	reducible to real factors	irreducible to real factors	reducible to complex factors	irreducible to complex factors

FBISE model paper | Section A Q42 | 0.75 marks

Scenario for MCQs (41-44)	**Given a complex polynomial $z^2 + 4$, where z is a complex number.**

42.	If 4 is replaced with 8 and z^2 is replaced with z^3 in polynomial $(z^2 + 4)$, then the number of linear factor(s) of polynomial are:	1	2	3	Not possible

FBISE model paper | Section A Q44 | 0.75 marks

Scenario for MCQs (41-44)	**Given a complex polynomial $z^2 + 4$, where z is a complex number.**

44.	The two factors of $z^2 + 4$ are:	conjugate of each other	same	additive inverse of each other	reciprocal of each other

FBISE model paper | Section B Q1 | 4 marks

1.	Find the quadratic equation of: $\arg(z-2)-\arg(z+2)=\pi/4$	4

FBISE model paper | Section B Q2 OR | 4 marks

OR	Solve the simultaneous linear equations: $\frac{3}{2}z-6\left(1+\frac{i}{3}\right)w=5,$ $\frac{i}{2}z+\left(\frac{3}{4}-\frac{1}{2}i\right)w=\left(\frac{1}{2}+2\mathrm{i}\right)$	4

First Annual 2025 | Section B Q2(i) | 4 marks

(i)	Solve the quadratic equation $3z^2 + 2z + 2 = 0, \; z \in C$ by completing the square method.	04
(ii)	Verify that:	

First Annual 2025 | Section B Q2(x) | 4 marks

If $z_1 = 10\left(\cos 100^\circ + i \sin 100^\circ\right)$ and $z_2 = 5\left(\cos 40^\circ + i \sin 40^\circ\right)$, then find the following in polar form: (a) $z_1 \cdot z_2$, (b) $\frac{z_1}{z_2}$.	04

First Annual 2025 | Section B Q2(x) | 4 marks

(x)	Solve the simultaneous linear equations $2iz - 3iw = 4$ and $-3iz + 5iw = 9$ carrying complex coefficients $\left(i = \sqrt{-1}\right)$.	

Second Annual 2025 | Section B Q2(i) | 4 marks

(i)	Solve the quadratic equation $z^2 - 5z + 6 = 0$ by completing the square method.	**04**

Second Annual 2025 | Section B Q2(ix) | 4 marks

(ix)	Find modulus and argument of complex number $3 + 4i$	04

Second Annual 2025 | Section B Q2(xi) OR | 4 marks

	b. Find the sum of first 6 terms.	
OR	Solve the following system of linear equations with complex coefficients. $z + (1 + i)\, w = 2 + i;\quad (1 + i)\, z + w = 2 + i$	04

First Annual 2026 | Section B Q2(iii) | 4 marks

Given $z_1 = 2(\cos 30° + i \sin 30°)$ and $z_2 = 3(\cos 60° + i \sin 60°)$, find $z_1 z_2$ in polar form.	04

First Annual 2026 | Section B Q2(vi) | 4 marks

(vi)	Solve the following equations: $(2+i)\omega = 1$ $(3-i)z + 5\omega = 2 - i$	04

First Annual 2026 | Section B Q2(x) | 4 marks

(x)	Convert $z = 1 + i$ into polar form and then find z^2 using polar representation.	04

FBISE model paper | Section A Q1(i) | 1 mark

i.	If $z = x + iy$ then what is the real solution of $(x - 3) \leq 2$?	$x \leq 5$	$y \leq 2$	$x \leq -5$	$y \leq -2$

FBISE model paper | Section A Q1(ii) | 1 mark

ii.	If $Z = \sqrt{3} - i$ then principal argument of z is written	$-\frac{\pi}{6}$	$\frac{\pi}{6}$	$-\frac{\pi}{3}$	$\frac{\pi}{3}$

FBISE model paper | Section B Q2(i) | 4 marks

i.	If $z = x + iy$ then simplify the equation $\|z - 2i\| = \|\overline{z} + 3\|$	4

FBISE model paper | Section B Q2(x) | 4 marks

x.	If $z = x + iy$ and $arg\left(\frac{z-1}{z+1}\right) = \frac{\pi}{2}$, then show that $x^2 + y^2 = 1$	4

Second Annual 2025 | Section B Q2(i) | 4 marks

(i)	If $z_1 = 3 + 4i$ and $z_2 = 1 - 2i$ then prove that $\overline{z_1 + z_2} = \overline{z_1} + \overline{z_2}$	04

Second Annual 2025 | Section B Q2(x) | 4 marks

(x)	Express the complex number $\left(\frac{1+i}{2-i} \times \frac{3-i}{1+2i}\right)$ in the form $x + iy$.	

Q.3	Solve the following system of linear equations with complex coefficients: $(1+i)z + w = 3 + 2i,$ $z + (1-i)w = 2 + 3i$	**08**
Q.4	Maximize $f(x, y) = 5x + 4y$ subject to the constraints $x + 2y \leq 10,\ 2x + y \leq 12,\ x + y \leq 7,\ x \geq 0\ ,\ y \geq 0.$	**08**

Factorize the polynomial $P(z)$ into linear factors $P(z) = z^3 - 2z^2 + z - 2$	04

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Matrices & Determinants

Domain A: Numbers and Algebra

FBISE model paper | Section A Q4 | 0.75 marks

4.	If A is a square matrix of order 3 with $\|A\| = 5$, then the value of $\|2A\|$ is:	5	10	25	40

FBISE model paper | Section A Q5 | 0.75 marks

5.	For $A = \begin{bmatrix} 3 & 3 & 1 \\ 0 & 5 & -1 \\ 2 & 1 & 4 \end{bmatrix}$, what is the value the cofactor A_{12}?	-2	0	2	-11

FBISE model paper | Section A Q6 | 0.75 marks

6.	Which condition defines an inconsistent system of linear equations?	One solution	Infinite solutions	Trivial solution	No solution

FBISE model paper | Section A Q45 | 0.75 marks

Scenario for MCQs (45-48)	**Three seismic stations track wave data where $x, y,$ and z represent the exact amplitude of primary, secondary, and surface waves respectively. The seismic network model is:** **AX = B,** $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 0 \\ 5 & 5 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \\ 0 \end{bmatrix}$**, then**				
45.	The value of $\|A\|$ is:	-16	-8	0	16

FBISE model paper | Section A Q46 | 0.75 marks

Scenario for MCQs (45-48)	**Three seismic stations track wave data where $x, y,$ and z represent the exact amplitude of primary, secondary, and surface waves respectively. The seismic network model is:** **AX = B,** $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 0 \\ 5 & 5 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \\ 0 \end{bmatrix}$**, then**				
46.	The value of $\|A_z\|$ is:	-16	-60	0	60

FBISE model paper | Section A Q47 | 0.75 marks

Scenario for MCQs (45-48)	**Three seismic stations track wave data where $x, y,$ and z represent the exact amplitude of primary, secondary, and surface waves respectively. The seismic network model is:** **AX = B,** $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 0 \\ 5 & 5 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \\ 0 \end{bmatrix}$**, then**				
47.	The value of z is:	-3.75	0.27	3.75	7.5

FBISE model paper | Section A Q48 | 0.75 marks

Scenario for MCQs (45-48)	**Three seismic stations track wave data where $x, y,$ and z represent the exact amplitude of primary, secondary, and surface waves respectively. The seismic network model is:** $\mathbf{AX = B}$, $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 0 \\ 5 & 5 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 12 \\ 0 \end{bmatrix}$**, then**

48.	The value of $\lvert A \rvert$ if Row 3 is replaced by $[3 \quad 3 \quad 3]$	-48	-16	0	48

FBISE model paper | Section B Q1 OR | 4 marks

OR	Find A^{-1}, If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 3 \\ 3 & 7 & 7 \end{bmatrix}$ by using row operations.	4

Q8	Consider the system of linear equations: $\begin{cases} 3x + y - \beta z = 0 \\ 4x - 2y - 3z = 0 \\ 2x + 4y + \beta z = 0 \end{cases}$ Find the value(s) of β for which the given system of homogeneous equations has non-trivial solution. Also solve the system for the value(s) of β.	8

First Annual 2025 | Section B Q2(vii) | 4 marks

Verify that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ & & \end{vmatrix} = (b-a)(c-a)(c-b)$	**04**

First Annual 2025 | Section B Q2(xii) | 4 marks

(b) Calculate work done by the force F.	
Solve $x+y+z=3$; $y+z=2$; $z=2$ using Cramer's rule:	**04**

Q.5	Solve $x+2y-3z=4$, $2x-3y+4z=5$, $3x+4y-5z=6$ using the Gaussian elimination method.	**08**

First Annual 2025 | Section B Q2(vii) | 4 marks

(vii)	Verify that $\begin{vmatrix} a+k & a & a \\ a & a+k & a \end{vmatrix} = k^2(3a+k)$	04	OR	If $\sin\theta = -\frac{3}{5}$ exact values of

First Annual 2025 | Section B Q2(xii) | 4 marks

(xii)	Solve the system $x - y + z = 1; x - z = 2; z = 3$ using Cramer's rule.

Solve the system $x+y+z=6, 2x+3y+z=11, 3x+y+2z=8$ using the Gaussian elimination method.	**08**

Second Annual 2025 | Section B Q2(iii) | 4 marks

Find the inverse of given matrix using row operations. $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix}$	04

Second Annual 2025 | Section B Q2(iv) OR | 4 marks

OR	Find the value of k if the given system is consistent: $x - 4y + 3z = 0$ $2x + ky + z = 0$ $x - 2y + kz = 0$	04

(v)	Solve system of equations: $x + y = 6,\ x + z = 5, z = 2$ by using Cramer's Rule.	04

Solve the homogeneous system of equations using Gaussian Elimination method: $x + 2y - z = 0, \quad 2x + 3y - 2z = 0,$ $-x - y + z = 0$	08	OR	Giv a. b.
Use binomial theorem to expand $\sqrt{101}$ and $\sqrt{99}$			A c

First Annual 2026 | Section B Q2(ii) OR | 4 marks

OR	Find the rank of matrix: $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \end{bmatrix}$	**04**

First Annual 2026 | Section B Q2(xii) | 4 marks

(xii)	Find the inverse of matrix if possible: $\begin{bmatrix} 0 & 3 & 4 \\ -4 & 2 & 6 \end{bmatrix}$	**04**

c. Find the sum up to infinity.

Q.4 Solve:

$$2x + y - z = 1$$
$$x + 2y + z = 4$$
$$3x + y + 2z = 7$$

08

First Annual 2026 | Section B Q2(i) | 4 marks

(i)	Solve the system: $z + 2\omega = 4i$ $2z + 5\omega = 3$	**04**
(ii)	Verify that	

First Annual 2026 | Section B Q2(vii) | 4 marks

(vii)	Find the rank of matrix: $\begin{bmatrix} 3 & -4 & 2 \\ 2 & 3 & 5 \\ 1 & 0 & 1 \end{bmatrix}$	**04**

First Annual 2026 | Section B Q2(viii) OR | 4 marks

Find the inverse of given matrix if possible: $\begin{bmatrix} 2 & 1 & 0 \\ 0 & 3 & 2 \\ 2 & 1 & 4 \end{bmatrix}$	**04**

First Annual 2026 | Section B Q2(xii) | 4 marks

(xii)	For what value of λ the given matrix is singular? $\begin{bmatrix} 1 & -1 & 2 \\ 2 & 1 & \lambda \end{bmatrix}$	**04**

First Annual 2026 | Section C Q5 | 8 marks

Q.5	Solve the system: $x+y+z=6$ $2x+3y+z=10$ $x+2y+3z=11$	08

FBISE model paper | Section A Q1(iii) | 1 mark

iii.	For a square matrix A of order 3×3, $\|A\| = 9$, $A_{21} = 3$, $A_{22} = 3$, $A_{23} = -1$, $a_{21} = 1$, $a_{23} = 2$, what is the value of a_{22}?	2	3	9	-1

FBISE model paper | Section B Q2(vii) | 4 marks

vii.	Without expansion show that: $\begin{vmatrix} x & -z & 0 \\ 0 & y & -x \\ -y & 0 & z \end{vmatrix} = 0$	4

FBISE model paper | Section B Q2(xii) | 4 marks

xii.	If $A = \begin{bmatrix} x & 0 \\ y & 1 \end{bmatrix}$, then show that $A^n = \begin{bmatrix} x^n & 0 \\ \frac{y(x^n-1)}{(x-1)} & 1 \end{bmatrix}, n \epsilon z^+$	4

Q5	Solve the following system of non-homogeneous linear equations by Gaussian Elimination Method: $2x - 3y + 5z = 2,$ $x + 4y - 2z = 1,$ $4x + 5y + z = 4$	8

First Annual 2025 | Section B Q2(i) | 4 marks

(i)	Find Echelon from of the given matrix: $\begin{bmatrix} 4 & 5 & 6 \end{bmatrix}$	

First Annual 2025 | Section B Q2(ii) | 4 marks

	$\begin{bmatrix} 7 & 8 & 9 \end{bmatrix}$	
(ii)	Find the rank of the matrix: $\begin{bmatrix} 1 & 3 & -1 \\ 2 & 1 & 4 \end{bmatrix}$	**04**

First Annual 2025 | Section B Q2(v) OR | 4 marks

OR	Solve for 't' if: $\begin{vmatrix} 2 & t+3 & 4 \\ 2 & 3 & t+4 \end{vmatrix} = 0$		**04**

First Annual 2025 | Section B Q2(vii) OR | 4 marks

OR	Verify that: $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$		

OR	Use Cramer's rule to solve the system of equations:	$x-2y=-4$ $3x+y=-5$ $2x+z=-1$	**08**

Second Annual 2025 | Section B Q2(ii) | 4 marks

(ii)	Solve for x : $\begin{vmatrix} x & 1 & 1 \\ 1 & x & 2 \\ 1 & 2 & 3 \end{vmatrix} = 0$	04

Second Annual 2025 | Section B Q2(vii) | 4 marks

(vii)	Find adjoint of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ -1 & 3 & 2 \\ 0 & 5 & -1 \end{bmatrix}$
(viii)	Solve the inequality $\frac{x}{2} - 1 \leq$

Q.5	Use Cramer's rule to find the solution of the following system: $x + 2y + 3z = 14, \quad 2x - y + z = 3, \quad 3x + y - 2z = -1$	**08**

First Annual 2026 | Section B Q2(i) OR | 4 marks

(i)	Factorize the polynomial $P(z)$ into linear factors $P(z) = z^3 - 2z^2 + z - 2$	04	OR	Without expansion prove that $\begin{vmatrix} bc & ca & ab \\ \frac{1}{a} & \frac{1}{b} & \frac{1}{c} \end{vmatrix} = 0$		04

First Annual 2026 | Section B Q2(ii) | 4 marks

(ii)	Find the value of x if the following matrix is singular: $\begin{bmatrix} x+2 & 3 & 4 \\ 2 & x+3 & 4 \end{bmatrix}$	04

$\begin{bmatrix} 2 & 3 & x+4 \end{bmatrix}$			a. PR b. PM c. OM		
For $A=\begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ and $B=[-2\ -1\ -4]$, verify that $(AB)'=B'A'$	04	OR	For what value of λ, the vectors $\underline{a}=\underline{i}+3\underline{j}+\underline{k}$, $\underline{b}=2\underline{i}-\underline{j}-\underline{k}$ and $\underline{c}=\lambda\underline{j}+3\underline{k}$ are coplanar.	04	
			Find the term independent of x in the expansion of		

(Use of graph paper is not necessary. Candidates can make

Q.3	Solve the following system of equations.	$x-2y+z=2$ $2x+2y-z=4$ $x+y=0$	08

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Sequences and Series

Domain A: Numbers and Algebra

FBISE model paper | Section A Q7 | 0.75 marks

7.	If the first term of a sequence is 10 and the common difference is 0, what is the 50th term?	0	10	50	500

FBISE model paper | Section A Q8 | 0.75 marks

8.	Row 1 of a theatre has 20 seats. Each successive row has 2 additional seats. At which row number does the seat count reach 40?	10th	11th	12th	20th

FBISE model paper | Section A Q9 | 0.75 marks

9.	A ball is dropped and rebounds to 60%, of its previous height. If the first bounce is 100 cm, what is the height of the 2nd bounce?	60 cm	48 cm	36 cm	6 cm

FBISE model paper | Section A Q10 | 0.75 marks

10.	Find the 5th term of an HP whose corresponding AP is 5, 10, 15, ...	$\frac{1}{20}$	$\frac{1}{25}$	$\frac{1}{30}$	$\frac{1}{35}$

FBISE model paper | Section A Q49 | 0.75 marks

Scenario for MCQs (49-52)

Use the table below showing the Weekly Savings of a student to answer the questions.

Week (n)	Total Savings (S_n)
1st	Rs 150
2nd	Rs 350
3rd	Rs 600
4th	Rs 900

49.	What is the value of a_2?	150	200	250	350

FBISE model paper | Section A Q50 | 0.75 marks

Scenario for MCQs (49-52)

Use the table below showing the Weekly Savings of a student to answer the questions.

Week (n)	Total Savings (S_n)
1st	Rs 150
2nd	Rs 350
3rd	Rs 600
4th	Rs 900

50.	What is the total savings for the 3rd week?	200	250	350	600

FBISE model paper | Section A Q51 | 0.75 marks

Scenario for MCQs (49-52)

Use the table below showing the Weekly Savings of a student to answer the questions.

Week (n)	Total Savings (S_n)
1st	Rs 150
2nd	Rs 350
3rd	Rs 600
4th	Rs 900

51.	Which formula represents the total savings (S_n) for any week (n)?	$s_n = \frac{n}{2}[300 + (n-1)50]$	$s_n = 150 + (n-1)50$	$s_n = \frac{n}{2}[150 + (n-1)50]$	$s_n = 150n + 50$

FBISE model paper | Section A Q52 | 0.75 marks

Scenario for MCQs (49-52)

Use the table below showing the Weekly Savings of a student to answer the questions.

Week (n)	Total Savings (S_n)
1st	Rs 150
2nd	Rs 350
3rd	Rs 600
4th	Rs 900

52.	By the end of which week will the student's total savings first exceed Rs. 2,500?	6th week	7th week	8th week	9th week

FBISE model paper | Section B Q2 | 4 marks

2.	The 2nd term of an H.P. is $\frac{1}{5}$ and 5th term is $\frac{1}{11}$. Find the 12th term?	4

OR	In an A.P, the sum of the first n terms is given by: $S_n = 3n + tn^2$. If $S_4 = 28$, i. Find the value of t. ii. Determine first term and the common difference.	4

Q9	Given that $1+\frac{4}{5}+\frac{7}{5^2}+\frac{10}{5^3}+\ldots\ldots$ i. Find the sum of first n terms of the series. ii. Find the sum to infinity of the series.	8

First Annual 2025 | Section B Q2(iv) OR | 4 marks

A harmonic sequence has 2nd term $\frac{1}{6}$ and 4th term $\frac{1}{12}$ Find general term of the sequence.	**04**

First Annual 2025 | Section B Q2(vi) | 4 marks

In an arithmetic sequence, the 5th term is 15, and the 12th term is 50. Find a) Common difference and b) First term of the sequence.	**04**

A bouncing ball rebounds 80% of its previous height. If the ball is dropped from a height of 50 meters. Find the total distance traveled by the ball before coming to rest.	04
Use the principle of mathematical induction to prove	

For an arithmetic-geometric series:

$$1+5\left(\frac{1}{2}\right)^{1}+9\left(\frac{1}{2}\right)^{2}+13\left(\frac{1}{2}\right)^{3}+\ldots$$

(a) Find general term of the series.
(b) Sum the series upto n terms,
(c) Sum the series upto infinite terms.

08

First Annual 2025 | Section B Q2(iv) OR | 4 marks

A harmonic sequence has 3rd term $\frac{1}{8}$ and 5th term $\frac{1}{20}$. Find:

(a) the general term and

(b) the 15th term of the sequence.

First Annual 2025 | Section B Q2(vi) | 4 marks

(vi)	In an arithmetic sequence, first term is 12, and 10th term is 48. Find: **a)** the common difference and **b)** the sum of the first 12 terms of the sequence.

(viii)	A falcon dives from a height of 100 meters to catch its prey and then ascends back to 85% of its previous height after each unsuccessful attempt. Find the total vertical distance travelled by the falcon before stopping its attempts.

For an arithmetic-geometric series: $1(1)+3\left(\frac{1}{2}\right)+5\left(\frac{1}{4}\right)+7\left(\frac{1}{8}\right)+9\left(\frac{1}{16}\right)+....$ **(a)** Find n^{th} term of the series , **(b)** Sum the series up to n terms and **(c)** Sum the series up to infinite terms	**08**

Second Annual 2025 | Section B Q2(vi) | 4 marks

(vi)	Find a Harmonic sequence whose 4^{th} term is $\frac{1}{3}$ and 9^{th} term is $\frac{1}{13}$.	**04**

Second Annual 2025 | Section B Q2(x) OR | 4 marks

The 10^{th} term of an arithmetic series is 25 and the first term is 7: **a.** Find the common difference **b.** Find the sum of first 10 terms.	**04**	**OR**	A geometric sequence has first term $a_1 = 3$ and common ratio $r = 2$: **a.** Find the 6th term. **b.** Find the sum of first 6 terms.	**04**

Second Annual 2025 | Section B Q2(x) | 4 marks

(x)	The 10^{th} term of an arithmetic series is 25 and the first term is 7: **a.** Find the common difference **b.** Find the sum of first 10 terms.	**04**	**OR**	A ç com **a.** **b.**

First Annual 2026 | Section B Q2(i) | 4 marks

(i)	Find the sum of the geometric series $\frac{2}{3}, -1, \frac{3}{2}, \ldots$ up	**04**

First Annual 2026 | Section B Q2(ix) OR | 4 marks

OR	Find the sum to n terms of the sequence: 3, 9, 27, 81...	04

First Annual 2026 | Section B Q2(xi) | 4 marks

(xi)	Find the Sum of first 20 terms of A.P with $a=1, d=3$.	04

Q.3	**a.** Recognize the sequence (as A.P or G.P) and find the general term of the sequence $4,2,1,\frac{1}{2},....$ **b.** Find the sum up to n terms. **c.** Find the sum up to infinity.	**4+2 +2**	**OR**	A committee of 5 members is to be selected from a group of 8 men and 6 women. In how many ways can the committee be formed if it must include at least 2 women?	**08**
Q.4	Solve:			In a robotics project, a mechanical arm moves in such	

First Annual 2026 | Section B Q2(iv) OR | 4 marks

Find the sum of 6 terms of sequence: $1+\frac{1}{2}+\frac{1}{4}+....$	04
Find the angle between vectors:	

First Annual 2026 | Section B Q2(vi) | 4 marks

(vi)	Find the 10^{th} term of an A.P with $a=3$ and the 7^{th} term of it is 15.	04

(viii)	The 3rd term of a geometric sequence is 16 and the 5th term is 64. Find the common ratio and 1st term. Also write the sequence for positive vaues.	**04**

First Annual 2026 | Section C Q6 | 8 marks

Q.6	a. For the sequence 2, 5, 8, 11, ... find the general term. Also find the sum of first 20 terms. b. Find the sum of the n terms of the series $1.2+2.3+3.4+.....$	4+4

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FBISE model paper | Section A Q1(v) | 1 mark

v.	What is the A.M of 20 terms of an A.P with first term 2 and common difference 2?	20	21	22	42

FBISE model paper | Section A Q1(vi) | 1 mark

vi.	What is the value of H. M between two non-zero real numbers, if their $A.M = \frac{3\sqrt{2}}{2}$ and $G.M = 2$?	$\frac{8}{3\sqrt{2}}$	$\frac{4}{3\sqrt{2}}$	$\frac{3\sqrt{2}}{8}$	$\frac{3\sqrt{2}}{4}$

FBISE model paper | Section B Q2(iv) OR | 4 marks

In H.P if $a_3 = \frac{1}{11}$ and $a_{16} = \frac{1}{63}$, then find values of a_1, d and a_{20}	4

FBISE model paper | Section B Q2(vi) | 4 marks

vi.	In an arithmetic progression, sum of the first ten terms is 200 and the sum up to twenty terms is 1000. Find common difference and the first term.	4

Q6	Find sum of the series $(a)\sum_{i=1}^{n}\frac{i}{7^i}\ and\ \ (b)\sum_{i=1}^{\infty}\frac{i}{7^i}$	8

(v)	Sum the series up to "n" terms: 1.3.5+2.4.6+3.5.7+..... to "n" terms.	04	OR	Solve for 't' if:	$\begin{vmatrix} t+2 & 3 & 4 \\ 2 & t+3 & 4 \end{vmatrix}$

OR	A ball is dropped from a height of 30 meter and it rebounds every time $\frac{1}{3}$ of previous height. How far it travels up to eight bounce?	**08**
	Without using calculator by applying combination	

Second Annual 2025 | Section B Q2(ii) OR | 4 marks

	are coplanar.	
OR	Find sum of the series $2 + 6 + 18 + 54 + \cdots + n$ terms.	04

Second Annual 2025 | Section B Q2(vi) OR | 4 marks

04	OR	The 10^{th} term of an arithmetic sequence is 42 and the 4^{th} term is 18. Find first term and common difference of the sequence.	04

04	OR	Insert three GMs between 5 and 80.	04

	$x + 2y + 3z = 14$, $2x - y + z = 5$, $3x + y - 2z = 1$				
Q.6	In a geometric progression $a_3 = 27$ and $a_5 = 243$. Find the common ratio r, first term a_1, 6th term a_6 and sum up to 6th term S_6.	08	OR	In triangle ABC, the side lengths are $a = 13$, $b = 14$ and $c = 15$. Find values of circumradius R and escribed radii r_1, r_2 , r_3 of the triangle ABC.	08

First Annual 2026 | Section B Q2(iv) | 4 marks

a.	Find Arithmatic Mean (A), Geometric Mean (G) and Harmonic Mean (H) of -6 and -216.	04
b.	Verify that $A \times H = G^2$.	

First Annual 2026 | Section B Q2(v) | 4 marks

(v)	Find sum of the series upto "n" terms whose n^{th} term is $n^2(2n+3)$	04
(vi)	Find the values of n and r if $\overset{n}{P}_r = 840$, $\overset{n}{C}_r = 35$	

OR	If 3rd term of a geometric series is $\frac{1}{125}$ and its 4th term is $\frac{1}{625}$, then find the series and its sum upto infinity.

APOLLO

Mathematical Induction and Binomial Theorem

Domain A: Numbers and Algebra

FBISE model paper | Section A Q11 | 0.75 marks

11.	The third term in the expansion of $(x^2-2)^4$ is:	$24\,x^4$	$-24\,x^4$	$-32\,x^2$	$32\,x^2$

FBISE model paper | Section A Q12 | 0.75 marks

12.	Which term in the expansion of $\left(x^2-\frac{1}{x^2}\right)^6$ is independent of x?	T_3	T_4	T_5	T_6

FBISE model paper | Section A Q13 | 0.75 marks

13.	The simplified form of $(x+1)^3-(x-1)^3$ is:	$2x^3+6x$	$6x^2+2$	$6x^2+2x$	$2x^3+6x^2$

FBISE model paper | Section A Q14 | 0.75 marks

14.	When 3^{50} is divided by 8, the remainder is:	1	3	5	7

FBISE model paper | Section B Q4 | 4 marks

4.	In a class of 40 students, 25 passed Mathematics and 18 passed Science. A student claims: "At least 3 students passed both subjects." Using the principle of inclusion-exclusion, justify whether this claim is correct.	4

OR	Expand $(3+x)^5$ using the Binomial Theorem. Then evaluate the expansion at $x = 0.1$ to find the numerical value of $(3.1)^5$ without a calculator (show terms).	8

First Annual 2025 | Section B Q2(ii) OR | 4 marks

OR	Verify that: $\binom{n}{r}+\binom{n}{r-1}=\binom{n+1}{r}$	**04**

First Annual 2025 | Section B Q2(ix) | 4 marks

Use the principle of mathematical induction to prove that $1^3+2^3+3^3+\ldots+n^3=\left(\frac{n(n+1)}{2}\right)^2 \forall n \in N, n \geq 1$.	**04**	**OR**	Find rank of the matrix $\begin{bmatrix} 1 \\ 2 \\ 4 \end{bmatrix}$	

First Annual 2025 | Section B Q2(v) OR | 4 marks

Find the term containing x^3 in the expansion of $(x+2)^6$.	04

First Annual 2025 | Section B Q2(xii) OR | 4 marks

Use binomial theorem to approximate the value of $\sqrt{101}\times\sqrt{99}$ up to three places of decimal.	04

First Annual 2025 | Section B Q2(ix) | 4 marks

				relative to due north.
(ix)	Use principle of mathematical induction to prove that: $1^2+2^2+3^2+\cdots+n^2=\frac{n(n+1)(2n+1)}{6}$	**04**	**OR**	Find rank of the matrix: $\begin{bmatrix} 1 & 1 & 0 & -2 \\ 2 & 0 & 2 & 2 \end{bmatrix}$

First Annual 2025 | Section B Q2(xi) | 4 marks

(xi)	Find the term containing x^4 in the expansion of $(2x-3)^7$.

(b) Solve the equations to find values of p and q.

Use binomial theorem to approximate the value of $\frac{(1.03)^4}{(0.98)^3}$ upto three places of the decimal.

If x is very small such that its square and higher powers can be neglected, then show that $$\frac{(8+2x)^{\frac{2}{3}}}{(2+x)\left(\sqrt{4-2x}\right)} \approx 1-\frac{x}{12}$$	**08**

Second Annual 2025 | Section B Q2(ii) | 4 marks

Prove by using mathematical induction: $1 + 2 + 3 + \ldots + \quad n = \frac{n(n+1)}{2}$	04
Find the inverse of given matrix using row operations	

Second Annual 2025 | Section B Q2(vi) OR | 4 marks

Harmonic sequence whose 4^{th} term is $\frac{1}{3}$ and 9^{th} is $\frac{1}{\square}$.	04	OR	Expand $(1+x)^5$ using Binomial theorem and find the coefficient of x^2.	04

OR	Use Binomial Theorem to expand up to four terms and find an approximate value (correct up to 3 decimal places) of $(1.03)^3$.	**04**
	If $a = 5\hat{i} - 2\hat{j} + \hat{k}$ and $b = \hat{i} + 2\hat{j} + 2\hat{k}$ then find	

Use binomial theorem to expand $\sqrt{101}$ and $\sqrt{99}$ separately. Multiply the two expansions and approximate the final answer rounded to three decimal places.	**08**

			d. At most 1 Arts teacher	
$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$	08	OR	If x is very small such that its square and higher powers can be neglected, then show that: $\frac{(8+2x)^{\frac{2}{3}}}{(2+x)(\sqrt{4-2x})} \approx 1-\frac{x}{12}$	6+2

First Annual 2026 | Section B Q2(ii) | 4 marks

Find the last two digits of $(12)^{11}$.	04

First Annual 2026 | Section B Q2(iv) | 4 marks

Find the remainder when 9^{205} is divided by 31 using Binomial expansion.	04

First Annual 2026 | Section B Q2(v) OR | 4 marks

OR	Prove by mathematical induction that: $2^n \geq n+1$ for all $n \geq 1$	04

Q.5	Find the middle term(s) in the expansion of $\left(3x^2 - \frac{1}{2x}\right)^{10}$. Also find the 9^{th} term.	**08**

First Annual 2026 | Section B Q2(xi) | 4 marks

(xi)	Use Binomial Theorem to find the remainder when 8^{205} is divided by 48 .	04

First Annual 2026 | Section B Q2(xii) OR | 4 marks

Use mathematical induction to prove: $1+2+3+\ldots+n=\frac{n(n+1)}{2}$	04

First Annual 2026 | Section C Q4 | 8 marks

b. Verify your answer by long division. Find the term independent of x in the expansion of $\left(2x-\frac{1}{x}\right)^{12}$. Also find the 10th term.	4+4

FBISE model paper | Section A Q1(vii) | 1 mark

vii.	What is the 8th term of $(2x-\frac{1}{2x})^{12}$?	$198x^{-2}$	$198x^{2}$	$-198x^{-2}$	$-198x^{2}$

FBISE model paper | Section A Q1(viii) | 1 mark

viii.	If (n): $2^n < n!$ then what is the smallest possible integer for which $S(n)$ is true:	1	2	3	4