

Applied Mathematics

Original practice in 13 topic units, with explanations, worked examples and answer guidance. Use alongside the prescribed texts and syllabus.



13 practice units

78 tasks with answer guidance

Name / नाम: _____

Original selected-topic practice. Use alongside school lessons and the prescribed textbook. The contents define this book's scope.

CBSE course 241 · 2026–27 · Selected practice, not a complete syllabus or official examination paper.

UNIT 01 / 13 · LEARN & TRY

Quantification and matrix models

Name: _____ Date: _____

Goal: Use modular and mixture reasoning and solve a nonsingular matrix model.

Learn

Modulo arithmetic records a remainder relative to a positive modulus. If a and b differ by a multiple of m , they are congruent modulo m ; they need not be equal as ordinary integers. For mixtures, a weighted average uses the quantities of the two components, not merely the average of their unit prices. Alligation is a shortcut for this balance: the quantity ratio of cheaper to dearer components is $(\text{dearer price} - \text{mean price}) : (\text{mean price} - \text{cheaper price})$. Keep those differences in the correct order. Matrices organise several equations or quantities at once. A coefficient matrix must use the same variable order in every row. Its determinant indicates whether a square system has a unique inverse-based solution: a nonzero determinant allows that method. For a two-by-two matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, the inverse is $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix} / (ad - bc)$. Check the calculated solution in the original context and retain the units of the variables.

Worked example

Tea costing ₹200/kg and ₹300/kg is mixed to cost ₹240/kg before other charges. Let cheaper and dearer quantities be x, y . The balance is $200x + 300y = 240(x + y)$, so $60y = 40x$ and $x:y = 3:2$. Alligation gives $(300 - 240):(240 - 200) = 60:40 = 3:2$.

1. Find the least nonnegative residue of 47 modulo 6 and of $47 + 19$ modulo 6. [2 marks]

2. Rice priced ₹40/kg and ₹70/kg is mixed to have mean price ₹52/kg. Find the cheaper:dearer quantity ratio. [2 marks]

UNIT 01 · PRACTISE · 3–6

Quantification and matrix models

3. A boat moves at 12 km/h in still water and a stream at 3 km/h. Find time for 27 km downstream and 27 km upstream. [2 marks]

4. For $A = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$, find $\det A$ and A^{-1} . [3 marks]

5. Solve $2x + y = 11$ and $x + 3y = 18$ using that inverse. [3 marks]

6. For $M = \begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}$, can an inverse matrix solve every right-hand-side system? Explain. [2 marks]

Explain one answer. Choose a question to revisit after a few days.

UNIT 01 · ANSWER GUIDANCE

Quantification and matrix models

1. $47 = 6 \times 7 + 5$ gives residue 5. Sum 66 is divisible by 6, giving residue 0.
2. Alligation ratio = $(70 - 52):(52 - 40) = 18:12 = 3:2$.
3. Downstream speed 15: time $27/15 = 1.8$ h. Upstream speed 9: time $27/9 = 3$ h.
4. $\det A = 6 - 1 = 5$. $A^{-1} = (1/5)[[3, -1], [-1, 2]]$.
5. $[[x], [y]] = (1/5)[[3, -1], [-1, 2]][[11], [18]] = (1/5)[[15], [25]]$. Thus $x = 3$ and $y = 5$.
6. $\det M = 4 - 4 = 0$, so M has no inverse. Depending on the right-hand side, a system may have no solution or infinitely many; it does not have a unique inverse-based solution.

Teaching note

Keep variable order fixed when creating a coefficient matrix.

Curriculum reference: https://cbseacademic.nic.in/web_material/CurriculumMain27/SecPart2/

Applied_Mathematics_SecP2_2026-27.pdf

Selected practice; outcomes are publisher-defined. School practicals, projects and prescribed readings require separate preparation.