NCERT Solutions for Class 10 Maths Chapter 8 Introduction to Trigonometry EXERCISE 8.2

1. Evaluate the following:

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

Solution: (i) sin60° cos30° + sin30° cos 60°

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

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

= 1

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

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

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

= 2

(i) $\dfrac{co\sec 45}{\sec 30 + cosec\ 30}$

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

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

$= \frac{\sqrt{3}}{2\sqrt{2}+2\sqrt{6}}$

$= \frac{\sqrt{3}\left(2\sqrt{2}-2\sqrt{6}\right)}{\left(2\sqrt{2}+2\sqrt{6}\right)\left(2\sqrt{2}-2\sqrt{6}\right)}$

$= \frac{2\sqrt{3}\ (\sqrt{6}-\sqrt{2})}{16}$

$= \frac{3\sqrt{2}-\sqrt{6}}{8}$

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

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

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

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

$= \frac{\left(3\sqrt{3}-4\right)\left(3\sqrt{3}-4\right)}{\left(3\sqrt{3}+4\right)\left(3\sqrt{3}-4\right)}$

$= \frac{\left(3\sqrt{3}-4\right)\left(3\sqrt{3}-4\right)}{\left(3\sqrt{3}\right)\left(3\sqrt{3}\right)-4*4}$

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

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

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

$= \frac{5\left(\frac{1}{4}\right) + \left(\frac{16}{3}\right) - 1}{\frac{1}{4} + \frac{3}{4}}$

$= \frac{67}{12}$

2. Choose the correct option and justify your choice:

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

A.	sin 60°	B.	cos 60°
C.	tan 60°	D.	sin 30°

Solution: $\frac{2\left(\frac{1}{\sqrt{3}}\right)}{1 + \left(\frac{1}{\sqrt{3}}\right)\left(\frac{1}{\sqrt{3}}\right)}$

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

$= \frac{6}{4\sqrt{3}}$

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

Out of the given alternatives, only sin 60° = $\frac{\sqrt{3}}{2}$

Hence, (A) is correct

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

A.	tan 90°	B.	1
C.	sin 45°	D.	0

Solution: $\frac{1 - 1 * 1}{1 + 1 * 1}$

$= \frac{1 - 1}{1 + 1}$

$= \frac{0}{2}$

$= 0$

Hence, (D) is correct

(iii) Sin 2A = 2 sin A is true when A =

A. 0° B. 30°

C. 45° D. 60°

Solution: Out of the given alternatives, only A = 0° is correct

As

sin 2A = sin 0° = 0

2 sin A = 2sin 0° = 2(0) = 0

Hence, (A) is correct

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

A. Cos 60° B. sin 60°

C. tan 60° D.sin 30°

Solution: $\frac{2\left(\frac{1}{\sqrt{3}}\right)}{1-\frac{1}{\sqrt{3}}*\frac{1}{\sqrt{3}}}$

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

$= \sqrt{3}$

Out of the given alternatives, only tan 60° = $\sqrt{3}$

Hence, (C) is correct

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

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

tan (A + B) = tan 60°

A + B = 60^O (i)

tan (A – B) = $\frac{1}{\sqrt{3}}$

tan (A - B) = tan 30^O

A - B = 30 (ii)

On adding both equations, we obtain

2 A = 90

⇒ A = 45

From equation (i), we obtain

45 + B = 60

B = 15°

Therefore, ∠A = 45° and ∠B = 15°

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

(i) Sin (A + B) = sin A + sin B

(ii) The value of sin θ increases as θ increases

(iii) The value of cos θ increases as θ increases.

(iv) Sin θ = cos θ for all values of θ.

(v) Cot A is not defined for A = 0°

Solution: (i) sin (A + B) = sin A + sin B

Let A = 30° and B = 60°

sin (A + B) = sin (30° + 60°)

= sin 90°

= 1

sin A + sin B = sin 30° + sin 60°

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

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

Clearly, sin (A + B) ≠sin A + sin B

Hence, the given statement is false

(ii) The value of sin θ increases as θ increases in the interval of 0° < θ < 90° as sin 0° = 0

sin 30° = $\frac{1}{2} = 0.5$

sin 45° = $\frac{1}{\sqrt{2}}$ = 0.707

sin 60° = $\frac{\sqrt{3}}{2}$ = 0.886

sin 90° = 1

Hence, the given statement is true

(iii) cos 0° = 1

cos 30° = $\frac{\sqrt{3}}{2} = 0.866$

cos 45° = $\frac{1}{\sqrt{2}} = 0.707$

cos 60° = $\frac{1}{2} = 0.5$

cos 90° = 0

It can be observed that the value of cos θ does not increase in the interval of 0° < θ < 90°

Hence, the given statement is false

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

This is true when θ = 45°

As,

sin 45° = $\frac{1}{\sqrt{2}}$

cos 45° = $\frac{1}{\sqrt{2}}$

It is not true for all other values of θ

As sin 30° = $\frac{1}{2}$ and cos 30° = $\frac{\sqrt{3}}{2}$

Hence, the given statement is false

(v) cot A is not defined for A = 0°

cot A = $\frac{\cos A}{\sin A}$

cot 0° = $\frac{\cos 0}{\sin 0}$

= $\frac{1}{0} = undefined$

Hence, the given statement is true