THE VILLAGE
INTERNATIONAL SCHOOL
"We Nurture Dreams"

DEPARTMENT OF MATHEMATICS

CHAPTER2-INVERSE TRIGONOMETRY

CLASS12

ONE MARK QUESTIONS

1. Write the principal value of

(i) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ **(ii)** $\cos^{-1}(\sqrt{3}/2)$

(iii) $\tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ **(iv)** $\text{cosec}^{-1}(-2)$

(v) $\cot^{-1}\left(\frac{1}{\sqrt{3}}\right)$ **(vi)** $\sec^{-1}(-2)$.

2. What is the value of the following functions (using principal value)

(i) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right) - \sec^{-1}\left(\frac{2}{\sqrt{3}}\right)$ **(ii)** $\sin^{-1}\left(-\frac{1}{2}\right) - \cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

(iii) $\tan^{-1}(1) - \cot^{-1}(-1)$ **(iv)** $\text{cosec}^{-1}(\sqrt{2}) + \sec^{-1}(\sqrt{2})$

(v) $\tan^{-1}(1) + \cot^{-1}(1) + \sin^{-1}(1)$. **(vi)** $\sin^{-1}\left(sin\frac{4\pi}{5}\right)$

(vii) $\tan^{-1}\left(tan\frac{5\pi}{6}\right)$ **(viii)** $\text{cosec}^{-1}\left(cosec\frac{3\pi}{4}\right)$

3. If $\tan^{-1} x + \tan^{-1} y = \frac{4\pi}{5}$, find $\cot^{-1} x + \cot^{-1} y$.

4. Find the values of the following

(i) $\sin\left\{\frac{\pi}{6}-\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)\right\}$ (ii) $\tan^{-1}\left(\sin\left(-\frac{\pi}{2}\right)\right)$

(iii) $\tan\left(\cos^{-1}\frac{8}{17}\right)$ (iv) $\sin^{-1}\left\{\cos\left(\sin^{-1}\frac{\sqrt{3}}{2}\right)\right\}$

5. Evaluate the following

(i) $\sin(2\sin^{-1}(0.6))$ (ii) $\sin(2\tan^{-1}(0.75))$

(iii) $\sin\left(2\cos^{-1}\left(-\frac{5}{15}\right)\right)$ (iv) $\tan\left\{\frac{1}{2}\cos^{-1}\left(\frac{\sqrt{5}}{3}\right)\right\}$

6. If $\tan^{-1}x + \tan^{-1}y = \frac{\pi}{4}$, $xy < 1$, then the value of $x + y + xy$.

7. If $3\tan^{-1}x + \cot^{-1}x = \pi$, then find the value of x.

8. If $\cos\left(\sin^{-1}\frac{2}{5}+\cos^{-1}x\right)=0$, then find the value of x.

9. If $\sin^{-1}x + \sin^{-1}y = \frac{\pi}{2}$, then find the value of $\cos^{-1}x + \cos^{-1}y$.

10. If $\cos^{-1}\alpha + \cos^{-1}\beta + \cos^{-1}\gamma = 3\pi$, then find the value of $\alpha(\alpha+\gamma)+\beta(\alpha+\gamma)+\gamma(\alpha+\beta)$.

11. If $\tan^{-1}x - \cot^{-1}x = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$, the find the value of x:

12. Find the value of $\tan^2(\sec^{-1}2) + \cot^2(\operatorname{cosec}^{-1}3)$

13. Evaluate $\sin\{\cot^{-1}(\cos(\tan^{-1}1))\}$

14. If $a \le 2\sin^{-1}x + \cos^{-1}x \le b$, then find the value of a and b.

15. Solve $\cos^{-1}(\sin(\cos^{-1}x)) = \frac{\pi}{3}$

16. Write the value of $\tan\left(2\tan^{-1}\frac{1}{5}\right)$

17. Write the value of $\operatorname{Sec}^{-1}\left(\sec\left(-\frac{8\pi}{5}\right)\right)$

TWO MARK QUESTIONS

1. Find the value of the following

(i) $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) + \cos^{-1}\left(-\frac{1}{2}\right) + \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right)$

(ii) $\sin^{-1}\left(Sin\frac{2\pi}{3}\right) + \cos^{-1}\left(\cos\frac{4\pi}{3}\right)$

(iii) $\sin\left\{\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right\}$

(iv) $\tan^{-1}\left(\tan\frac{7\pi}{6}\right) + \cos^{-1}\left(\cos\frac{7\pi}{6}\right)$

2. Simplify

(i) $\tan^{-1}\left(\frac{\sin x}{1+\cos x}\right)$

(ii) $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$, $x < -1$

(iii) $\cos\left\{\cos^{-1}\left(\frac{-\sqrt{3}}{2}\right) + \frac{\pi}{6}\right\}$

(iv) $\tan\left[\frac{1}{2}\cos^{-1}\left(\frac{3}{\sqrt{11}}\right)\right]$

3. Simplify : $\sin^{-1}\left\{\frac{\sin x + \cos x}{\sqrt{2}}\right\}, -\frac{\pi}{4} < x < \frac{\pi}{4}$

4 MARK QUESTIONS

1. Show that : $\tan^{-1}\left[\frac{\sqrt{1+\cos x} + \sqrt{1-\cos x}}{\sqrt{1+\cos} - \sqrt{1-\cos x}}\right] = \frac{\pi}{4} + \frac{x}{2}$; $x \in [0, \pi]$

2.

Prove that:

$\tan^{-1}\left(\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \frac{\pi}{4} + \frac{1}{2}cos^{-1}x^2$

3.

Prove that:

$\tan\left[\frac{\pi}{4} + \frac{1}{2}tan^{-1}\left(\frac{a}{b}\right)\right] + \tan\left[\frac{\pi}{4} - \frac{1}{2}\tan^{-1}\left(\frac{a}{b}\right)\right] = \frac{2\sqrt{a^2+b^2}}{b}$

4.

Prove that $\tan\left(\frac{\pi}{4} + \frac{1}{2}\cos^{-1}\frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2}\cos^{-1}\frac{a}{b}\right) = \frac{2b}{a}$

ANSWERS

ONE MARK QUESTIONS

1. (i) $-\frac{\pi}{3}$ (ii) $\frac{\pi}{6}$ (iii) $\frac{-\pi}{6}$ (iv) $\frac{-\pi}{6}$ (v) $\frac{\pi}{3}$ (vi) $\frac{2\pi}{3}$

2. (i) 0 (ii) $\frac{-\pi}{3}$ (iii) $-\frac{\pi}{2}$ (iv) $\frac{\pi}{2}$

(v) π (vi) $\frac{\pi}{5}$ (vii) $\frac{-\pi}{6}$ (Viii) $\frac{\pi}{4}$

3. $\pi/5$

4. (i) 1 (ii) $-\frac{\pi}{4}$ (iii) $-\frac{15}{8}$ (iv) $\frac{\pi}{6}$

5. (i) 0.96 (ii) 0.96 (iii) $-\frac{120}{169}$ (iv) $\frac{3-\sqrt{5}}{2}$

6. 1

7. x = 1

8. $x = \frac{2}{5}$

9. $\frac{\pi}{2}$ **10.** 6 **11.** $x = \sqrt{3}$

12. 11 **13.** $\sqrt{\frac{2}{3}}$

14. $a = 0, b = \pi$ **15.** $x = \frac{\sqrt{3}}{2}$

16. 5/12 **17.** $\frac{2\pi}{5}$

TWO MARK QUESTIONS

1. (i) $\frac{\pi}{6}$ (ii) π (iii) 1 (iv) π

2. (i) $\frac{x}{2}$ (ii) $\pi - \sec^{-1} x$ (iii) –1 (iv) $\frac{\sqrt{11}-3}{\sqrt{2}}$

3. $x + \frac{\pi}{4}$ 7. $\frac{\pi}{4}$