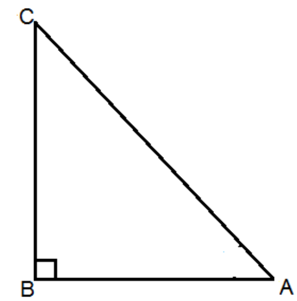
DAY 3

1. **In a right angle ΔABC, right angled at B, If $\tan A = 1$, then verify that $2\sin A.\cos A = 1$** **[Example 4]**

Sol :- Given $\tan A = 1 = \frac{1}{1} = \frac{\text{Perpendicular}}{\text{Base}}$



$\therefore$ Perpendicular(P) $= 1$ and Base(B) $= 1$

By Pythagoras Theorem, we have

$H^2 = P^2 + B^2 \quad \Rightarrow \quad H^2 = 1^2 + 1^2$

$\Rightarrow \quad H^2 = 1 \times 1 + 1 \times 1 \quad \Rightarrow \quad H^2 = 1 + 1 = 2 = \left(\sqrt{2}\right)^2$

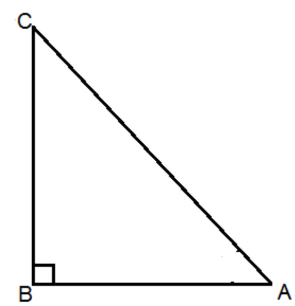
$\Rightarrow \quad \mathbf{H = \sqrt{2}}$

Now $\quad \sin A = \frac{P}{H} = \frac{1}{\sqrt{2}} \qquad \cos A = \frac{B}{H} = \frac{1}{\sqrt{2}}$

LHS: $2\sin A.\cos A$ $= 2 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}} = 2 \times \frac{1}{2} = 1 =$ RHS

2. **In ΔABC, right angled at B, if $\tan A = \frac{1}{\sqrt{3}}$ then find $\sin A.\cos C + \cos A.\sin C$ [Ex 8.1, Q9]**

Sol :- Given $\tan A = \frac{1}{\sqrt{3}} = \frac{\text{Perpendicular}}{\text{Base}}$



$\therefore$ Perpendicular(P) $= BC = 1$ and Base(B) $= AB = \sqrt{3}$

By Pythagoras Theorem, we have

$H^2 = P^2 + B^2 \quad \Rightarrow \quad H^2 = 1^2 + \left(\sqrt{3}\right)^2$

$\Rightarrow \quad H^2 = 1 \times 1 + \sqrt{3} \times \sqrt{3} \quad \Rightarrow \quad H^2 = 1 + 3 = 4 = (2)^2$

$\Rightarrow \quad \mathbf{H = 2}$

Now $\quad \sin A = \frac{P}{H} = \frac{1}{2}$ and $\cos A = \frac{B}{H} = \frac{\sqrt{3}}{2}$

For $\angle C$, Perpendicular $= AB = \sqrt{3}$ and Base $= BC = 1$

$\sin C = \frac{P}{H} = \frac{AB}{AC} = \frac{\sqrt{3}}{2}$ and $\cos C = \frac{B}{H} = \frac{BC}{AC} = \frac{1}{2}$

Now $\sin A.\cos C + \cos A.\sin C$ $= \frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \frac{1}{4} + \frac{3}{4} = \frac{1+3}{4} = \frac{4}{4} = \mathbf{1}$

3. **In ΔOPQ, right angled at P. $OP = 7\ cm$ and $OQ - PQ = 1\ cm$. Determine the values of $\sin Q$ and $\cos Q$.** **[Example 5]**

Sol :- Given $OP = 7\ cm$ and $OQ - PQ = 1\ cm$

Let $PQ = x$ then $OQ = 1 + x$

By Pythagoras Theorem:

$$OQ^2 = OP^2 + PQ^2 \quad \Rightarrow \quad (1+x)^2 = 7^2 + x^2$$

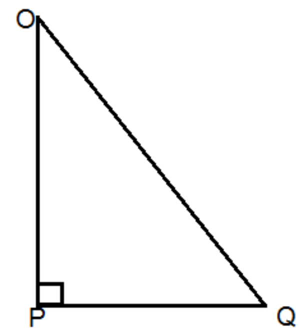
$$\Rightarrow 1 + x^2 + 2x = 49 + x^2 \quad \Rightarrow \quad x^2 + 2x + 1 - 49 - x^2 = 0$$

$$\Rightarrow \quad 2x - 48 = 0 \quad \Rightarrow \quad 2x = 48$$

$$\Rightarrow \quad x = \frac{48}{2} = \mathbf{24}$$

$\therefore PQ = x = 24$ and $OP = 1 + x = 1 + 24 = 25$

For Q: $\sin Q = \frac{P}{H} = \frac{7}{25}$ and $\cos Q = \frac{B}{H} = \frac{24}{25}$



EXERCISE

1. In a right angle ΔABC, right angled at C, If $AB = 29$, $BC = 21$ and $\angle B = \theta$, then find
   i) $\sin^2\theta + \cos^2\theta$ **ii**) $\cos^2\theta - \sin^2\theta$
2. Ex 8.1, Q 7,8,9,10