

Maxprap. Chapter wise Series Class 12th - Inverse Trigonometry

Class : 12th

Subject: Mathematics

Max. Marks : 55

Duration : 2 Hrs

Sections: A (MCQs), B (Short Answer-I), C (Short Answer-II), D (Case-Based).

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 30 questions divided into five Sections A, B, C and D.
- (iii). Section A comprises of 12 MCQs of 1 mark each. Section B comprises of 10 questions of 2 marks each. Section C comprises of 5 questions of 3 marks each and Section D comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted.

Section A

Questions 1 to 10 carry 1 mark each

1. The principal value of $\operatorname{cosec}^{-1}(-1)$ is
a) $\frac{3\pi}{2}$ b) $\frac{-\pi}{2}$ c) 0 d) $\frac{\pi}{2}$
2. The principal value of $\cos^{-1}\left(\frac{-1}{2}\right)$ is
a) $\frac{-\pi}{3}$ b) $\frac{\pi}{3}$ c) $\frac{2\pi}{3}$ d) $\frac{4\pi}{3}$
3. The value of $\sin^{-1}\left(\cos\left(\frac{43\pi}{5}\right)\right)$ is
a) $\frac{\pi}{10}$ b) $\frac{-7\pi}{5}$ c) $\frac{3\pi}{5}$ d) $-\frac{\pi}{10}$
4. What is the domain of the function $\cos^{-1}(2x - 3)$?
a) $(-1, 1)$ b) $[1, 2]$ c) $[-1, 1]$ d) $[1, 3]$
5. The value of $\tan^{-1}(\sqrt{3}) + \cos^{-1}\left(-\frac{1}{2}\right)$ corresponding to principal branches is
a) 0 b) $-\frac{\pi}{12}$ c) π d) $\frac{\pi}{3}$
6. $\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to
a) π b) $\frac{\pi}{3}$ c) $\frac{2\pi}{3}$ d) $-\frac{\pi}{3}$
7. Range of $\sec^{-1} x$ is
a) $[0, \pi]$ b) $\left[0, \frac{\pi}{2}\right]$ c) $\left[0, \frac{\pi}{4}\right]$ d) $-\left\{\frac{\pi}{2}\right\}$

8. The value of $\cot$ is

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

9. The value of the expression $\sin [\cot^{-1} (\cos (\tan^{-1} 1))]$ is

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

10. The domain of the function $\cos^{-1} (2x - 1)$ is

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

Assertion(A)/Reason(R) Based (11-12): In the following questions, 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.

11. Assertion (A): Principal value of $\tan^{-1} (-\sqrt{3})$ is $-\frac{\pi}{3}$.

Reason (R): $\tan^{-1} : \mathbb{R} \rightarrow \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$ so for any $x \in \mathbb{R}$, $\tan^{-1} (x)$ represent an angle in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

12. Assertion (A): The domain of the function $\sec^{-1} 2x$ is $\left(-\infty, -\frac{1}{2}\right] \cup \left[\frac{1}{2}, \infty\right)$

Reason (R): $\sec^{-1} (-2) = -\frac{\pi}{4}$

SECTION – B

Questions 13 to 22 carry 2 marks each

13. Find the principal value of $\cot^{-1}(\sqrt{3})$.

14. For the principal value, evaluate $\tan^{-1} \left\{ 2 \cos \left(2 \sin^{-1} \frac{1}{2} \right) \right\}$.

15. Evaluate: $-\tan^{-1} \left(-\frac{1}{\sqrt{3}} \right) + \cot^{-1} \left(\frac{1}{\sqrt{3}} \right) + \tan^{-1} \left(\sin \left(-\frac{\pi}{2} \right) \right)$

16. Write the value of $\sin^{-1} \left(\frac{1}{3} \right) - \cos^{-1} \left(-\frac{1}{3} \right)$

17. Write the interval for the principal value of function and draw its graph: $\tan^{-1} x$.

18. Evaluate: $\tan^{-1} \sqrt{3} - \sec^{-1} (-2)$.

19. Using the principal values, write the value of $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$.

20. Evaluate $\cos\left[\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \frac{\pi}{6}\right]$

21. Find the value of $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \cot^{-1}\left(\frac{1}{\sqrt{3}}\right) + \tan^{-1}\left[\sin\left(\frac{-\pi}{2}\right)\right]$.

22. Write the interval for the principal value of function and draw its graph: $\operatorname{cosec}^{-1} x$.

SECTION – C

Questions 23 to 27 carry 3 marks each

23. Find the value of x , if $\tan\left[\sec^{-1}\left(\frac{1}{x}\right)\right] = \sin(\tan^{-1} 2)$, $x > 0$.

24. Evaluate: $-\cot^{-1}\left\{2\cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right\}$

25. Evaluate: $-\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + \tan^{-1}(-\sqrt{3}) + \tan^{-1}\left(\sin\left(-\frac{\pi}{2}\right)\right)$

26. Evaluate: $-\cot^{-1}\frac{1}{\sqrt{3}} - \operatorname{cosec}^{-1}(-2) + \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$.

27. Find the principal value of $\cos^{-1}\left(\sin\frac{4\pi}{3}\right)$.

SECTION – D (Case Study Based Questions)

Questions 29 & 30 carry 4 marks each

28. Read the following text carefully and answer the questions that follow:

Rajni is preparing for her board exams. So, she decided to prepare chart of formulas of maths and important facts related to each chapter, For the chapter Inverse Trigonometric Functions she has prepared the following table to remember the principal branch values of inverse trigonometric functions.

Inverse	Domain	Principal Value Branch
$\sin^{-1}$	$[-1, 1]$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$
$\cos^{-1}$	$[-1, 1]$	$[0, \pi]$
$\operatorname{cosec}^{-1}$	$\mathbb{R} - (-1, 1)$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$
$\sec^{-1}$	$\mathbb{R} - (-1, 1)$	$[0, \pi] - \left\{\frac{\pi}{2}\right\}$
$\tan^{-1}$	$\mathbb{R}$	$\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$
$\cot^{-1}$	$\mathbb{R}$	$(0, \pi)$

- a) Find the principal value of $\operatorname{cosec}^{-1}(-1)$. (1)
- b) Find the principal value of $\sec^{-1}(-2)$. (1)
- c) Solve the following equation: $\tan^{-1}\left(\frac{x+1}{x-1}\right) + \tan^{-1}\left(\frac{x-1}{x}\right) = \tan^{-1}(-7)$. (2)

OR

Show that $\sin^{-1} 2x\sqrt{1-x^2} = 2 \sin^{-1} x$. (2)

29. Read the following text carefully and answer the questions that follow:

Today in the class of Mathematics, Mrs. Pandey is explaining the inverse trigonometric function. She draws the graph of the $\sin^{-1} x$ and write down the following about the principal value of branch function $\sin^{-1} x$:

Principal value of branch function $\sin^{-1} x$: It is a function with domain $[-1, 1]$ and range $\left[-\frac{3\pi}{2}, -\frac{\pi}{2}\right]$, $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ or $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ and so on corresponding to each interval, we get a branch of the function $\sin^{-1} x$. The branch with range $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ is called the principal value branch.

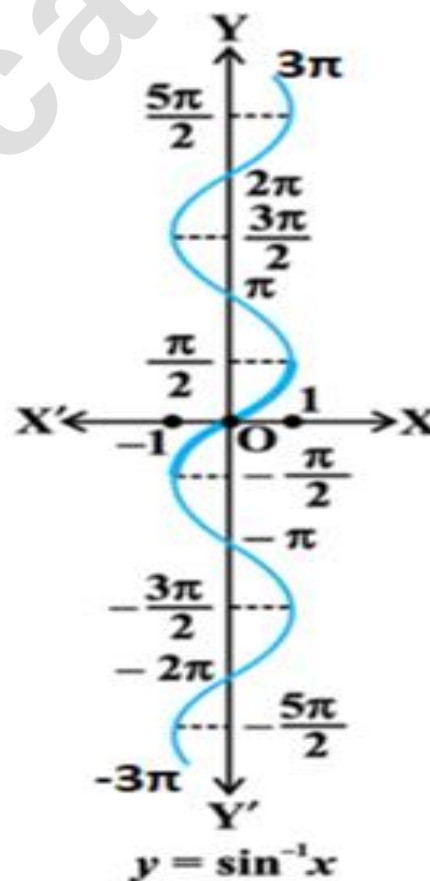
Thus, $\sin^{-1} x$:

$$[-1, 1] \rightarrow \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$

- a) Find the domain of $\sin^{-1} \sqrt{x-1}$. (1)
- b) Find the domain of $\sin^{-1} [x]$. (1)
- c) Find the values $\left[\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right]$. (2)

OR

The principal value of $\cos^{-1}\left(\cos \frac{2\pi}{3}\right) + \sin^{-1}\left(\sin \frac{2\pi}{3}\right)$ is π . (2)



Inverse Trigonometric Function Paper Details – Analysis		
Objective Questions		
MCQ	1 marks x 10 question = 10	
Assertion Reason	1 marks x 2 question = 2	
Subjective		
Short type I	2 marks x 10 question = 20	
Short type II	3 marks x 5 question = 15	
Case Studies Based		
Case 1	4 marks	
Case 2	4 marks	

Total = 55 marks Your Score =