# NCERT Solutions for Class 12 Maths Chapter 2 – Inverse Trigonometric Functions

## Exercise 2.1

**1.**

**Find the principle value of $sin^{-1}\left(-\frac{1}{2}\right)$**

**Ans -** Let $sin^{-1}\left(-\frac{1}{2}\right) = y$

$\Rightarrow \sin y = \left(-\frac{1}{2}\right) = -\sin\left(\frac{\pi}{6}\right) = \sin\left(-\frac{\pi}{6}\right).$

As we know that the range of the principle value branch of $sin^{-1}\ is\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]\ and\ \sin\left(-\frac{\pi}{6}\right) = \frac{1}{2}$

$\therefore$ the principle value of $sin^{-1}\left(-\frac{1}{2}\right)\ is\ -\frac{\pi}{6}.$

**2.**

**Find the principle value of $cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$.**

**Ans -** Let $cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = y.$

Then $\cos y = \left(\frac{\sqrt{3}}{2}\right) = \cos\left(\frac{\pi}{6}\right).$

As we know that the range of the principle value branch of $cos^{-1}\ is\ [0, \pi]\ and\ \cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$

$\therefore$ the principle value of $cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\ is\ \frac{\pi}{6}.$

**3.**

**Find the principle value of $cosec^{-1}(2)$.**

**Ans -** Let $cosec^{-1}(2) = y$.

Then, $cosec\ y = 2 = cosec\left(\frac{\pi}{6}\right)$.

As we know that the range of the principle value branch of $cosec^{-1}\ is\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}$.

$\therefore$ the principle value of $cosec^{-1}(2)$ is $\frac{\pi}{6}$.

**4.**

**Find the principle value of $tan^{-1}(-\sqrt{3})$**

**Ans -** Let $tan^{-1}(-\sqrt{3}) = y$,

Then, $\tan y = -\sqrt{3} = -\tan\frac{\pi}{3} = \tan\left(-\frac{\pi}{3}\right)$.

As we know that the range of the principle value branch of $tan^{-1}\ is\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]\ and\ \tan\left(-\frac{\pi}{3}\right)\ is\ -\sqrt{3}$.

$\therefore$ the principle value of $tan^{-1}(-\sqrt{3}) is -\frac{\pi}{3}$.

**5.**

**Find the principle value of $cos^{-1}\left(-\frac{1}{2}\right)$**

**Ans -** Let $cos^{-1}\left(-\frac{1}{2}\right) = y$.

Then, $\cos y = -\frac{1}{2} = -\cos\left(\frac{\pi}{3}\right) = \cos\left(\pi - \frac{\pi}{3}\right) = \cos\left(\frac{2\pi}{3}\right)$.

As we know that the range of the principle value branch of $cos^{-1}\ is\ [0, \pi]\ and\ \cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$

$\therefore$ the principle value of $cos^{-1}\left(-\frac{1}{2}\right)\ is\ \left(\frac{2\pi}{3}\right)$.

**6.**

**Find the value of $\boldsymbol{tan^{-1}(-1)}$**

**Ans -** Let $tan^{-1}(-1) = y$.

Then, $\tan y = -1 = -\tan\left(\frac{\pi}{4}\right) = \tan\left(-\frac{\pi}{4}\right)$.

As we know that the range of the principle value branch of $tan^{-1}$ *is* $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ *and* $\tan\left(-\frac{\pi}{4}\right) = -1$.

$\therefore$ the principle value of $tan^{-1}(-1)$ is $-\frac{\pi}{4}$.

**7.**

**Find the principle value of $\boldsymbol{sec^{-1}\left(\frac{2}{\sqrt{3}}\right)}$**

**Ans -** Let $sec^{-1}\left(\frac{2}{\sqrt{3}}\right) = y$.

Then $\sec y = \frac{2}{\sqrt{3}} = \sec\left(\frac{\pi}{6}\right)$.

As we know that the range of the principle value branch of $sec^{-1}$ *is* $[0, \pi] - \left\{\frac{\pi}{2}\right\}$ *and* $\sec\left(\frac{\pi}{6}\right) = \frac{2}{\sqrt{3}}$.

**8.**

**Find the principle value of $\boldsymbol{cot^{-1}\sqrt{3}}$.**

**Ans** - Let $cot^{-1}\sqrt{3} = y$. Then $\cot y = \sqrt{3} = \cot\left(\frac{\pi}{6}\right)$

As we know that the range of the principle value branch of $cot^{-1}$ *is* $[0, \pi]$ *and* $\cot\left(\frac{\pi}{6}\right) = \sqrt{3}$.

$\therefore$ the principle value of $cot^{-1}\sqrt{3} = \frac{\pi}{6}$.

**9.**

**Find the principle value of $\boldsymbol{cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)}$**

**Ans** - Let $cos^{-1}\left(-\frac{1}{\sqrt{2}}\right) = y.$

Then $\cos y = -\frac{1}{\sqrt{2}} = -\cos\left(\frac{\pi}{4}\right) = \cos\left(\pi - \frac{\pi}{4}\right) = \cos\left(\frac{3\pi}{4}\right)$

As we know that the range of the principle value branch of $cos^{-1}\ is\ [0, \pi]\ and\ \cos\left(\frac{3\pi}{4}\right) = -\frac{1}{\sqrt{2}}.$

∴ the principle value of $cos^{-1}\left(-\frac{1}{\sqrt{2}}\right)\ is\ \frac{3\pi}{4}.$

**10.**

**Find the principle value of $cosec^{-1}(-\sqrt{2})$**

**Ans -** Let $cosec^{-1}(-\sqrt{2}) = y.$

Then, $cosec\ y = -\sqrt{2} = -cosec\ \left(\frac{\pi}{4}\right) = cosec\ \left(-\frac{\pi}{4}\right).$

As we know that the range of the principle value branch of $cosec^{-1}\ is\ \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] - \{0\}\ and\ \operatorname{cosec}\left(-\frac{\pi}{4}\right) = -\sqrt{2}.$

∴ the principle value of $cosec^{-1}(-\sqrt{2})\ is\ -\frac{\pi}{4}.$

**11.**

**Find the value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right) + \sin^{-1}\left(-\frac{1}{2}\right)$**

**Ans -** Let $\tan^{-1}(1) = x$.

$Then, \tan x = 1 = \tan\left(\frac{\pi}{4}\right)$.

$\therefore \tan^{-1}(1) = \frac{\pi}{4}$

Let us assume, $\cos^{-1}\left(-\frac{1}{2}\right) = y$

Then, $\cos y = -\frac{1}{2} = -\cos\left(\frac{\pi}{3}\right) = \cos\left(\pi - \frac{\pi}{3}\right) = \cos\left(\frac{2\pi}{3}\right)$.

$\therefore \cos^{-1}\left(-\frac{1}{2}\right) = \frac{2\pi}{3}$

Let's again assume that $\sin^{-1}\left(-\frac{1}{2}\right) = z$

Then, $\sin z = -\frac{1}{2} = -\sin\left(\frac{\pi}{6}\right) = \sin\left(-\frac{\pi}{6}\right)$

$\therefore \sin^{-1}\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$

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

$= \frac{\pi}{4} + \frac{2\pi}{3} - \frac{\pi}{6}$

$= \frac{3\pi + 8\pi - 2\pi}{12} = \frac{9\pi}{12} = \frac{3\pi}{4}$

**12.**

**Find the value of $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$**

**Ans -** Let's consider, $\cos^{-1}\left(\frac{1}{2}\right) = x$

Then, $\cos x = \frac{1}{2} = \cos\left(\frac{\pi}{3}\right)$.

$\therefore \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$.

Let's assume $\sin^{-1}\left(\frac{1}{2}\right) = y$.

Then, $\sin y = \frac{1}{2} = \sin\left(\frac{\pi}{6}\right)$.

$$\therefore \sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{6}$$

$$\therefore \cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3} + 2 \times \frac{\pi}{6} = \frac{\pi}{3} + \frac{\pi}{3} = \frac{2\pi}{3}$$

**13.**

**If $\sin^{-1}x = y$, then**

(A) $0 \leq y \leq \pi$

(B) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$

(C) $0 < y < \pi$

(D) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

**Ans -** It is given that $\sin^{-1}x = y$.

As we know that the range of the principle value branch of $\sin^{-1}$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.

Therefore, $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$.

Hence option (B) is correct.

**14.**

**$\tan^{-1}\sqrt{3} - \sec^{-1}(-2)$ is equal to**

(A) $\pi$

(B) $-\pi/3$

(C) $\pi/3$

(D) $2\pi/3$

**Ans -** Let's consider, $\tan^{-1}\sqrt{3} = x$.

Then, $\tan x = \sqrt{3} = \tan\frac{\pi}{3}$

As we know that the range of the principle value branch of $\tan^{-1}$ is $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$. $\therefore$ $\tan^{-1}\sqrt{3} = \frac{\pi}{3}$.

Let assume, $\sec^{-1}(-2) = y$.

Then, $\sec y = -2 = -\sec\left(\frac{\pi}{3}\right) = \sec\left(\pi - \frac{\pi}{3}\right) = \sec\frac{2\pi}{3}$.

As we know that the range of the principle value branch of $\sec^{-1}$ is $[0, \pi] - \left\{\frac{\pi}{2}\right\}$. $\therefore$ $\sec^{-1}(-2) = \frac{2\pi}{3}$

Thus, $\tan^{-1}\sqrt{3} - \sec^{-1}(-2) = \frac{\pi}{3} - \frac{2\pi}{3} = -\frac{\pi}{3}$

Therefore, $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$.

## Exercise 2.1

**1.**

**Prove $3\sin^{-1}x = \sin^{-1}(3x - 4x^3), x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$**

**Ans -** Tom prove $3\sin^{-1}x = \sin^{-1}(3x - 4x^3), where\ x \in \left[-\frac{1}{2}, \frac{1}{2}\right]$

Let $x = \sin\theta$. Then, $\sin^{-1}x = \theta$.

We have given that,

R.H.S $\sin^{-1}(3x - 4x^3) = \sin^{-1}(3\sin\theta - 4sin^3\theta)$

$= \sin^{-1}(\sin 3\theta)$

$= 3\theta$

$= 3\sin^{-1}x = L.H.S$

Hence proved.

**2.**

**Prove $3\cos^{-1}x = \cos^{-1}(4x^3 - 3x), x \in \left[\frac{1}{2}, 1\right]$**

**Ans -** To prove $3\cos^{-1}x = \cos^{-1}(4x^3 - 3x), x \in \left[\frac{1}{2}, 1\right]$

Let $x = \cos\theta$. Then, $\cos^{-1}x = \theta$

We have given that,

R.H.S $= \cos^{-1}(4x^3 - 3x)$

$= \cos^{-1}(4cos^3\theta - 3\cos\theta)$

$= \cos^{-1}(\cos 3\theta)$

$= 3\theta$

$= 3\cos^{-1}x = L.H.S$

Hence proved.

**3.**

**Write the finction in the simplest form:**

$\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}, x \neq 0.$

$\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}, x \neq 0.$

**Ans -** $\tan^{-1}\frac{\sqrt{1+x^2}-1}{x}$

By putting $x = \tan\theta \to \theta = \tan^{-1}x$

$$\therefore \tan^{-1}\frac{\sqrt{1+x^2}-1}{x} = \tan^{-1}\frac{\sqrt{1+tan^2\theta}-1}{\tan\theta}$$

$$= \tan^{-1}\left(\frac{\sec\theta-1}{\tan\theta}\right) = \tan^{-1}\left(\frac{1-\cos\theta}{\sin\theta}\right)$$

$$\tan^{-1}\left(\frac{2\sin^2\left(\frac{\theta}{2}\right)}{2\sin\frac{\theta}{2}\cos\frac{\theta}{2}}\right)$$

$$= \tan^{-1}\left(\tan\frac{\theta}{2}\right) = \frac{\theta}{2} = \frac{1}{2}\tan^{-1}x$$

**4.**

**Write the function in the simplest form:**

$\tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right), x < \pi.$

**Ans -** Given that, $\tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right), x < \pi$

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

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

$$= \tan^{-1}\left(\frac{\sin\frac{x}{2}}{\cos\frac{x}{2}}\right)$$

$$= \tan^{-1}\left(\tan\frac{x}{2}\right)$$

$$= \frac{x}{2}$$

**5.**

**Write the function in the simplest form:**

$\mathbf{\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right), 0 < x < \pi.}$

**Ans -** We have given that, $\tan^{-1}\left(\frac{\cos x - \sin x}{\cos x + \sin x}\right)$

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

$$= \tan^{-1}\left(\frac{1-\tan x}{1+\tan x}\right)$$

$$= \tan^{-1}(1) - \tan^{-1}(\tan x)\left[\because \frac{-y}{x-xy} = \tan^{-1}x - \tan^{-1}y\right]$$

$$= \frac{\pi}{4} - x$$

**6.**

**Write the following function in the simplest form:**

$\tan^{-1}\frac{x}{\sqrt{a^2-x^2}}$ , $|x| < a$.

**Ans -** We have given that, $\tan^{-1}\frac{x}{\sqrt{a^2-x^2}}$.

Let's consider, $x = a\sin\theta \Rightarrow \frac{x}{a} = \sin\theta \Rightarrow \sin^{-1}\left(\frac{x}{a}\right)$

$$\therefore \tan^{-1}\frac{x}{\sqrt{a^2-x^2}}$$

$$= \tan^{-1}\frac{a\sin\theta}{\sqrt{a^2-a^2\sin^2\theta}}$$

$$= \tan^{-1}\left(\frac{a\sin\theta}{a\sqrt{1-\sin^2\theta}}\right)$$

$$= \tan^{-1}\left(\frac{a\sin\theta}{a\cos\theta}\right)$$

$$= \tan^{-1}(\tan\theta) = \theta = \sin^{-1}\frac{x}{a}$$

**7.**

**Write the function in the simplest form:** $\tan^{-1}\left(\frac{3a^2x-x^3}{a^3-3ax^2}\right)$

**Ans -** Consider, $\tan^{-1}\left(\frac{3a^2x-x^3}{a^3-3ax^2}\right)$

Let's consider, $x = \text{a} \tan\theta \Rightarrow \frac{x}{a} = \tan\theta \Rightarrow \theta = \tan^{-1}\left(\frac{x}{a}\right)$

$$\tan^{-1}\left(\frac{3a^2x - x^3}{a^3 - 3ax^2}\right)$$

$$= \tan^{-1}\left(\frac{3a^2.\text{a}\tan\theta - a^3\tan^3\theta}{a^3 - 3a.a^2\tan^2\theta}\right)$$

$$= \tan^{-1}\left(\frac{3a^3\tan\theta - a^3\tan^3\theta}{a^3 - 3\,a^3\tan^2\theta}\right)$$

$$= \tan^{-1}(\tan 3\,\theta)$$

$$= 3\theta$$

$$= 3\tan^{-1}\frac{x}{a}$$

**8.**

**Find the value of** $\tan^{-1}\left[2\cos\left(2\sin^{-1}\frac{1}{2}\right)\right]$

**Ans -** Let's consider, $\sin^{-1}\frac{1}{2} = x$

Then $\sin x = \frac{1}{2} = \sin\left(\frac{\pi}{6}\right)$

$\therefore \sin^{-1}\frac{1}{2} = \frac{\pi}{6}$

$\therefore \tan^{-1}\left[2\cos\left(2\sin^{-1}\frac{1}{2}\right)\right]$

$= \tan^{-1}\left[2\cos\left(2 \times \frac{\pi}{6}\right)\right]$

$= \tan^{-1}\left[2\cos\frac{\pi}{3}\right]$

$= \tan^{-1}\left[2 \times \frac{1}{2}\right]$

$= \tan^{-1}1 = \frac{\pi}{4}$

**9.**

**Find the value of** $\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2} + \cos^{-1}\frac{1-y^2}{1+y^2}\right], |x| < 1, y > 0 \text{ and } xy < 1$

**Ans -** Let consider, $x = \tan\theta$

Then, $\theta = \tan^{-1}x$.

$$\therefore \sin^{-1}\frac{2x}{1+x^2} = \sin^{-1}\left(\frac{2\tan\theta}{1+\tan^2\theta}\right)$$

$\sin^{-1}(\sin 2\theta)$

$= 2\theta$

$= 2\tan^{-1}x$

Let's assume, $y = \tan\theta$. Then, $\theta = \tan^{-1}y$.

$$\therefore \cos^{-1}\left(\frac{1-y^2}{1+y^2}\right)$$

$$= \cos^{-1}\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}\right)$$

$= \cos^{-1}(\cos 2\theta)$

$= 2\theta = 2\tan^{-1}y$

$$\therefore \tan\frac{1}{2}\left[\sin^{-1}\left(\frac{2x}{1+x^2}\right) + \cos^{-1}\left(\frac{1-y^2}{1+y^2}\right)\right]$$

$$= \tan\frac{1}{2}[2\tan^{-1}x + 2\tan^{-1}y]$$

$$\left[As, \tan^{-1}x + \tan^{-1}y = \tan^{-1}\frac{x+y}{1+xy}\right]$$

$$= \tan\left[\tan^{-1}\left(\frac{x+y}{1+xy}\right)\right]$$

$$= \frac{x+y}{1+xy}$$

**10.**

**Find the values of $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$**

**Ans -** Let's consider, $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$

As we know that $\sin^{-1}(\sin x) = x$

If $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, which is the principle value branch of $\sin^{-1}x$.

Here, $\frac{2\pi}{3} \notin \left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

Now, $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ can be written as:

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

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

$$= \sin^{-1}\left(\sin\frac{2\pi}{3}\right), where\ \frac{\pi}{3} \in \left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$$

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

**11.**

**Find the values of $\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$**

**Ans -** Let's consider, $\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$

As we know that $\tan^{-1}(\tan x) = x$

If $x \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$, which is the principle value branch of $\tan^{-1}x$. Here, $\frac{3\pi}{4} \notin \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$.

Now, $\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$ can be written as:

$$\tan^{-1}\left(\tan\frac{3\pi}{4}\right) = \tan^{-1}\left[-\tan\left(\frac{-3\pi}{4}\right)\right]$$
$$= \tan^{-1}\left[-\tan\left(\pi - \frac{\pi}{4}\right)\right]$$

$\tan^{-1}\left(\tan\frac{3\pi}{4}\right) = \tan^{-1}\left[-\tan\left(\frac{-\pi}{4}\right)\right]$ where $-\frac{\pi}{4} \in \left(-\frac{\pi}{2},\frac{\pi}{2}\right)$

$$\therefore\ \tan^{-1}\left(\tan\frac{3\pi}{4}\right) = \tan^{-1}\left[-\tan\left(\frac{-\pi}{4}\right)\right] = \frac{-\pi}{4}$$

**12.**

**Find the value of** $\tan\left(\sin^{-1}\frac{3}{5} + \cot^{-1}\frac{3}{2}\right)$

**Ans -** Let consider, $\sin^{-1}\frac{3}{5} = x$

Then, $\sin x = \frac{3}{5}$

$$\Rightarrow \cos x = \sqrt{1 - \sin^2 x} = \frac{4}{5}$$

$$\Rightarrow \sec x = \frac{5}{4}$$

$$\therefore \tan x = \sqrt{\sec^2 x - 1} = \sqrt{\frac{25}{16} - 1} = \frac{3}{4}$$

$$\therefore x = \tan^{-1}\frac{3}{4}$$

$$\therefore \sin^{-1}\frac{3}{5} = \tan^{-1}\frac{3}{4} \ldots\ldots (i)$$

Therefore, $\tan\left(\sin^{-1}\frac{3}{5} + \cot^{-1}\frac{3}{2}\right)$

$$= \tan\left(\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{2}{3}\right) \quad \textit{Using } (i) \textit{ and } (ii)$$

$$= \tan\left[\tan^{-1}\left(\frac{\frac{3}{4} + \frac{2}{3}}{1 - \frac{3}{4} \cdot \frac{2}{3}}\right)\right]$$

$$\left[As, \tan^{-1}x + \tan^{-1}y = \tan^{-1}\frac{x+y}{1-xy}\right]$$

$$= \tan\left(\tan^{-1}\frac{9+8}{12-6}\right)$$

$$= \tan\left(\tan^{-1}\frac{17}{6}\right) = \frac{17}{6}$$

**13.**

**Find the values of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is equal to**

**(A)** $\frac{7\pi}{6}$ **(B)** $\frac{5\pi}{6}$ **(C)** $\frac{\pi}{3}$ **(D)** $\frac{\pi}{6}$

**Ans -** As we know that $\cos^{-1}(\cos x) = x$ if $x \in [0, x]$, which is the principle value branch of $\cos^{-1}x$. Here, $\frac{7\pi}{6} \notin [0, \pi]$.

Now, $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ can be written as:

$$\cos^{-1}\left(\cos\frac{7\pi}{6}\right) = \cos^{-1}\left(\cos\frac{-7\pi}{6}\right) = \cos^{-1}\left(2\pi - \frac{7\pi}{6}\right) \; [\because +x = \cos x]$$

$$\therefore \cos^{-1}\left(\cos\frac{7\pi}{6}\right) = \cos^{-1}\left(\cos\frac{5\pi}{6}\right) = \frac{5\pi}{6}$$

The correct answer is B.

**14.**

**Find the values of $\sin\left(\frac{\pi}{3} - \sin^{-1}\left(-\frac{1}{2}\right)\right)$ is equal to**

**(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{4}$ (D) 1**

**Ans -** Let's consider, $\sin^{-1}\left(-\frac{1}{2}\right) = x$.

Then, $\sin x = -\frac{1}{2} = -\sin\frac{\pi}{6} = \sin\left(-\frac{\pi}{6}\right)$

As we know that the range of the Principal value branch of $\sin^{-1}$ is $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$. $\sin^{-1}\left(-\frac{1}{2}\right) = \frac{\pi}{6}$

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

$$= \sin\left(\frac{\pi}{3} + \frac{\pi}{6}\right) = \sin\left(\frac{3\pi}{6}\right) = \sin\left(\frac{\pi}{2}\right) = 1$$

The correct answer is D.

**15.**

**$\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3})$ *is equal to***

**(A) $\pi$ (B) $-\frac{\pi}{2}$ (C) 0 (D) $2\sqrt{3}$**

**Ans -** Suppose that,

$$A=\tan^{-1}(\sqrt{3})-\cot^{-1}(-\sqrt{3}) \qquad ...(i)$$

As we know that,

$$\cot^{-1}(-x)=\pi-\cot^{-1}(x)$$

So,

$$\cot^{-1}(-\sqrt{3})=\pi-\cot^{-1}(\sqrt{3})$$

Put the value in the equation (i)

$$A=\tan^{-1}(\sqrt{3})-\pi+\cot^{-1}(-\sqrt{3})$$

As we know that,

$$\cot^{-1}x=\frac{\pi}{2}-\tan^{-1}x$$

So,

$$\cot^{-1}(\sqrt{3})=\frac{\pi}{2}-\tan^{-1}(\sqrt{3})$$

Put the value in the equation (ii),

$$A=\tan^{-1}(\sqrt{3})-\pi+\frac{\pi}{2}-\tan^{-1}(\sqrt{3})$$

$$A=-\frac{\pi}{2}$$

Hence, the correct option is B.