

Mathematics

Original practice in 12 topic units, with explanations, worked examples and answer guidance. Use alongside the prescribed texts and syllabus.



12 practice units

72 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 041 · 2026–27 · Selected practice, not a complete syllabus or official examination paper.

UNIT 01 / 12 · LEARN & TRY

Functions, inverse values and matrix structure

Name: _____ Date: _____

Goal: Justify function/relation properties and use a verified matrix inverse.

Learn

A function is one-to-one when different inputs have different outputs, and onto when every specified codomain element is reached. These properties depend on the stated domain and codomain, not only on the formula. An equivalence relation is reflexive, symmetric and transitive; check each condition rather than relying on examples alone. Inverse trigonometric functions use restricted principal-value ranges, so $\sin^{-1}(\sin \theta)$ need not equal θ outside that range. A matrix is a rectangular array whose order is rows by columns. Addition requires matching orders; multiplication requires the first matrix's column count to equal the second's row count. Multiplication is generally not commutative. For $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, $\det A = ad - bc$. It has an inverse exactly when this determinant is nonzero, and $A^{-1} = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} / (ad - bc)$. Check an inverse by multiplying to obtain the identity matrix.

Worked example

For $A = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$, $\det A = 2 \times 1 - 1 \times 1 = 1$. Therefore $A^{-1} = \begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$. Multiplication gives $AA^{-1} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, so the inverse is verified.

1. For $f: \mathbb{R} \rightarrow \mathbb{R}$ with $f(x) = 3x - 2$, prove it is one-to-one and onto. [3 marks]

2. On the integers, define aRb when $a - b$ is divisible by 3. Show R is an equivalence relation. [3 marks]

UNIT 01 · PRACTISE · 3–6

Functions, inverse values and matrix structure

3. Find the principal values $\sin^{-1}(\sin(5\pi/6))$ and $\tan^{-1}(1)$. [2 marks]

4. For $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$, calculate AB and BA . [3 marks]

5. Find the inverse of $A = \begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix}$. [2 marks]

6. Solve $3x + y = 7$ and $2x + y = 5$ using the inverse matrix from the preceding question.

[3 marks]

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

UNIT 01 · ANSWER GUIDANCE

Functions, inverse values and matrix structure

1. If $3a - 2 = 3b - 2$, then $a = b$, so one-to-one. For any real y , choose $x = (y + 2)/3$; $f(x) = y$, so onto.
2. Reflexive: $a - a = 0$ is divisible by 3. Symmetric: if $a - b$ is divisible by 3, so is its negative $b - a$. Transitive: add $a - b$ and $b - c$ to get $a - c$. All three hold.
3. $\sin(5\pi/6) = 1/2$, so $\sin^{-1}(1/2) = \pi/6$. $\tan^{-1}(1) = \pi/4$.
4. $AB = \begin{bmatrix} 7 & 2 \\ 3 & 1 \end{bmatrix}$. $BA = \begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$. They differ, illustrating noncommutativity.
5. $\det A = 3 - 2 = 1$. $A^{-1} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix}$.
6. $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -2 & 3 \end{bmatrix} \begin{bmatrix} 7 \\ 5 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$. Thus $x = 2$, $y = 1$; substitution checks both equations.

Teaching note

Give the codomain when claiming onto; matrix multiplication must respect dimensions.

Curriculum reference: https://cbseacademic.nic.in/web_material/CurriculumMain27/SecPart2/Maths_SecP2_2026-27.pdf

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