NCERT Solutions For Class 10 Chapter 8 Introduction to Trigonometry Exercise 8.2

Q1. Evaluate:

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

(ii) $2\tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$

(iii) $\dfrac{\cos 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$

(iv) $\dfrac{\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ}{\sec 30^\circ + \cos 60^\circ + \cot 45^\circ}$

(v) $\dfrac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$

Ans: (i) $\sin 60^\circ \cos 30^\circ + \sin 30^\circ \cos 60^\circ$

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

$= \dfrac{3}{4} + \dfrac{1}{4} = \dfrac{4}{4}$ $=\mathbf{1}$

(ii) $2\tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$

$= 2(1)^2 + \left(\dfrac{\sqrt{3}}{2}\right)^2 - \left(\dfrac{\sqrt{3}}{2}\right)^2$

$= 2 + \dfrac{3}{4} - \dfrac{3}{4}$ $=\mathbf{2}$

(iii) $\dfrac{\cos 45^\circ}{\sec 30^\circ + \operatorname{cosec} 30^\circ}$

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

$= \dfrac{1}{\sqrt{2}} \times \dfrac{\sqrt{3}}{2+2\sqrt{3}} = \dfrac{\sqrt{3}}{\sqrt{2}\times 2\left(\sqrt{3}+1\right)}$

$= \dfrac{\sqrt{3}}{\sqrt{2}\times 2\left(\sqrt{3}+1\right)} \times \dfrac{\sqrt{3}-1}{\sqrt{3}-1}$

$= \dfrac{\sqrt{3}\left(\sqrt{3}-1\right)}{\sqrt{2}\times 2(3-1)} = \dfrac{\sqrt{3}\left(\sqrt{3}-1\right)}{4\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}} = \dfrac{3\sqrt{2}-\sqrt{6}}{8}$

$\sin 30^\circ + \tan 45^\circ - \operatorname{cosec} 60^\circ$

(iv) $\dfrac{\quad}{\sin 30^\circ + \cos 45^\circ + \cot 45^\circ}$

$$= \frac{\frac{1}{2}+1-\frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}}+\frac{1}{2}+1} = \frac{\frac{\sqrt{3}+2\sqrt{3}-4}{2\sqrt{3}}}{\frac{4+\sqrt{3}+2\sqrt{3}}{2\sqrt{3}}} = \frac{3\sqrt{3}-4}{3\sqrt{3}+4}$$

$$= \frac{3\sqrt{3}-4}{3\sqrt{3}+4} \times \frac{3\sqrt{3}-4}{3\sqrt{3}-4}$$

$$= \frac{27+16-24\sqrt{3}}{27-16} = \frac{43-24\sqrt{3}}{11}$$

(v) $\dfrac{5\cos^2 60^\circ + 4\sec^2 30^\circ - \tan^2 45^\circ}{\sin^2 30^\circ + \cos^2 30^\circ}$

$$= \frac{5\left(\frac{1}{2}\right)^2 + 4\left(\frac{2}{\sqrt{3}}\right)^2 - (1)^2}{\left(\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2}$$

$$= \frac{5\times\frac{1}{4}+4\times\frac{4}{3}-1}{\frac{1}{4}+\frac{3}{4}}$$

$$= \frac{\frac{1}{12}\times 67}{\frac{4}{4}} = \frac{67}{12}$$

Q2. Choose the correct option and justify:

(i) $\dfrac{2\tan 30^\circ}{1+\tan^2 30^\circ} =$

(A) $\sin 60^\circ$

(B) $\cos 60^\circ$

(C) $\tan 60^\circ$

(D) $\sin 30^\circ$

(ii) $\dfrac{1-\tan^2 45^\circ}{1+\tan^2 45^\circ} =$

(A) $\tan 90^\circ$

(B) 1

(B) 1

(C) $\sin 45^\circ$

(D) 0

(iii) $\sin 2A = 2\sin A$ is true when A =

(A) 0°

(B) 30°

(C) 45°

(D) 60°

(iv) $\frac{2\tan 30^\circ}{1-\tan^2 30^\circ}$ =

(A) $\cos 60^\circ$

(B) $\sin 60^\circ$

(C) $\tan 60^\circ$

(D) Non e of these

Ans: (i) (A) $\frac{2\tan 30^\circ}{1+\tan^2 30^\circ}$

$= \frac{2\times {}^{1}\!/\!{}_{\sqrt{3}}}{1+\left({}^{1}\!/\!{}_{\sqrt{3}}\right)^2}$

$= \frac{2}{\sqrt{3}}\times\frac{3}{3+1} = \frac{\sqrt{3}}{2} = \sin 60^\circ$

(ii) (D) $\frac{1-\tan^2 45^\circ}{1+\tan^2 45^\circ} = \frac{1-1}{1+1} = \frac{0}{2} = 0$

(iii) (A) Since A = 0, then

$\sin 2A = \sin 0^\circ = 0$ and $2\sin A = 2\sin 0^\circ$

$= 2\times 0 = 0$

$\therefore \sin 2A = \sin A$ when A = 0

(iv) (C) $\frac{2\tan 30^\circ}{1-\tan^2 30^\circ}$

$= \frac{2\times\frac{1}{\sqrt{3}}}{1-\left(\frac{1}{\sqrt{3}}\right)^2} = \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}}$

$= \frac{2}{\sqrt{3}} \times \frac{3}{3-1} = \sqrt{3} = \tan 60^\circ$

Q3. If $\tan(A+B) = \sqrt{3}$ and $\tan(A-B) = \frac{1}{\sqrt{3}}$; $0^\circ < A+B \le 90^\circ$; $A > B$, find A and B.

Ans: $\tan(A+B) = \sqrt{3}$

$\Rightarrow \tan(A+B) = \tan 60^\circ$

$\Rightarrow$ A + B = 60° ....(i)

$\tan(A-B) = \frac{1}{\sqrt{3}}$

$\Rightarrow \tan(A-B) = \tan 30^\circ$

$\Rightarrow$ A – B = 30° ....(ii)

On adding eq. (i) and (ii), we get,

2A = $90^\circ \Rightarrow$ A = 45°

On Subtracting eq. (i) and eq. (ii), we get

2B = $30^\circ \Rightarrow$ B = 15°

Q4. State whether the following are true or false. Justify your answer.

(i) $\sin(A+B) = \sin A + \sin B$

(ii) The value of $\sin\theta$ increases as θ increases.

(iii) The value of $\cos\theta$ increases as θ increases.

(iv) $\sin\theta = \cos\theta$ for all values of θ.

(v) $\cot A$ is not defined for $A = 0^\circ$.

Ans: (i) False, because

$\sin(A+B) = \sin(60^\circ + 30^\circ) = \sin 90^\circ = 1$

And $\sin A + \sin B = \sin 60^\circ + \sin 30^\circ = \frac{\sqrt{3}}{2} + \frac{1}{2} = \frac{\sqrt{3}+1}{2}$

$\therefore \sin(A+B) \neq \sin A + \sin B$

(ii) True, because

θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1

It is clear, the value of $\sin\theta$ increases as θ increases.

(iii) False, because

θ	0°	30°	45°	60°	90°
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0

It is clear, the value of $\cos\theta$ decreases as θ increases

(iv) False as it is only true for $\theta = 45^\circ$.

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

(v) True, because $\tan 0^\circ = 0$ and $\cot 0^\circ = \frac{1}{\tan 0^\circ}$

$= \frac{1}{0}$ i.e. undefined.

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