

Inverse Trigonometric Functions — CBSE Pattern Test 2

Class 12 Maths · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 2 — CBSE Pattern (90 minutes, 40 marks)

Class 12 Maths · Inverse Trigonometric Functions · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. The principal value branch of $\tan^{-1} x$ is

- (A) $(-\pi/2, \pi/2)$
- (B) $[0, \pi]$
- (C) $[-\pi/2, \pi/2]$
- (D) $[-\pi, \pi]$

2. The value of $\sin^{-1}(1)$ is

- (A) $\pi/2$
- (B) π
- (C) 0
- (D) $\pi/4$

3. The value of $\cos^{-1}(0)$ is

- (A) $\pi/2$
- (B) 0
- (C) π
- (D) $\pi/4$

4. For $xy < 1$, $\tan^{-1} x + \tan^{-1} y$ equals

- (A) $\tan^{-1}((x + y)/(1 - xy))$
- (B) $\tan^{-1}((x - y)/(1 + xy))$
- (C) $\tan^{-1}(xy)$
- (D) $\tan^{-1}(x + y)$

5. $2 \tan^{-1} x$ equals

- (A) $\tan^{-1}(2x/(1 - x^2))$
- (B) $\tan^{-1}(2x)$
- (C) $\tan^{-1}(x^2)$
- (D) $\sin^{-1}(2x)$

6. If $\tan^{-1} x = \pi/4$, then x equals

- (A) 1
- (B) 0
- (C) $\sqrt{3}$
- (D) $1/\sqrt{3}$

7. The solution of $2 \tan^{-1} x = \pi/2$ is

- (A) $x = 1$

- (B) $x = 0$
- (C) $x = -1$
- (D) no solution

8. If $\cos^{-1} x = 0$, then x equals

- (A) 1
- (B) 0
- (C) -1
- (D) $1/2$

9. Write $\tan^{-1} x + \cot^{-1} x$ for $x \in \mathbb{R}$.

10. Write the formula for $\tan^{-1} x + \tan^{-1} y$ when $xy < 1$.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. Write the principal value branch of $\cos^{-1} x$.

12. Write $\cos^{-1}(-x)$ in terms of $\cos^{-1} x$.

13. Express $2 \tan^{-1} x$ as a single inverse tangent.

14. Solve $\sin^{-1} x = \pi/6$.

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Find the principal value of $\tan^{-1}(-1)$.

16. Find the value of $\sin^{-1}(1/2) + \cos^{-1}(1/2)$.

17. Evaluate $\tan^{-1}(1/2) + \tan^{-1}(1/3)$.

18. Solve $\sin^{-1}(x) = \cos^{-1}(x)$.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. Find the value of $\tan^{-1}(1) + \tan^{-1}(\sqrt{3})$. Write $2 \tan^{-1}(1/2)$ in terms of $\tan^{-1}$ and simplify.

20. Solve $2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$. Prove $\sin^{-1} x + \cos^{-1} x = \pi/2$ for $x \in [-1, 1]$.

Answer Key (Marking Scheme)

Q1 — (A) $(-\pi/2, \pi/2)$. Q2 — (A) $\pi/2$. Q3 — (A) $\pi/2$. Q4 — (A) $\tan^{-1}((x + y)/(1 - xy))$.

Q5 — (A) $\tan^{-1}(2x/(1 - x^2))$. Q6 — (A) 1. Q7 — (A) $x = 1$. Q8 — (A) 1.

Q9 — $\pi/2$.

Q10 — $\tan^{-1}((x + y)/(1 - xy))$.

Q11 — $[0, \pi]$.

Q12 — $\pi - \cos^{-1} x$.

Q13 — $\tan^{-1}(2x/(1 - x^2))$.

Q14 — $x = 1/2$.

Q15 — $-\pi/4$.

Q16 — $\pi/2$.

Q17 — $\pi/4$.

Q18 — $x = 1/\sqrt{2}$.

Q19 — $7\pi/12$; $2 \tan^{-1}(1/2) = \tan^{-1}(4/3)$.

Q20 — $x = \pi/3$; identity proof as in notes.