

9th Math Exercise 6.4

Q. 1 Find the value of the following trigonometric ratios without using the calculator.

(i) $\sin 30^\circ$

Solution:

$$\sin 30^\circ = \frac{1}{2}$$

(ii) $\cos 30^\circ$

Solution:

$$\cos 30^\circ = \frac{\sqrt{3}}{2}$$

(iii) $\tan \frac{\pi}{6}$

Solution:

$$\begin{aligned}\tan 30^\circ &= \frac{1}{\sqrt{3}} \\ \left(\because \frac{\pi}{6} &= 30^\circ \right)\end{aligned}$$

(iv) $\tan 60^\circ$

Solution

$\tan 60^\circ$

$$\tan 60^\circ = \sqrt{3}$$

(v) $\sec 60^\circ$

Solution:

$$\begin{aligned}\sec 60^\circ &= \frac{1}{\cos 60^\circ} = 1 \div \cos 60^\circ \\ &= 1 \div \frac{1}{2} \\ &= 1 \times \frac{1}{\frac{1}{2}} = 2\end{aligned}$$

$\sec 60^\circ = 2$

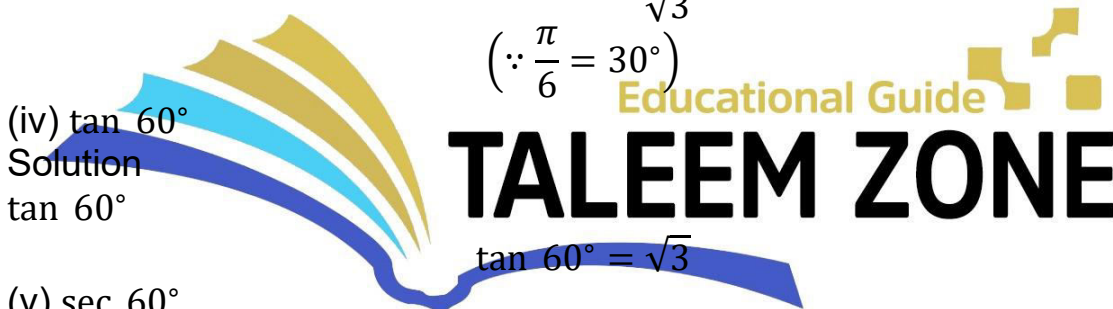
(vi) $\cos \frac{\pi}{3}$

Solution:

$$\begin{aligned}\cos \frac{\pi}{3} &= \cos 60^\circ = \frac{1}{2} \\ \left(\because \frac{\pi}{3} &= 60^\circ \right)\end{aligned}$$

(vii) $\cot 60^\circ$

Solution:



$$\cot 60^\circ = \frac{1}{\tan 60^\circ} = 1 \div \tan 60^\circ$$

$$= 1 \div \sqrt{3} = \frac{1}{\sqrt{3}}$$

$$\cot 60^\circ$$

$$\cot 60^\circ = \frac{1}{\sqrt{3}}$$

(viii) $\sin 60^\circ$

Solution:

$$\sin 60^\circ$$

$$\sin 60^\circ = \frac{\sqrt{3}}{2}$$

(ix) $\sec 30^\circ$

Solution:

$$\sec 30^\circ = \frac{1}{\cos 30^\circ} = 1 \div \cos 30^\circ$$

$$= 1 + \frac{\sqrt{1}}{2} = 1 \times \frac{2}{\sqrt{3}} = \frac{2}{\sqrt{1}}$$

$$\sec 30^\circ = \frac{2}{\sqrt{1}}$$

(s) $\operatorname{cosec} 30^\circ$

Solution:

$$\operatorname{cosec} 30^\circ = \frac{1}{\sin 10^\circ} = 1 \div \sin 20^\circ$$

$$= 1 + \frac{1}{2} = 1 \times \frac{2}{1} = 2$$

$$\operatorname{Cosec} 30^\circ = 2$$

(xi) $\sin 45^\circ$

Solution:

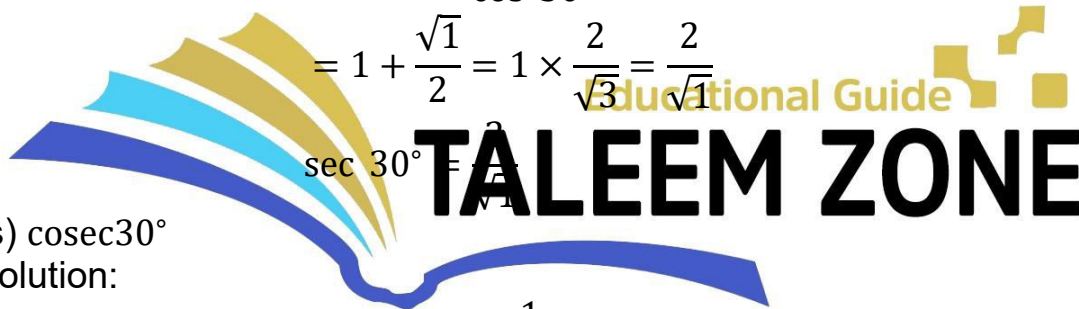
$$\sin 45^\circ = \frac{1}{\sqrt{2}}$$

(xii) $\cos \frac{\pi}{4}$

Solution

$$\cos \frac{\pi}{4} = \cos 45^\circ = \frac{1}{\sqrt{2}}$$

$$\left(\frac{\pi}{4} = 45^\circ\right)$$



Q. 2 Evaluate

(i) $2\sin 60^\circ \cos 60^\circ$

Solution:

$$2\sin 60^\circ \cos 60^\circ$$

$$2 \times \frac{\sqrt{3}}{2} \times \frac{1}{2}$$

$$= \frac{\sqrt{3}}{2}$$

(ii) $2\cos \frac{\pi}{6} \sin \frac{\pi}{6}$

Solution:

$$= 2\cos \frac{\pi}{6} \sin \frac{\pi}{6}$$

$$= -2\cos 30^\circ \sin 30^\circ$$

$$\left(\frac{\pi}{6} = 30^\circ\right)$$

$$= -2 \times \frac{\pi}{2} + \frac{1}{2}$$

$$= \frac{\sqrt{3}}{2}$$

(iii) $2\sin 45^\circ + 2\cos 45^\circ$

Solution :

$$2\sin 45^\circ + 2\cos 45^\circ$$

$$= 2 \times \frac{1}{\sqrt{2}} + 2 \times \frac{1}{\sqrt{2}}$$

$$= \frac{2}{\sqrt{2}} + \frac{2}{\sqrt{2}}$$

$$= \frac{2+2}{\sqrt{2}}$$

$$= \frac{4}{\sqrt{2}} = 2 \times \frac{2}{\sqrt{2}}$$

$$= 2\sqrt{2} \left(\because \frac{a}{\sqrt{a}} = \sqrt{a} \right)$$

(iv) $\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$

Solution :

$$\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$$

$$= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{1}{2} \cdot \frac{1}{2}$$

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$$\begin{aligned}
 &= \frac{(\sqrt{3})^2}{4} - \frac{1}{4} \\
 &= \frac{3}{4} - \frac{1}{4} \\
 &= \frac{3-1}{4} \\
 &= \frac{2}{4} \\
 &= \frac{1}{2}
 \end{aligned}$$

(v) $\cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ$

Solution :

$$\cos 60^\circ \cos 30^\circ - \sin 60^\circ \sin 30^\circ$$

$$\begin{aligned}
 &= \frac{1}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{3}}{2} \cdot \frac{1}{2} \\
 &= \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} \\
 &= \frac{\sqrt{3} - \sqrt{3}}{4} \\
 &= \frac{0}{4} = 0
 \end{aligned}$$

(vi) $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$

Solution:

$$\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$$

$$\begin{aligned}
 &= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \frac{1}{2} \\
 &= \frac{3}{4} - \frac{1}{4}
 \end{aligned}$$

$$= \frac{3-1}{4}$$

$$= \frac{2}{4}$$

$$= \frac{1}{2}$$

(vii) $\cos 60^\circ \cos 30^\circ + \sin 60^\circ \sin 30^\circ$

Solution:

Educational Guide

TALEEM ZONE

$$\begin{aligned}
 & \cos 60^\circ \cos 30^\circ + \sin 60^\circ \sin 30^\circ \\
 &= \frac{1}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{1}{2} \\
 &= \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} \\
 &= \frac{\sqrt{3} + \sqrt{3}}{4} \\
 &= \frac{2\sqrt{3}}{4} \\
 &= \frac{\sqrt{3}}{2}
 \end{aligned}$$

(viii) $\tan \frac{\pi}{6} \cot \frac{\pi}{6} + 1$

Solution:

$$\begin{aligned}
 & \tan \frac{\pi}{6} \cot \frac{\pi}{6} + 1 \left(\frac{\pi}{6} = 30^\circ \right) \\
 &= \frac{1}{\sqrt{3}} \sqrt{3} + 1
 \end{aligned}$$

Q. 3 If $\sin 45^\circ$ and $\cos 45^\circ$ equal to each, then find the value of the followings :

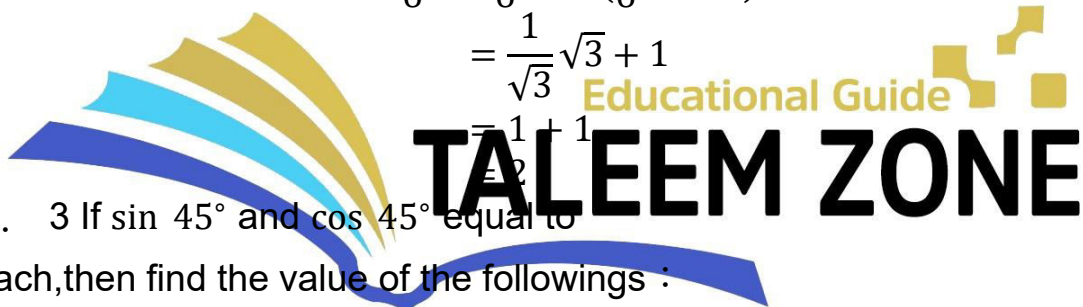
(i) $2\sin 45^\circ - 2\cos 45^\circ$

Solution :

$$\begin{aligned}
 & 2\sin 45^\circ - 2\cos 45^\circ \\
 &= 2 \times \frac{1}{\sqrt{2}} - 2 \times \frac{1}{\sqrt{2}} \\
 &= \frac{2-2}{\sqrt{2}} = \frac{0}{\sqrt{2}} = 0
 \end{aligned}$$

(ii) $3\cos 45^\circ + 4\sin 30^\circ$

Solution :



$$\begin{aligned}
 & 3\cos 45^\circ + 4\sin 30^\circ \\
 &= 3 \times \frac{1}{\sqrt{2}} + 4 \times \frac{1}{\sqrt{2}} \\
 &= \frac{3}{\sqrt{2}} + \frac{4}{\sqrt{2}} \\
 &= \frac{3+4}{\sqrt{2}} \\
 &= \frac{7}{\sqrt{2}}
 \end{aligned}$$

(iii) $5\cos 45^\circ - 3\sin 45^\circ$

Solution :

$$\begin{aligned}
 & 5\cos 45^\circ - 3\sin 45^\circ \\
 &= 5 \times \frac{1}{\sqrt{2}} - 3 \times \frac{1}{\sqrt{2}} \\
 &= \frac{5}{\sqrt{2}} - \frac{3}{\sqrt{2}} \\
 &= \frac{5-3}{\sqrt{2}} \\
 &= \frac{2}{\sqrt{2}} \\
 &= \sqrt{2}
 \end{aligned}$$

