

# UNIQUE STUDY POINT

BY SUMEET SAHU

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Class: **X**

Subject: **Mathematics**

Session: **2025-26**

Chapter: **Ch 8: Introduction to Trigonometry (PYQ)**

## PREVIOUS YEAR QUESTIONS (PYQ)

Chapter 8: Introduction to Trigonometry

CBSE Board Exam 2019-2025 | With Direct Answers

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This document contains chapter-wise Previous Year Questions from CBSE Class X Board Examinations (2019-2025) for **Chapter 8: Introduction to Trigonometry**. Each question includes the year of examination, marks allotted, and direct answer for quick revision.

**△ NOTE: All questions strictly as per CBSE 2025-26 Syllabus. Topics: Trigonometric Ratios of acute angles, Standard angle values ( $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ ), Trigonometric Identities. □ EXCLUDED: Complementary angle ratios (deleted from syllabus).**

### SECTION A: Multiple Choice Questions (1 Mark Each)

[CBSE 2024 | 1 Mark]

**Q1.** If  $\sin \alpha = \sqrt{3}/2$  and  $\cos \beta = \sqrt{3}/2$ , then  $\tan \alpha \cdot \tan \beta$  is:

- (a)  $\sqrt{3}$
- (b)  $1/\sqrt{3}$
- (c) 1
- (d) 0

**Ans: (c) 1.**  $\sin \alpha = \sqrt{3}/2 \Rightarrow \alpha = 60^\circ$ .  $\cos \beta = \sqrt{3}/2 \Rightarrow \beta = 30^\circ$ .  $\tan 60^\circ \times \tan 30^\circ = \sqrt{3} \times 1/\sqrt{3} = 1$

[CBSE 2023 | 1 Mark]

**Q2.** If  $\sin \theta = \cos \theta$ , then the value of  $\theta$  is:

- (a)  $0^\circ$
- (b)  $30^\circ$
- (c)  $45^\circ$
- (d)  $60^\circ$

**Ans: (c)  $45^\circ$ .**  $\sin \theta = \cos \theta \Rightarrow \tan \theta = 1 \Rightarrow \theta = 45^\circ$

[CBSE 2024 | 1 Mark]

**Q3.** If  $\tan \theta = 1/\sqrt{3}$ , then the value of  $\sec^2\theta - \operatorname{cosec}^2\theta$  is:

- (a)  $-8/3$
- (b)  $8/3$
- (c)  $-4/3$
- (d)  $4/3$

**Ans: (a)  $-8/3$ .**  $\tan \theta = 1/\sqrt{3} \Rightarrow \theta = 30^\circ$ .  $\sec^2 30^\circ - \operatorname{cosec}^2 30^\circ = 4/3 - 4 = -8/3$

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[CBSE 2021 | 1 Mark]

**Q4.** The value of  $(\sin 30^\circ + \cos 60^\circ) - (\sin 60^\circ + \cos 30^\circ)$  is:

- (a) 0
- (b)  $1 + \sqrt{3}$
- (c)  $1 - \sqrt{3}$
- (d)  $1 + 2\sqrt{3}$

**Ans: (c)  $1 - \sqrt{3}$ .  $(1/2 + 1/2) - (\sqrt{3}/2 + \sqrt{3}/2) = 1 - \sqrt{3}$**

[CBSE 2020 | 1 Mark]

**Q5.** The value of  $\sin^2 60^\circ + \cos^2 60^\circ$  is:

- (a) 0
- (b) 1
- (c)  $1/2$
- (d)  $\sqrt{3}/2$

**Ans: (b) 1. By identity  $\sin^2\theta + \cos^2\theta = 1$  for all  $\theta$ .**

[CBSE 2021 | 1 Mark]

**Q6.** Given that  $\sin \theta = a/b$ , then  $\cos \theta$  is:

- (a)  $b/\sqrt{b^2 - a^2}$
- (b)  $b/a$
- (c)  $\sqrt{b^2 - a^2}/b$
- (d)  $a/\sqrt{b^2 - a^2}$

**Ans: (c)  $\sqrt{b^2 - a^2}/b$ .  $\cos \theta = \sqrt{1 - a^2/b^2} = \sqrt{b^2 - a^2}/b$**

[CBSE 2023 | 1 Mark]

**Q7.** If  $\sin \theta - \cos \theta = 0$ , then the value of  $\sin^4\theta + \cos^4\theta$  is:

- (a) 1
- (b)  $3/4$
- (c)  $1/2$
- (d)  $1/4$

**Ans: (c)  $1/2$ .  $\sin \theta = \cos \theta \Rightarrow \theta = 45^\circ$ .  $\sin^4 45^\circ + \cos^4 45^\circ = 1/4 + 1/4 = 1/2$**

[CBSE 2019 | 1 Mark]

**Q8.** If  $\sec \theta = 25/7$ , then  $\sin \theta =$

- (a)  $7/25$
- (b)  $24/25$
- (c)  $25/24$
- (d)  $7/24$

**Ans: (b)  $24/25$ .  $\cos \theta = 7/25$ .  $\sin \theta = \sqrt{1 - 49/625} = \sqrt{576/625} = 24/25$**

[CBSE 2020 | 1 Mark]

**Q9.** If  $4 \tan \theta = 3$ , then the value of  $(4 \sin \theta - \cos \theta)/(4 \sin \theta + \cos \theta)$  is:

- (a)  $2/3$
- (b)  $1/3$
- (c)  $1/2$
- (d)  $3/4$

**Ans: (c)  $1/2$ .  $\tan \theta = 3/4$ . Divide by  $\cos \theta$ :  $(4 \tan \theta - 1)/(4 \tan \theta + 1) = (3 - 1)/(3 + 1) = 1/2$**

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[CBSE 2022 | 1 Mark]

**Q10.** The maximum value of  $1/\sec \theta$  is:

- (a) 0
- (b) 1
- (c)  $\sqrt{2}$
- (d)  $1/2$

**Ans: (b) 1.  $1/\sec \theta = \cos \theta$ . Maximum value of  $\cos \theta = 1$  (at  $\theta = 0^\circ$ ).**

[CBSE 2022 | 1 Mark]

**Q11.** If  $x = a \cos \theta$  and  $y = b \sin \theta$ , then  $b^2x^2 + a^2y^2 =$

- (a)  $a^2b^2$
- (b)  $ab$
- (c)  $a^4b^4$
- (d)  $a^2 + b^2$

**Ans: (a)  $a^2b^2$ .  $b^2(a \cos \theta)^2 + a^2(b \sin \theta)^2 = a^2b^2(\cos^2\theta + \sin^2\theta) = a^2b^2$**

## SECTION B: Assertion-Reason Questions (1 Mark Each)

[CBSE 2023 | 1 Mark]

**Q12. Assertion (A):** For any acute angle  $\theta$ ,  $\sin^2\theta + \cos^2\theta = 1$ .

**Reason (R):** For any acute angle  $\theta$ ,  $\sec^2\theta - \tan^2\theta = 1$ .

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

**Ans: (b) Both true but R is not the correct explanation of A. Both are independent identities.**

[CBSE 2024 | 1 Mark]

**Q13. Assertion (A):** In a right  $\triangle ABC$ , right-angled at B,  $\operatorname{cosec} A$  can be less than 1.

**Reason (R):**  $\operatorname{cosec} A = \text{Hypotenuse/Perpendicular}$ , and hypotenuse is always the longest side.

- (a) Both A and R are true and R is the correct explanation of A
- (b) Both A and R are true but R is not the correct explanation of A
- (c) A is true but R is false
- (d) A is false but R is true

**Ans: (d) A is false but R is true. Since hypotenuse  $\geq$  perpendicular,  $\operatorname{cosec} A \geq 1$  always.**

## SECTION C: Short Answer Questions (2 Marks Each)

[CBSE 2024 | 2 Marks]

**Q14.** If  $\tan A + \cot A = 6$ , find the value of  $\tan^2A + \cot^2A - 4$ .

**Ans:  $(\tan A + \cot A)^2 = 36 \Rightarrow \tan^2A + \cot^2A + 2 = 36 \Rightarrow \tan^2A + \cot^2A = 34$ . Answer =  $34 - 4 = 30$**

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[CBSE 2020 | 2 Marks]

**Q15.** Evaluate:  $2 \tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$ .

$$\text{Ans: } 2(1)^2 + (\sqrt{3}/2)^2 - (\sqrt{3}/2)^2 = 2 + 3/4 - 3/4 = 2$$

[CBSE 2019 | 2 Marks]

**Q16.** In a right triangle ABC, right-angled at B, if  $\tan A = 1$ , verify that  $2 \sin A \cos A = 1$ .

$$\text{Ans: } \tan A = 1 \Rightarrow A = 45^\circ. \quad 2 \sin 45^\circ \cos 45^\circ = 2 \times (1/\sqrt{2})(1/\sqrt{2}) = 2 \times 1/2 = 1. \text{ Verified.}$$

[CBSE 2022 | 2 Marks]

**Q17.** If  $\sin(A - B) = 1/2$  and  $\cos(A + B) = 1/2$ , where  $0^\circ < A + B \leq 90^\circ$ , find A and B.

$$\text{Ans: } A - B = 30^\circ \dots \text{(i). } A + B = 60^\circ \dots \text{(ii). Adding: } 2A = 90^\circ \Rightarrow A = 45^\circ, B = 15^\circ.$$

[CBSE 2021 | 2 Marks]

**Q18.** If  $\sqrt{3} \tan \theta = 1$ , find the value of  $\sin^2 \theta - \cos^2 \theta$ .

$$\text{Ans: } \tan \theta = 1/\sqrt{3} \Rightarrow \theta = 30^\circ. \quad \sin^2 30^\circ - \cos^2 30^\circ = 1/4 - 3/4 = -1/2$$

## SECTION D: Prove the Following Identities (3 Marks Each)

[CBSE 2024 | 3 Marks]

**Q19.** Prove that:  $(\operatorname{cosec} \theta - \sin \theta)(\sec \theta - \cos \theta)(\tan \theta + \cot \theta) = 1$

$$\text{Ans: LHS} = [\cos^2 \theta / \sin \theta] \times [\sin^2 \theta / \cos \theta] \times [1 / (\sin \theta \cos \theta)] = (\sin \theta \cos \theta) / (\sin \theta \cos \theta) = 1 = \text{RHS}$$

[CBSE 2023 | 3 Marks]

**Q20.** Prove that:  $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$

$$\text{Ans: LHS} = \sin^2 \theta + \operatorname{cosec}^2 \theta + 2 + \cos^2 \theta + \sec^2 \theta + 2 = 1 + (1 + \cot^2 \theta) + (1 + \tan^2 \theta) + 4 = 7 + \tan^2 \theta + \cot^2 \theta = \text{RHS}$$

[CBSE 2022 | 3 Marks]

**Q21.** Prove that:  $\tan \theta / (1 - \cot \theta) + \cot \theta / (1 - \tan \theta) = 1 + \sec \theta \operatorname{cosec} \theta$

$$\text{Ans: LHS} = \tan^2 \theta / (\tan \theta - 1) - 1 / [\tan \theta (\tan \theta - 1)] = (\tan^3 \theta - 1) / [\tan \theta (\tan \theta - 1)] = (\tan^2 \theta + \tan \theta + 1) / \tan \theta = \tan \theta + 1 + \cot \theta = 1 + 1 / (\sin \theta \cos \theta) = 1 + \sec \theta \operatorname{cosec} \theta = \text{RHS}$$

[CBSE 2021 | 3 Marks]

**Q22.** Prove that:  $(\sin A - 2 \sin^3 A) / (2 \cos^3 A - \cos A) = \tan A$

$$\text{Ans: LHS} = \sin A (1 - 2 \sin^2 A) / \cos A (2 \cos^2 A - 1). \text{ Since } 2 \cos^2 A - 1 = 1 - 2 \sin^2 A, \text{ LHS} = \sin A / \cos A = \tan A = \text{RHS}$$

[CBSE 2020 | 3 Marks]

**Q23.** Prove that:  $\sqrt{[(1 + \sin A) / (1 - \sin A)]} = \sec A + \tan A$

$$\text{Ans: Multiply inside by } (1 + \sin A) / (1 + \sin A): \sqrt{[(1 + \sin A)^2 / (1 - \sin^2 A)]} = (1 + \sin A) / \cos A = \sec A + \tan A = \text{RHS}$$

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[CBSE 2019 | 3 Marks]

**Q24.** Prove that:  $(\operatorname{cosec} A - \cot A)^2 = (1 - \cos A)/(1 + \cos A)$

**Ans:** LHS =  $[(1 - \cos A)/\sin A]^2 = (1 - \cos A)^2/\sin^2 A = (1 - \cos A)^2/(1 - \cos^2 A) = (1 - \cos A)/(1 + \cos A) = \text{RHS}$

## SECTION E: Long Answer Questions (5 Marks Each)

[CBSE 2022 | 5 Marks]

**Q25.** If  $\sin \theta + \cos \theta = \sqrt{3}$ , then prove that  $\tan \theta + \cot \theta = 1$ .

**Ans: Squaring:**  $1 + 2 \sin \theta \cos \theta = 3 \Rightarrow \sin \theta \cos \theta = 1$ .  $\tan \theta + \cot \theta = (\sin^2 \theta + \cos^2 \theta)/(\sin \theta \cos \theta) = 1/1 = 1$

[CBSE 2019 | 5 Marks]

**Q26.** If  $\tan \theta + \sin \theta = m$  and  $\tan \theta - \sin \theta = n$ , show that  $m^2 - n^2 = 4\sqrt{mn}$ .

**Ans:**  $m^2 - n^2 = 4 \tan \theta \sin \theta$ .  $mn = \tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$ .  $\sqrt{mn} = \tan \theta \sin \theta$ . So  $4\sqrt{mn} = 4 \tan \theta \sin \theta = m^2 - n^2$

## SECTION F: Case Study Based Questions (4 Marks Each)

[CBSE 2025 | 4 Marks]

**Q27. Case Study:** In a right triangle ABC, right-angled at B, AB = 5 cm and AC = 13 cm.

- Find  $\sin A$  and  $\cos A$ .
- Find  $\tan A$  and  $\cot A$ .
- Verify that  $\sin^2 A + \cos^2 A = 1$ .
- Find  $\sec^2 A - \tan^2 A$ .

**Ans:**  $BC = \sqrt{169 - 25} = 12 \text{ cm}$ . (i)  $\sin A = 12/13$ ,  $\cos A = 5/13$ . (ii)  $\tan A = 12/5$ ,  $\cot A = 5/12$ . (iii)  $144/169 + 25/169 = 1$  ✓ (iv)  $\sec^2 A - \tan^2 A = 1$  (identity)

[CBSE 2024 | 4 Marks]

**Q28. Case Study:** For an acute angle  $\theta$  in a right triangle with sides p, b and h:

- If  $\sin \theta = 3/5$ , find  $\cos \theta$ .
- Find  $\sin^2 \theta + \cos^2 \theta$ .
- If  $\tan \theta = 4/3$ , find  $\sec \theta$ .
- Verify:  $1 + \tan^2 \theta = \sec^2 \theta$ .

**Ans:** (i)  $\cos \theta = 4/5$ . (ii)  $9/25 + 16/25 = 1$ . (iii)  $\sec \theta = 5/3$ . (iv)  $1 + 16/9 = 25/9 = \sec^2 \theta$  ✓

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## □ PYQ SUMMARY & ANALYSIS

| Topic   | Years Asked | Frequency  | Marks |
|---|-------------|------------|-------|
| Standard angle values   | 2019-2025   | Every Year | 1-2   |
| Trigonometric ratios from given info  | 2019-2024   | Every Year | 1-2   |
| Identity: $\sin^2\theta + \cos^2\theta = 1$                                 | 2019-2025   | Every Year | 1-3   |
| Prove that (identity proofs)  | 2019-2024   | Every Year | 3     |
| Expression evaluation   | 2019-2024   | 5 times    | 1-2   |
| Relation between ratios   | 2020-2024   | 4 times    | 2-3   |
| $\sec^2\theta - \tan^2\theta / \operatorname{cosec}^2\theta - \cot^2\theta$ | 2019-2025   | 5 times    | 1-3   |
| Case Study (triangle ratios)  | 2024-2025   | 2 times    | 4     |

### Key Observations for Students:

- "Prove that" identity questions are the MOST important — 3 marks, asked every year.
- Standard angle values ( $\sin$ ,  $\cos$ ,  $\tan$  of  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ ) — MUST MEMORIZE.
- Three identities:  $\sin^2\theta + \cos^2\theta = 1$ ,  $1 + \tan^2\theta = \sec^2\theta$ ,  $1 + \cot^2\theta = \operatorname{cosec}^2\theta$ .
- Tip for proving: Convert everything to  $\sin \theta$  and  $\cos \theta$ , then simplify.
- Complementary angle ratios ( $\sin(90^\circ - \theta) = \cos \theta$  etc.) are DELETED from 2025-26 syllabus.
- Expected marks from this chapter: 6-8 marks (combined with Ch 9).

*"Practice makes perfect. Solve PYQs to master your Board Exam!"*

**Best Wishes for Your Board Exam!**

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