# Class-10
## Exercise 8.2

| | $0^\circ$ | $30^\circ$ | $45^\circ$ | $60^\circ$ | $90^\circ$ |
|---|---|---|---|---|---|
| Sin A | 0 | $1/2$ | $1/\sqrt{2}$ | $\sqrt{3}/2$ | 1 |
| Cos A | 1 | $\sqrt{3}/2$ | $1/\sqrt{2}$ | $\frac{1}{2}$ | 0 |
| tan A | 0 | $1/\sqrt{3}$ | 1 | $\sqrt{3}$ | $\infty$ |
| Cosec A | $\infty$ | 2 | $\sqrt{2}$ | $\frac{2}{\sqrt{3}}$ | 1 |
| Sec A | 1 | $\frac{2}{\sqrt{3}}$ | $\sqrt{2}$ | 2 | $\infty$ |
| Cot A | $\infty$ | $\sqrt{3}$ | 1 | $\frac{1}{\sqrt{3}}$ | 0 |

1 Evaluate the following

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

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

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

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

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

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

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

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

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

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

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

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

$= \dfrac{\sqrt{3}}{2\sqrt{2}+2\sqrt{6}} \times \dfrac{2\sqrt{2}-2\sqrt{6}}{2\sqrt{2}-2\sqrt{6}}$

$= \dfrac{2\sqrt{6}-2\sqrt{18}}{(2\sqrt{2})^2-(2\sqrt{6})^2}$

$= \dfrac{2\sqrt{6}-2\sqrt{18}}{8-24} = \dfrac{2\sqrt{6}-6\sqrt{2}}{-16} = \dfrac{2(\sqrt{6}-3\sqrt{2})}{-16}$

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

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

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

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

$$= \frac{12\sqrt{3}-27-16+12\sqrt{3}}{16-27}$$

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

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

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

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

$$= \frac{\frac{5}{4} + \frac{16}{3} - 1}{\frac{1}{4} + \frac{3}{4}}$$

$$= \frac{15 + 64 - 12}{12}$$

$$= \frac{67}{12}$$

2. Choose the correct answer and justify your choice.

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

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

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

$= \frac{2/\sqrt{3}}{4/3}$

$= \frac{2}{\sqrt{3}} \times \frac{3}{4}$

$= \frac{\sqrt{3}}{2} = \sin 60^\circ$ Ans:. (A)

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

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

Ans:. (A) ie, $0^\circ$.

Justification If $A=0$ $\sin 2A = \sin 0 = 0$

$2\sin A = 2 \times 0 = 0$.

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

$= \frac{2\,(1/\sqrt{3})}{1-(1/\sqrt{3})^2}$

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

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

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

$= \sqrt{3} = \tan 60^\circ$ Ans: (C)

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

Given $\tan(A+B) = \sqrt{3} = \tan 60^\circ$

$\tan(A-B) = \frac{1}{\sqrt{3}} = \tan 30^\circ$

$\therefore A+B = 60^\circ$

$A-B = 30^\circ$

$2A = 90^\circ$

$\Rightarrow A = 45^\circ$

$\therefore 45^\circ + B = 60^\circ$

$\Rightarrow B = 60^\circ - 45^\circ = 15^\circ$

$\therefore A = 45^\circ$; $B = 15^\circ$

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

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

Let $A = 0°$ ; $B = 30°$

$\sin(A+B) = \sin(0+30°) = \sin 30° = 1/2$

$\sin 0° + \sin 30° = 0 + 1/2 = 1/2$.

But if $A = 30$; $B = 60°$

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

$\sin 30° = \frac{1}{2}$ $\sin 60° = \frac{\sqrt{3}}{2}$

$\sin 30° + \sin 60° = \frac{1}{2} + \frac{\sqrt{3}}{2} = \frac{\sqrt{3}+1}{2} \neq \sin 90°$

∴ It is not true.

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

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

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

(v) $\cot A$ is not defined for $A = 0°$ True.

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