

SIMPLIFIED EDUCATION

The 70-Day CBSE Mathematics Revision Course

Class XII • 2027 Board Examinations

by Sunil Yadav

SAMPLE

Days 1, 2, 3 & 51 of 70 – full
book available on request

About This Sample

This is a short excerpt from *The 70-Day CBSE Mathematics Revision Course* – four worksheets, unedited, exactly as they appear in the complete 142-page course: **Days 1–3** (the chapterwise practice that makes up Days 1–50), and **Day 51** (a Mixed Practice paper, the format used for Days 51–70). It's here so you can see both formats, the question quality, and the answer-key style before buying the full book.

What the full book gives you:

- One worksheet a day, every day, for 70 days – 12 questions each, covering the entire CBSE Class XII Mathematics syllabus.
- **Days 1–50:** chapter-by-chapter practice, cycling back through every chapter multiple times at increasing difficulty.
- **Days 51–70:** mixed full-syllabus papers that mirror actual board-exam pacing.
- A compact answer key after every worksheet, a 70-day progress tracker, and a chapter finder so you can jump straight to any topic.

How to use this book: Do one day's worksheet per day, in order – don't skip ahead. Attempt every question before checking the answer key. Keep a separate notebook for rough work and for re-attempting anything you got wrong.

Boards revision does not have to feel like drowning in an endless pile of question papers. This book gives you one clear task every day: open today's worksheet, attempt all twelve questions, then check your answers. Trust the process, and let the 70 days do their work. — Sunil Yadav

Day 1 | Relations and Functions

1. Check whether the relation $R = \{(a, b) : a \leq b^3\}$ defined on the set of real numbers is reflexive, symmetric, or transitive.
2. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x + 5$ is both one-one and onto. Hence find f^{-1} .
3. Let R be the relation on $\mathbb{Z}$ defined by $aRb \iff (a - b)$ is divisible by 5. Show that R is an equivalence relation.
4. Let $A = \{1, 2, 3\}$. Find the number of relations on A that are both reflexive and symmetric.
5. If $f(x) = \frac{2x - 1}{3}$, find $f \circ f(x)$ and verify whether f is invertible.
6. Give an example of a relation which is symmetric and transitive but not reflexive. Justify with a full check of all three properties.
7. Show that the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2$ is neither one-one nor onto. Suggest a change of codomain that makes it onto.
8. Let $f : \mathbb{N} \rightarrow \mathbb{N}$ be defined by $f(x) = x^2$. Show that f is one-one but not onto.
9. Let R be the relation on the set of all triangles in a plane defined by $R = \{(T_1, T_2) : T_1 \text{ is similar to } T_2\}$. Show that R is an equivalence relation.
10. If $f, g : \mathbb{R} \rightarrow \mathbb{R}$ are given by $f(x) = \cos x$ and $g(x) = 3x^2$, find $f \circ g$ and $g \circ f$, and show that $f \circ g \neq g \circ f$.
11. Consider $f : \mathbb{R}^+ \rightarrow [4, \infty)$ given by $f(x) = x^2 + 4$. Show that f is invertible and find f^{-1} .
12. Let $A = \{1, 2, 3, \dots, 9\}$ and let R be the relation on $A \times A$ defined by $(a, b) R (c, d) \iff a + d = b + c$. Show that R is an equivalence relation.

Answer Key

1. Reflexive: No ($0.5 \not\leq 0.5^3$); Symmetric: No; Transitive: No (e.g. $8 R 2$ and $2 R 1.3$ hold, but $8 R 1.3$ fails). 2. $f^{-1}(x) = \frac{x - 5}{3}$. 3. Equivalence relation verified (reflexive, symmetric, transitive). 4. 8. 5. $f \circ f(x) = \frac{4x - 5}{9}$; f is invertible. 6. Example: $R = \{(1, 1), (1, 2), (2, 1)\}$ on $\{1, 2\}$ is not reflexive (missing $(2, 2)$) but symmetric and transitive. 7. Not one-one since $f(1) = f(-1)$; not onto since negative values are never attained; redefining the codomain as $[0, \infty)$ makes it onto. 8. One-one: $x_1^2 = x_2^2 \Rightarrow x_1 = x_2$ on $\mathbb{N}$; not onto, e.g. 2 has no preimage. 9. Standard equivalence-relation proof (similarity is reflexive, symmetric, transitive). 10. $f \circ g(x) = \cos(3x^2)$, $g \circ f(x) = 3\cos^2 x$; unequal, e.g. at $x = 0$: 1 vs 3. 11. $f^{-1}(y) = \sqrt{y - 4}$. 12. Standard equivalence-relation proof.

Day 2 | Inverse Trigonometric Functions

1. Find the principal value of $\sin^{-1}\left(-\frac{1}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right)$.
2. Prove that $\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) = \frac{\pi}{4}$.
3. Simplify $\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ for $-\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$, expressing the answer in terms of $\sin^{-1} x$.
4. Solve for x : $\tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}$.
5. Write $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$, $|x| > 1$, in the simplest form in terms of $\sec^{-1} x$.
6. Show that $2 \tan^{-1}\left(\frac{1}{3}\right) = \tan^{-1}\left(\frac{3}{4}\right)$.
7. Find the value of $\tan^{-1} \sqrt{3} - \sec^{-1}(-2)$.
8. Prove that $\cos^{-1}\left(\frac{4}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right) = \cos^{-1}\left(\frac{33}{65}\right)$.
9. Solve for x : $\sin^{-1}(1-x) - 2 \sin^{-1} x = \frac{\pi}{2}$.
10. Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$ in the simplest form, for $-\frac{\pi}{2} < x < \frac{\pi}{2}$.
11. If $\tan^{-1}\left(\frac{x-1}{x-2}\right) + \tan^{-1}\left(\frac{x+1}{x+2}\right) = \frac{\pi}{4}$, find the value of x .
12. Prove that $\tan^{-1}(1) + \tan^{-1}(2) + \tan^{-1}(3) = \pi$.

Answer Key

1. $-\frac{\pi}{6} + \frac{2\pi}{3} = \frac{\pi}{2}$. 2. Standard proof using the $\tan^{-1} a + \tan^{-1} b$ formula. 3. $2 \sin^{-1} x$. 4. $x = \frac{1}{6}$. 5. $\sec^{-1} x$. 6. Standard proof using the double-angle tangent formula. 7. $\frac{\pi}{3} - \frac{2\pi}{3} = -\frac{\pi}{3}$. 8. Standard proof using the $\cos^{-1} a + \cos^{-1} b$ formula. 9. $x = 0$. 10. $\frac{\pi}{4} + \frac{x}{2}$. 11. $x = \pm \frac{1}{\sqrt{2}}$. 12. Standard proof: $\tan^{-1} 2 + \tan^{-1} 3 = \pi - \tan^{-1} 1$, so the sum is π .

Day 3 | Matrices

1. If $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$, find $A^2 - 4A + I$.
2. Express the matrix $\begin{pmatrix} 3 & 5 \\ 1 & -1 \end{pmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.
3. If A is a square matrix such that $A^2 = A$, show that $(I + A)^3 = 7A + I$.
4. Find x and y if $\begin{pmatrix} x+y & 2 \\ 5 & xy \end{pmatrix} = \begin{pmatrix} 6 & 2 \\ 5 & 8 \end{pmatrix}$.
5. Using elementary row operations, find the inverse of $\begin{pmatrix} 2 & 1 \\ 7 & 4 \end{pmatrix}$.
6. If A and B are symmetric matrices of the same order, show that AB is symmetric if and only if $AB = BA$.
7. If $A = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$, show that $A^n = \begin{pmatrix} \cos n\alpha & -\sin n\alpha \\ \sin n\alpha & \cos n\alpha \end{pmatrix}$ for every positive integer n .
8. Construct a 3×3 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{1}{2}|-3i + j|$.
9. If A is a square matrix such that $A^2 = I$, find the value of $(A - I)^3 + (A + I)^3 - 7A$.
10. Using the matrix inverse method, solve the system: $2x + y = 5$, $3x + 2y = 8$.
11. If A is a 3×3 matrix and $|A| = 4$, find $|2A|$ and $|A^{-1}|$.
12. Show that the matrix $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ satisfies $A^2 - 5A + 7I = O$, and hence find A^{-1} using this result.

Answer Key

1. $\begin{pmatrix} 0 & 3 \\ 1 & 0 \end{pmatrix}$. 2. $\begin{pmatrix} 3 & 3 \\ 3 & -1 \end{pmatrix} + \begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix}$. 3. Standard proof using $A^2 = A$. 4. $x = 2$, $y = 4$.
5. $\begin{pmatrix} 4 & -1 \\ -7 & 2 \end{pmatrix}$. 6. Standard proof, both directions. 7. Standard proof by induction. 8.
 $\begin{pmatrix} 1 & 0.5 & 0 \\ 2.5 & 2 & 1.5 \\ 4 & 3.5 & 3 \end{pmatrix}$. 9. A . 10. $x = 2$, $y = 1$. 11. $|2A| = 32$; $|A^{-1}| = \frac{1}{4}$. 12. $A^{-1} = \frac{1}{7} \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$.

Day 51 | Mixed Practice

- Matrices and determinants.** (a) If $A = \begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$, find $A^2 - 4A$. (b) Solve for x : $\begin{vmatrix} x & 3 \\ 2 & x \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 2 & 1 \end{vmatrix}$.
- Continuity and differentiability.** (a) Find k so that $f(x) = \frac{x^2 - 9}{x - 3}$ for $x \neq 3$ and $f(3) = k$ is continuous at $x = 3$. (b) If $y = \log(\sin x)$, find $\frac{dy}{dx}$.
- Applications of derivatives.** (a) Find the intervals in which $f(x) = x^3 - 6x^2 + 9x + 15$ is increasing and decreasing. (b) Find the absolute maximum and minimum values of $f(x) = 2x^3 - 24x + 107$ on $[1, 3]$.
- Integrals.** (a) $\int x e^{2x} dx$ (b) $\int_0^{\pi/2} \frac{dx}{1 + \tan x}$.
- Area and differential equations.** (a) Using integration, find the area of the region bounded by the curves $y = x^2$ and $y = x$. (b) Solve the differential equation $\frac{dy}{dx} + y \tan x = \sec x$.
- Vectors and three dimensional geometry.** (a) If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $\vec{a} \cdot \vec{b} = 6$, find the angle between $\vec{a}$ and $\vec{b}$. (b) Find the angle between the lines whose direction ratios are $\langle 1, 2, 2 \rangle$ and $\langle 3, -2, 6 \rangle$.

Answer Key

1. (a) $-I = \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$ (b) $x = \pm 2\sqrt{3}$. 2. (a) $k = 6$ (b) $\cot x$. 3. (a) Increasing on $(-\infty, 1) \cup (3, \infty)$; decreasing on $(1, 3)$ (b) Absolute max = 89 at $x = 3$; absolute min = 75 at $x = 2$. 4. (a) $\frac{e^{2x}}{4}(2x - 1) + c$ (b) $\frac{\pi}{4}$. 5. (a) $\frac{1}{6}$ sq. unit (b) $y = \sin x + C \cos x$. 6. (a) 60° (b) $\cos^{-1}\left(\frac{11}{21}\right)$.

Like what you see?

This is 4 of 70 days – three chapterwise (Days 1–3) and one mixed (Day 51).

The full course covers the complete syllabus, worksheet after worksheet, all the way to exam day.

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