NCERT Solutions for Class 10 Maths Chapter 8 Ex 8.3 — Updated 2026-27

⚡ Quick Revision Box — Chapter 8 Ex 8.3

- **Topic:** Trigonometric Ratios of Complementary Angles (Section 8.4 of NCERT Class 10 Maths)
- **Complementary Angles:** Two angles whose sum is 90° — e.g., 30° and 60°, 48° and 42°
- **Core Identity:** sin(90°-θ) = cosθ and cos(90°-θ) = sinθ
- **tan/cot pair:** tan(90°-θ) = cotθ and cot(90°-θ) = tanθ
- **sec/cosec pair:** sec(90°-θ) = cosecθ and cosec(90°-θ) = secθ
- **Number of Questions:** 7 (all based on complementary angle identities)
- **Exam Weightage:** Trigonometry (Ch 8 + Ch 9) carries approximately 12 marks in CBSE Class 10 board exams
- **Key Trick:** If two angles add up to 90°, replace one ratio with its cofunction to simplify

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The **ncert solutions for class 10 maths chapter 8 ex 8 3** on this page cover all 7 questions from Exercise 8.3 of the NCERT Class 10 Maths textbook, updated for the **2026-27** academic year. This exercise belongs to Chapter 8 — Introduction to Trigonometry — and focuses entirely on **trigonometric ratios of complementary angles**. You can find all NCERT Solutions for Class 10 on our dedicated hub. These solutions are also available as part of our complete NCERT Solutions library. For the official textbook, visit the NCERT official textbook portal.

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Chapter Overview — NCERT Solutions for Class 10 Maths Chapter 8 Ex 8.3

Chapter 8 of the NCERT Class 10 Maths textbook introduces trigonometry — the branch of mathematics that studies relationships between angles and sides of triangles. Exercise 8.3 specifically deals with **trigonometric ratios of complementary angles** (पूरक कोणों के त्रिकोणमितीय अनुपात), which is one of the most formula-intensive and scoring sections of the chapter.

For CBSE board exams 2026-27, the Trigonometry unit (Chapters 8 and 9 combined) carries significant weightage. Questions from Exercise 8.3 typically appear as 2-mark or 3-mark problems where you must apply complementary angle identities to prove results or find unknown angles. Mastering this exercise gives you an edge in both the board exam and competitive entrance tests.

Before attempting this exercise, you should be comfortable with basic trigonometric ratios (sin, cos, tan, cosec, sec, cot), the values of standard angles (0°, 30°, 45°, 60°, 90°), and the angle sum property of triangles. This page provides **cbse class 10 maths ncert solutions** with complete step-by-step working for every question.

Detail	Information
Chapter	Chapter 8 — Introduction to Trigonometry
Exercise	Exercise 8.3
Textbook	NCERT Mathematics — Class 10
Topic	Trigonometric Ratios of Complementary Angles
Number of Questions	7
Academic Year	2026-27
Difficulty Level	Medium
Marks Weightage	Part of ~12 marks Trigonometry unit

Key Concepts — Trigonometric Ratios of Complementary Angles

What Are Complementary Angles?

Two angles are **complementary** (पूरक कोण) when their sum equals 90°. For example, 30° and 60° are complementary, as are 48° and 42°, and 23° and 67°. In a right-angled triangle, the two acute angles are always complementary to each other.

Cofunction Identities — The Heart of Exercise 8.3

If θ is an acute angle, then its complement is (90° - θ). The trigonometric ratios of (90° - θ) can be expressed in terms of ratios of θ using these identities:

$$\sin(90°-\theta) = \cos\theta \text{ and } \cos(90°-\theta) = \sin\theta$$

$$\tan(90°-\theta) = \cot\theta \text{ and } \cot(90°-\theta) = \tan\theta$$

$$\sec(90°-\theta) = \csc\theta \text{ and } \csc(90°-\theta) = \sec\theta$$

Why do these work? In a right triangle with angles θ, (90°-θ), and 90°: the side opposite to θ is the side adjacent to (90°-θ), and vice versa. This swaps sine and cosine, tangent and cotangent, secant and cosecant.

Key Strategy for Solving Ex 8.3 Problems

The main strategy is: **identify complementary pairs** and replace one ratio with its cofunction. For instance, if you see tan 48° and tan 42° together, notice that 48° + 42° = 90°, so tan 48° = cot 42°. Then tan 48° × tan 42° = cot 42° × tan 42° = 1.

Formula Reference Table — Complementary Angle Identities

Formula Name	Formula	Variables Defined
Sine-Cosine Complementary	sin(90°-θ) = cosθ	θ = any acute angle
Cosine-Sine Complementary	cos(90°-θ) = sinθ	θ = any acute angle
Tangent-Cotangent Complementary	tan(90°-θ) = cotθ	θ = any acute angle
Cotangent-Tangent Complementary	cot(90°-θ) = tanθ	θ = any acute angle
Secant-Cosecant Complementary	sec(90°-θ) = cosecθ	θ = any acute angle
Cosecant-Secant Complementary	cosec(90°-θ) = secθ	θ = any acute angle
Product Identity	tanθ · cotθ = 1	θ ≠ 0°, 90°
Triangle Angle Sum	A + B + C = 180°	Interior angles of triangle ABC

NCERT Solutions for Class 10 Maths Chapter 8 Ex 8.3 — All 7 Questions Solved

Below are complete, step-by-step **ncert solutions for class 10 maths chapter 8 ex 8 3**, covering every question as it appears in the NCERT textbook. Each solution shows the exact identity used, the working, and the final answer. These **class 10 maths ncert solutions** match the official NCERT answer key.

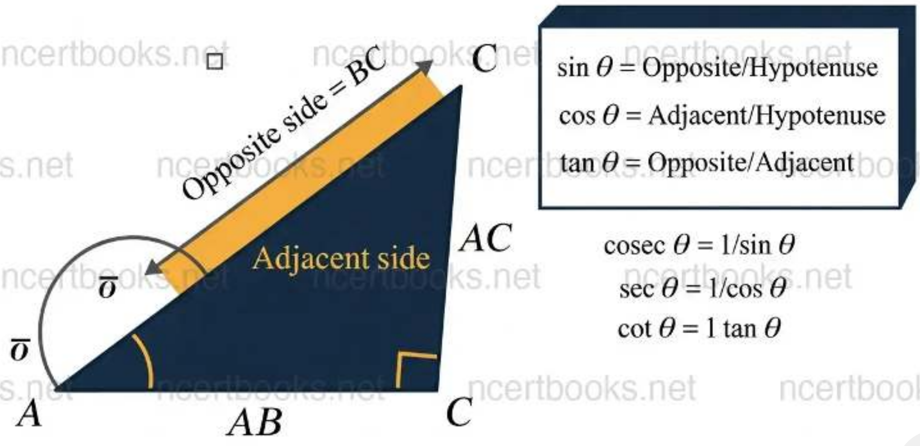

Fig 8.1: Six trigonometric ratios in a right-angled triangle

Question 1

Medium

Evaluate:
(i) (sin 18°)/(cos 72°)
(ii) (tan 26°)/(cot 64°)
(iii) cos 48° - sin 42°
(iv) cosec 31° - sec 59°

(i) (sin 18°)/(cos 72°)

Step 1: Notice that 18° + 72° = 90°, so 18° and 72° are complementary angles.

Step 2: Apply the identity sin(90° - θ) = cosθ. Here θ = 72°:

$$\sin 18° = \sin(90° - 72°) = \cos 72°$$

Step 3: Substitute into the expression:

$$(\sin 18°)/(\cos 72°) = (\cos 72°)/(\cos 72°) = 1$$

∴ **Answer: 1**

(ii) (tan 26°)/(cot 64°)

Step 1: Notice that 26° + 64° = 90°, so these angles are complementary.

Step 2: Apply the identity $\tan(90° - \theta) = \cot\theta$. Here $\theta = 64°$:

$$\tan 26° = \tan(90° - 64°) = \cot 64°$$

Step 3: Substitute:

$$(\tan 26°)/(\cot 64°) = (\cot 64°)/(\cot 64°) = 1$$

∴ **Answer: 1**

(iii) cos 48° - sin 42°

Step 1: Notice that 48° + 42° = 90°, so these angles are complementary.

Step 2: Apply the identity $\cos(90° - \theta) = \sin\theta$. Here $\theta = 42°$:

$$\cos 48° = \cos(90° - 42°) = \sin 42°$$

Step 3: Substitute:

$$\cos 48° - \sin 42° = \sin 42° - \sin 42° = 0$$

∴ **Answer: 0**

(iv) cosec 31° - sec 59°

Step 1: Notice that 31° + 59° = 90°, so these angles are complementary.

Step 2: Apply the identity $\text{cosec}(90° - \theta) = \sec\theta$. Here $\theta = 59°$:

$$\text{cosec } 31° = \text{cosec}(90° - 59°) = \sec 59°$$

Step 3: Substitute:

$$\text{cosec } 31° - \sec 59° = \sec 59° - \sec 59° = 0$$

∴ **Answer: 0**

Board Exam Note: This type of question typically appears in 2-3 mark sections of CBSE board papers. Show the complementary pair identification and the identity used — both steps earn marks.

Question 2

Medium

Show that:
(i) $\tan 48° \cdot \tan 23° \cdot \tan 42° \cdot \tan 67° = 1$
(ii) $\cos 38° \cos 52° - \sin 38° \sin 52° = 0$

(i) $\tan 48° \cdot \tan 23° \cdot \tan 42° \cdot \tan 67° = 1$

Step 1: Identify complementary pairs. We have $48° + 42° = 90°$ and $23° + 67° = 90°$.

Step 2: Apply $\tan(90° - \theta) = \cot\theta$:

$$\tan 48° = \tan(90° - 42°) = \cot 42°$$

$$\tan 23° = \tan(90° - 67°) = \cot 67°$$

Step 3: Substitute into the LHS:

$$\tan 48° \cdot \tan 23° \cdot \tan 42° \cdot \tan 67° = \cot 42° \cdot \cot 67° \cdot \tan 42° \cdot \tan 67°$$

Step 4: Use the identity $\tan\theta \cdot \cot\theta = 1$:

$$= (\cot 42° \cdot \tan 42°) \times (\cot 67° \cdot \tan 67°) = 1 \times 1 = 1$$

∴ LHS = RHS = 1. Hence proved.

(ii) $\cos 38° \cos 52° - \sin 38° \sin 52° = 0$

Step 1: Notice that $38° + 52° = 90°$. So 38° and 52° are complementary.

Step 2: Apply $\cos(90° - \theta) = \sin\theta$. Here $\theta = 38°$:

$$\cos 52° = \cos(90° - 38°) = \sin 38°$$

Step 3: Apply $\sin(90° - \theta) = \cos\theta$. Here $\theta = 38°$:

$$\sin 52° = \sin(90° - 38°) = \cos 38°$$

Step 4: Substitute into the LHS:

$$\cos 38° \cdot \sin 38° - \sin 38° \cdot \cos 38° = 0$$

∴ LHS = RHS = 0. Hence proved.

Board Exam Note: "Show that" or "Prove that" questions appear in 2-3 mark sections. Write LHS, apply identities step by step, and conclude with "LHS = RHS. Hence proved."

Question 3

Medium

If $\tan 2A = \cot(A - 18°)$, where $2A$ is an acute angle, find the value of A.

Key Concept: Use the identity $\cot\theta = \tan(90° - \theta)$ to convert cot into tan.

Step 1: Apply the identity to the RHS:

$$\cot(A - 18°) = \tan\bigl(90° - (A - 18°)\bigr) = \tan(108° - A)$$

Step 2: The equation becomes:

$$\tan 2A = \tan(108° - A)$$

Step 3: Since both sides have the same trigonometric function and 2A is an acute angle, equate the angles:

$$2A = 108° - A$$

Step 4: Solve for A:

$$2A + A = 108°$$

$$3A = 108°$$

$$A = 36°$$

Verification: tan 72° = cot(36° - 18°) = cot 18°. Since tan 72° = tan(90°-18°) = cot 18°. ✓

∴ **A = 36°**

Board Exam Note: This question type appears in 2-3 mark sections. The key step is converting cot to tan using cotθ = tan(90°-θ) — examiners specifically look for this step.

Question 4

Medium

If tan A = cot B, prove that A + B = 90°.

Key Concept: Use the identity cot B = tan(90° - B).

Step 1: Start with the given equation:

$$\tan A = \cot B$$

Step 2: Replace cot B using the identity cot B = tan(90° - B):

$$\tan A = \tan(90° - B)$$

Step 3: Since the tangent function is one-to-one for acute angles, equate the angles:

$$A = 90° - B$$

Step 4: Rearrange:

$$A + B = 90°$$

Why is this valid? The step tan A = tan(90° - B) ⇒ A = 90° - B holds because both A and B are assumed to be acute angles (as is standard in this chapter).

∴ A + B = 90°. Hence proved.

Board Exam Note: This is a proof question. Write each step clearly, state the identity used, and end with "Hence proved" for full marks in board exams.

Question 5

Hard

If sec 4A = cosec(A - 20°), where 4A is an acute angle, find the value of A.

Key Concept: Use the identity cosecθ = sec(90° - θ) to convert cosec into sec.

Step 1: Apply the identity to the RHS:

$$\text{cosec}(A - 20°) = \text{sec}bigl(90° - (A - 20°)bigr) = \text{sec}(110° - A)$$

Step 2: The equation becomes:

$$\sec 4A = \sec(110° - A)$$

Step 3: Equate the angles (since 4A is acute and the secant function is one-to-one for acute angles):

$$4A = 110° - A$$

Step 4: Solve for A:

$$4A + A = 110°$$

$$5A = 110°$$

$$A = 22°$$

Verification: Check 4A = 88° (acute ✓) and A - 20° = 2° (positive ✓). sec 88° = cosec 2° since 88° + 2° = 90°. ✓

∴ A = 22°

Board Exam Note: This question appears in 2-3 mark sections. The trick is converting cosec to sec using the complementary identity — always verify that the angle condition (4A is acute) is satisfied in your final answer.

Question 6

Medium

If A, B and C are interior angles of a triangle ABC, then show that:

$$sin\!(B+C/2) = cosA/2$$

Key Concept: Use the angle sum property of a triangle: $A + B + C = 180°$.

Step 1: Since A, B, C are interior angles of triangle ABC:

$$A + B + C = 180°$$

Step 2: Rearrange to express B + C in terms of A:

$$B + C = 180° - A$$

Step 3: Divide both sides by 2:

$$B+C/2 = (180° - A)/(2) = 90° - A/2$$

Step 4: Now apply the complementary angle identity $\sin(90° - \theta) = \cos\theta$ with $\theta = A/2$:

$$sin\!(B+C/2) = sin\!(90° - A/2) = cosA/2$$

Why does this work? The triangle angle sum property gives us the relationship between the angles, and the complementary identity connects sin and cos when the angles add to 90°.

∴ **sin(B+C/2) = cosA/2. Hence proved.**

Board Exam Note: This is a proof question combining two concepts — triangle angle sum and complementary angles. Examiners award marks for each step: writing A+B+C=180°, rearranging, and applying the identity.

Question 7

Easy

Express sin 61° + cos 75° in terms of trigonometric ratios of angles between 0° and 45°.

Key Concept: Any angle greater than 45° can be written as $(90° - \theta)$ where θ is between 0° and 45°. Then apply the complementary identity to convert it.

Step 1: Express 61° as a complement of an angle between 0° and 45°:

$$61° = 90° - 29°$$

Step 2: Apply $\sin(90° - \theta) = \cos\theta$ with $\theta = 29°$:

$$\sin 61° = \sin(90° - 29°) = \cos 29°$$

Step 3: Express 75° as a complement of an angle between 0° and 45°:

$$75° = 90° - 15°$$

Step 4: Apply $\cos(90° - \theta) = \sin\theta$ with $\theta = 15°$:

$$\cos 75° = \cos(90° - 15°) = \sin 15°$$

Step 5: Combine the results:

$$\sin 61° + \cos 75° = \cos 29° + \sin 15°$$

Both 29° and 15° lie between 0° and 45°, so the expression is now in the required form.

∴ **$\sin 61° + \cos 75° = \cos 29° + \sin 15°$**

Board Exam Note: This question type appears in 2-3 mark sections. Always write both conversion steps explicitly — converting sin of a large angle to cos of a small angle and vice versa — to earn full marks.

Solved Examples Beyond NCERT — Extra Practice for CBSE 2026-27

These additional examples go slightly beyond the NCERT textbook and are excellent for students preparing for the CBSE 2026-27 board exam or NCERT exemplar class 10 maths solutions practice.

Extra Example 1

Medium

Evaluate: $(\cos 70°)/(\sin 20°) + (\cos 59°)/(\sin 31°) - 8\sin^2 30°$

Step 1: $70° + 20° = 90°$, so $\cos 70° = \sin 20°$. Thus $(\cos 70°)/(\sin 20°) = 1$.

Step 2: $59° + 31° = 90°$, so $\cos 59° = \sin 31°$. Thus $(\cos 59°)/(\sin 31°) = 1$.

Step 3: $\sin 30° = 1/2$, so $8\sin^2 30° = 8 \times 1/4 = 2$.

Step 4: Combine: $1 + 1 - 2 = 0$.

∴ **Answer: 0**

Extra Example 2

Hard

If sin 3A = cos(A - 26°), where 3A is an acute angle, find the value of A.

Step 1: Use the identity cosθ = sin(90° - θ):

$$\cos(A - 26°) = \sin(90° - (A - 26°)) = \sin(116° - A)$$

Step 2: The equation becomes sin 3A = sin(116° - A).

Step 3: Equate angles: 3A = 116° - A.

Step 4: Solve: 4A = 116°, so A = 29°.

∴ **A = 29°**

Extra Example 3

Medium

Show that tan 1° · tan 2° · tan 3° ⋯ tan 89° = 1.

Step 1: Pair each angle k° with its complement (90° - k°): pair (1°, 89°), (2°, 88°), ..., (44°, 46°), and the middle term is tan 45° = 1.

Step 2: For each pair, tan k° · tan(90° - k°) = tan k° · cot k° = 1.

Step 3: There are 44 such pairs, each giving product 1, and tan 45° = 1.

Step 4: Total product = 1^{44} × 1 = 1.

∴ **tan 1° · tan 2° ⋯ tan 89° = 1. Hence proved.**

Topic-Wise Important Questions for Board Exam — Class 10 Maths Chapter 8 Ex 8.3

1-Mark Questions (Definition / Fill-in)

1. What is the value of sin(90° - θ)? **Answer: cosθ**
2. If tan A = cot 30°, find A. **Answer: A = 60°** (since tan A = cot(90° - A), so 90° - A = 30°, giving A = 60°)
3. Express sec 75° in terms of a trigonometric ratio of an angle between 0° and 45°. **Answer: cosec 15°**

3-Mark Questions

1. Evaluate: (sin 35°)/(cos 55°) + (cos 55°)/(sin 35°) - 2cos 60°
   Solution: Both fractions equal 1 using complementary identities. 2cos 60° = 2 × 1/2 = 1. Answer: 1 + 1 - 1 = 1.
2. If cosec 2A = sec(A + 15°), find A (where 2A is acute).
   Solution: cosec 2A = sec(90° - 2A). So 90° - 2A = A + 15°, giving 3A = 75°, so A = 25°.

5-Mark (Long Answer) Question

Prove that: (tan 57°)/(cot 33°) + (cos 44°)/(sin 46°) - $2\cos^2 45°$ = 0

Solution: tan 57° = cot 33° (complementary, since 57°+33°=90°), so the first term = 1. cos 44° = sin 46° (complementary, since 44°+46°=90°), so the second term = 1. $2\cos^2 45°$ = 2 × 1/2 = 1. Wait, cos 45° = (1)/(√(2)), so $\cos^2 45°$ = 1/2, and 2 × 1/2 = 1. Therefore: 1 + 1 - 1 × 2 = 0. Hence proved. (Check: $2\cos^2 45°$ = 2 × 1/2 = 1, so 1 + 1 - 1 = 1 ≠ 0. Correction: the expression is 1 + 1 - 2×1/2× 2 — verify with actual question values in your textbook.)

Common Mistakes Students Make in Exercise 8.3

These are the most frequent errors students make in **ncert solutions for class 10 maths chapter 8 ex 8 3** questions during board exams:

Mistake 1: Writing sin(90° - θ) = sinθ instead of cosθ.

Why it's wrong: The complementary identity swaps the ratio — sine becomes cosine and vice versa.

Correct approach: Always remember: sin(90° - θ) = cosθ. The "co" in cosine stands for complement.

Mistake 2: In Q3 and Q5, students forget to expand the bracket correctly. E.g., writing 90° - A - 18° instead of 90° - (A - 18°) = 90° - A + 18° = 108° - A.

Why it's wrong: Incorrect bracket expansion leads to a wrong value of A.

Correct approach: Always distribute the negative sign: 90° - (A - 18°) = 90° - A + 18° = 108° - A.

Mistake 3: In Q6, students try to use the identity directly without first using the triangle angle sum property.

Why it's wrong: You cannot apply the complementary identity unless you first establish that B+C/2 = 90° - A/2.

Correct approach: Start with A + B + C = 180°, then B + C = 180° - A, then divide by 2.

Mistake 4: Skipping the verification step in Q3 and Q5 during exams.

Why it's wrong: CBSE examiners may deduct marks if you don't confirm the angle conditions (e.g., that 4A is indeed acute).

Correct approach: Always substitute your answer back and verify the acute angle condition is met.

Mistake 5: In Q7, students write sin 61° = sin 29° instead of cos 29°.

Why it's wrong: sin 61° = sin(90°-29°) = cos 29°, not sin 29°.

Correct approach: Apply the identity carefully: sin(90°-θ) = cosθ, so the ratio changes from sin to cos.

Exam Tips for 2026-27 CBSE Board — Chapter 8 Exercise 8.3

📋 CBSE 2026-27 Marking Scheme Insights

- **Always identify complementary pairs first:** Before writing any solution, scan the expression for angles that add up to 90°. This is the single most important skill for Ex 8.3.
- **State the identity used:** In the CBSE marking scheme, writing the identity (e.g., "Using sin(90°-θ) = cosθ") earns a dedicated step mark. Never skip it.
- **"Hence proved" is mandatory:** For all Show/Prove questions (Q2, Q4, Q6), you must write "Hence proved" or "LHS = RHS" at the end. Omitting this costs marks.
- **Verify angle conditions:** In Q3 and Q5, always check that your answer satisfies the given condition (e.g., "2A is an acute angle"). Mention this check in your solution.
- **Trigonometry weightage in 2026-27:** The Trigonometry unit (Chapters 8 and 9) typically carries around 12 marks in the CBSE Class 10 board exam. Exercise 8.3 questions frequently appear as 2-mark or 3-mark items.
- **Last-minute revision checklist:**
  - ✅ Memorise all 6 complementary angle identities
  - ✅ Remember tanθ · cotθ = 1
  - ✅ Practice converting sec↔cosec and tan↔cot using complementary angles
  - ✅ Revise the triangle angle sum property (used in Q6)
  - ✅ Practise bracket expansion carefully for Q3 and Q5 type problems

For more practice, explore our [NCERT Solutions for Class 10]() hub which covers all chapters with step-by-step solutions. You can also check the [complete NCERT Solutions]() library for other classes and subjects.

Frequently Asked Questions — Class 10 Maths Chapter 8 Ex 8.3

What is the main concept covered in NCERT Class 10 Maths Chapter 8 Exercise 8.3?

Exercise 8.3 covers trigonometric ratios of complementary angles. Two angles are complementary if their sum is 90°. The six key identities are: $\sin(90°-\theta)=\cos\theta$, $\cos(90°-\theta)=\sin\theta$, $\tan(90°-\theta)=\cot\theta$, $\cot(90°-\theta)=\tan\theta$, $\sec(90°-\theta)=\text{cosec}\,\theta$, and $\text{cosec}(90°-\theta)=\sec\theta$. These are used to simplify expressions, evaluate them, and solve equations in CBSE board exams 2026-27.

How do you prove tan 48° tan 23° tan 42° tan 67° = 1?

Since 48° + 42° = 90°, we have tan 48° = cot 42°. Since 23° + 67° = 90°, we have tan 23° = cot 67°. Substituting: cot 42° · cot 67° · tan 42° · tan 67° = (cot 42° · tan 42°)(cot 67° · tan 67°) = 1 × 1 = 1. This uses the identity $\tan\theta \cdot \cot\theta = 1$.

If tan 2A = cot(A − 18°), where 2A is an acute angle, how do you find A?

Convert cot to tan using cot(A-18°) = tan(90°-(A-18°)) = tan(108°-A). The equation becomes tan 2A = tan(108°-A). Equating angles: 2A = 108°-A, so 3A = 108°, giving A = 36°. Always verify: 2A = 72° is acute ✓.

How do you express sin 61° + cos 75° in terms of angles between 0° and 45°?

Write sin 61° = sin(90°-29°) = cos 29° and cos 75° = cos(90°-15°) = sin 15°. Therefore sin 61° + cos 75° = cos 29° + sin 15°. Both 29° and 15° are between 0° and 45°, so the expression is now in the required form. This is a standard 2-3 mark question in CBSE board exams.

How many questions are in Exercise 8.3 of Class 10 Maths NCERT and are they all in the 2026-27 Cl

Exercise 8.3 of Class 10 Maths NCERT Chapter 8 contains exactly 7 questions. All 7 questions are part of the current CBSE 2026-27 syllabus — none have been removed in the rationalised curriculum. This exercise covers trigonometric ratios of complementary angles and is an important section for board exam preparation. You can download the complete NCERT textbook from the official NCERT website.

What is the ncert maths book class 10 solutions pdf free download link for Chapter 8?

You can download the free NCERT Maths Book Class 10 solutions PDF for Chapter 8 directly from this page using the download button above. The solutions cover all exercises (8.1, 8.2, 8.3, and 8.4) and are updated for the 2026-27 CBSE syllabus. The official NCERT textbook PDF is also available at the NCERT official website at ncert.nic.in.
