PRACTICE PAPER 01 (2026-27)
CHAPTER 02 : INVERSE TRIGONOMETRIC FUNCTIONS

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

General Instructions:

(i) All questions are compulsory.

(ii) This question paper contains 20 questions divided into five Sections A, B, C, D and E.

(iii) Section A comprises 10 MCQs of 1 mark each (Q9 and Q10 are Assertion–Reason questions). Section B comprises 4 questions of 2 marks each. Section C comprises 3 questions of 3 marks each. Section D comprises 1 question of 5 marks with an internal choice. Section E comprises 2 case study based questions of 4 marks each, with internal choice in the last sub-part.

(iv) There is no overall choice. Internal choices have been provided where indicated.

(v) Use of calculators is not permitted.

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The principal value of $\sec^{-1}(-\sqrt{2})$ is

(a) $\pi/4$ (b) $-\pi/4$ (c) $3\pi/4$ (d) $5\pi/4$

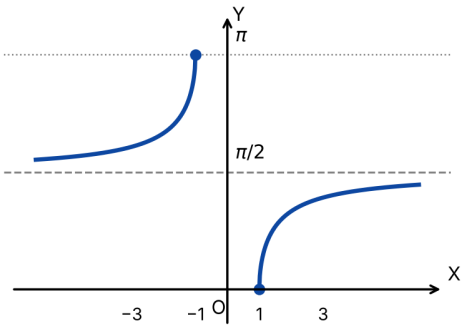
2. The domain of the function $f(x) = \sin^{-1}(2x - 1)$ is

(a) $[0, 1]$ (b) $[-1, 1]$ (c) $[0, 2]$ (d) $[-1, 0]$

3. The value of $\cos^{-1}(\cos 5\pi/3)$ is

(a) $5\pi/3$ (b) $\pi/3$ (c) $2\pi/3$ (d) $-\pi/3$

4. The graph given below represents the principal value branch of



(a) $\cos^{-1}x$ (b) $\text{cosec}^{-1}x$

(c) $\cot^{-1}x$ (d) $\sec^{-1}x$

5. The value of $\tan^{-1}1 + \tan^{-1}2 + \tan^{-1}3$ is

(a) $\pi/2$ (b) $3\pi/4$ (c) π (d) 2π

6. If $\cot^{-1}x = 2\pi/3$, then x is equal to

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

7. If $\sin^{-1}x + \sin^{-1}y = 2\pi/3$, then $\cos^{-1}x + \cos^{-1}y$ is equal to

(a) $\pi/3$ (b) $2\pi/3$ (c) π (d) $\pi/6$

8. The value of $\sin^{-1}(\sin 4)$ is

(a) 4 (b) $\pi - 4$ (c) $4 - \pi$ (d) $2\pi - 4$

For Q9 and Q10, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(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.

9. Assertion (A): The principal value of $\sin^{-1}(\sin 7\pi/6)$ is $-\pi/6$.
Reason (R): $\sin^{-1}(\sin x) = x$ only when $x \in [-\pi/2, \pi/2]$.

10. Assertion (A): $\tan^{-1}x + \cot^{-1}x = \pi/2$ for every real number x.
Reason (R): The principal value branches of $\tan^{-1}x$ and $\cot^{-1}x$ have ranges $(-\pi/2, \pi/2)$ and $(0, \pi)$ respectively.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. Find the value of $\sin^{-1}(\sin 2\pi/3) + \cos^{-1}(\cos 4\pi/3)$.

12. Prove that $\tan^{-1}(1/5) + \tan^{-1}(2/3) = \pi/4$.

13. Write $\tan^{-1}(\sqrt{(1 + x^2)} - x)$, $x \in \mathbb{R}$, in the simplest form.

14. Find the value of $\sin(2 \tan^{-1}(1/3))$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Prove that $\sin^{-1}(12/13) - \sin^{-1}(3/5) = \sin^{-1}(33/65)$.

16. Solve for x: $\tan^{-1}(2x) + \tan^{-1}(3x) = \pi/4$.

17. Find the domain of the function $f(x) = \sin^{-1}(2x + 1) + \cos^{-1}(3x + 2)$. Also find the value of $f(-1/2)$.

SECTION – D

Question 18 carries 5 marks.

18. Solve for x: $\tan^{-1}((x - 2)/(x - 3)) + \tan^{-1}((x + 2)/(x + 3)) = \pi/4$.

OR

Prove that $\tan^{-1}(1/2) + \tan^{-1}(1/5) + \tan^{-1}(1/8) = \pi/4$.

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. An art gallery displays a painting on a wall. The lower edge of the painting is 1 m and the upper edge is 3 m above the eye level of a viewer who stands x metres away from the wall ($x > 0$). Let α and β be the angles of elevation of the lower edge and the upper edge respectively, and let $\theta = \beta - \alpha$ be the angle subtended by the painting at the viewer's eye.

Based on the above information, answer the following questions:

(i) Write α and β in terms of x using the $\tan^{-1}$ function, and hence write θ. (1)

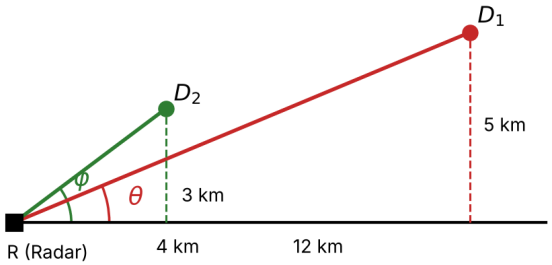
(ii) Show that $\theta = \tan^{-1}(2x/(x^2 + 3))$. (1)

(iii) Find the value of θ (in radians) when $x = \sqrt{3}$. (2)

OR

(iii) Show that a viewer standing 1 m from the wall and a viewer standing 3 m from the wall see the painting at the same angle. (2)

20. A radar station R tracks two drones. Drone D_1 is at a horizontal distance of 12 km and a height of 5 km, and drone D_2 is at a horizontal distance of 4 km and a height of 3 km from R, as shown in the figure. Let θ and φ be the angles of elevation of D_1 and D_2 respectively, as seen from R. *Based on the above information, answer the following questions:*



(i) Express θ in the form $\sin^{-1}(\cdot)$. (1)

(ii) Express φ in the form $\cos^{-1}(\cdot)$. (1)

(iii) Show that $\theta + \varphi = \tan^{-1}(56/33)$. (2)

OR

(iii) Show that $\varphi - \theta = \tan^{-1}(16/63)$. (2)

— End of Question Paper —