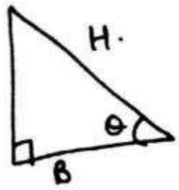
CLASS 65

TRIGONOMETRY

\#



$\sin\theta = \frac{P}{H}$

$\operatorname{cosec}\theta = \frac{H}{P}$

$\sin\theta \times \operatorname{cosec}\theta = 1$

$\cos\theta = \frac{B}{H}$

$\sec\theta = \frac{H}{B}$

$\cos\theta \times \sec\theta = 1$

L A L
K K A

P B P
H H B

$\tan\theta = \frac{P}{B}$

$\cot\theta = \frac{B}{P}$

$\tan\theta \times \cot\theta = 1$

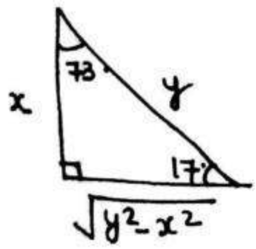
$\tan\theta = \frac{\sin\theta}{\cos\theta}$

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

\#

	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞
$\operatorname{cosec}\theta$	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
$\sec\theta$	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
$\cot\theta$	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

(1) if $\sin 17^\circ = \frac{x}{y}$. find $\sec 17^\circ - \sin 73^\circ$



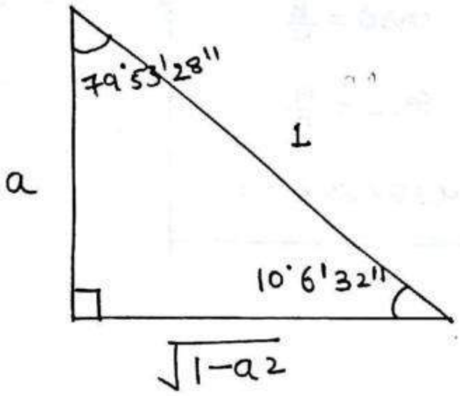
$\sin 17^\circ = \frac{x \text{ — } P}{Y \text{ — } H}$

$\sec 17^\circ - \sin 73 = \frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$

$\Rightarrow \frac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}} \Rightarrow \frac{x^2}{y\sqrt{y^2 - x^2}}$ Ans.

(2) If $\sin(10^\circ 6' 32'') = a$

$\cos(79^\circ 53' 28'') + \tan(10^\circ 6' 32'') = ?$



$$= \frac{a}{1} + \frac{a}{\sqrt{1-a^2}}$$

$$= \frac{a(\sqrt{1-a^2}) + a}{\sqrt{1-a^2}}$$

$\cos\theta = \frac{B}{H}$

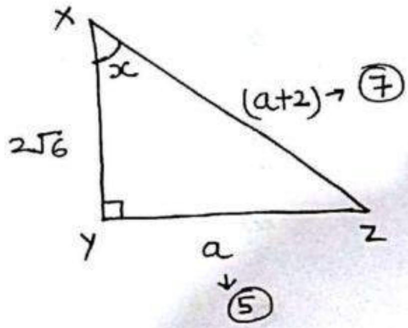
$\tan\theta = \frac{P}{B}.$

---

(3) in a Δxyz, $\angle Y = 90^\circ$

$XY = 2\sqrt{6}$ $\quad \sec x + \tan x = ?$

$XZ - YZ = 2$



$$(2\sqrt{6})^2 + a^2 = (a+2)^2$$

$$\downarrow$$

$$24 + 25 = (5+2)^2$$

$$\boxed{a=5}$$

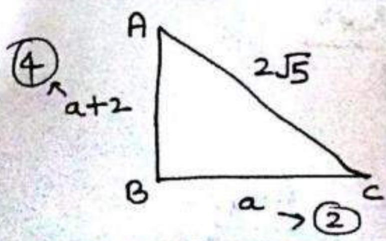
(Put values of a to satisfy eqn)

$$\sec x + \tan x = \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}} = \frac{12}{2\sqrt{6}} = \frac{6}{\sqrt{6}} = \sqrt{6} \text{ Ans}$$

---

(4) In a ΔABC, $\angle B = 90^\circ$

$AB - BC = 2$, $AC = 2\sqrt{5}$ $\quad \cos^2 A - \cos^2 C = ?$



$$(a+2)^2 + a^2 = (2\sqrt{5})^2$$

$$\underset{\downarrow 2}{(a+2)^2} + a^2 = 20$$

$$\boxed{a=2}$$

(a=2 will satisfy the relation)

$\cos^2 A - \cos^2 C = \left(\frac{4}{2\sqrt{5}}\right)^2 - \left(\frac{2}{2\sqrt{5}}\right)^2$

$\Rightarrow \frac{16}{20} - \frac{4}{20} = \frac{12}{20} = \frac{3}{5}$ Ans.

---

(5) $2\sin\alpha + 15\cos^2\alpha = 7$, $0° < \alpha < 90°$

$\cot\alpha = ?$

A) $\frac{3}{4}$ B) $\frac{5}{4}$ C) $\frac{1}{2}$ D) $\frac{1}{4}$

$\cot\alpha = \frac{B}{P}$. $2\sin\alpha + 15\cos^2\alpha = 7$

यहां root नहीं बनना चाहिए। (square है, so यहाँ root नहीं बनेगा)

∴ जो भी value होगी वो natural no. में आ रही होगी (Triplet बन रहा होगा)

only option A satisfies this condition.

$\cot\alpha = \frac{B}{P} = \frac{3}{4}$, $H = 5$.

∴ $\boxed{\cot\alpha = \frac{3}{4}}$ Ans.

$2\sin\alpha + 15\cos^2\alpha = 7$

$2\times\frac{4}{5} + \cancel{15}^{3}\times\frac{9}{\cancel{25}_{5}}$

$\frac{8}{5} + \frac{27}{5} = \frac{35}{5} = 7$ (satisfies)

(*) if we take option B.

$\cot\alpha = \frac{B}{P} = \frac{5}{4}$, $H = \sqrt{41}$

∴ $2\sin\alpha + 15\cos^2\alpha = 7$

$\underbrace{2\times\frac{4}{\sqrt{41}} + 15\times\left(\frac{5}{\sqrt{41}}\right)^2}$

ये कभी Add नहीं होगा ।

OR

$$2\sin\alpha + 15(1-\sin^2\alpha) = 7$$

$$2\sin\alpha + 15 - 15\sin^2\alpha = 7$$

$$-15\sin^2\alpha + 2\sin\alpha + 8 = 0$$

$$15\sin^2\alpha - 2\sin\alpha - 8 = 0$$

$$15\sin^2\alpha - 12\sin\alpha + 10\sin\alpha - 8 = 0$$

$$3\sin\alpha[5\sin\alpha - 4] + 2[5\sin\alpha - 4] = 0$$

$$[3\sin\alpha + 2][5\sin\alpha - 4] = 0$$

$3\sin\alpha + 2 = 0$

$\sin\alpha = \frac{-2}{3}$

$5\sin\alpha = 4$

$\sin\alpha = \frac{4}{5}\,\frac{-P}{-H}$, $B = 3$

$\therefore \boxed{\cot\alpha = \frac{3}{4}}$ Ans

---

(6) $2 - \cos^2\theta = 3\sin\theta \cdot \cos\theta.,\quad \tan\theta = ?$ A) $\frac{1}{2}$ B) 0 C) $\frac{2}{3}$ D) $\frac{1}{3}$

Put values from options.

A) $\tan\theta = \frac{1}{2}\,\frac{-P}{-B}$, $H = \sqrt{5}$

$$2 - \cos^2\theta = 3\sin\theta \cdot \cos\theta$$

$$2 - \frac{4}{5} = 3 \times \frac{1}{\sqrt{5}} \times \frac{2}{\sqrt{5}}$$

$$\frac{6}{5} = \frac{6}{5}$$ (Relation satisfied)

$\therefore \boxed{\tan\theta = \frac{1}{2}}$ Ans.

#

$$\sec^2\theta - \tan^2\theta = 1$$
$$\sec^2\theta = 1 + \tan^2\theta$$
$$\tan^2\theta = \sec^2\theta - 1$$

$$(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) =$$
$$(\sec\theta - \tan\theta) = \frac{1}{(\sec\theta + \tan\theta)}$$
$$(\sec\theta + \tan\theta) = \frac{1}{(\sec\theta - \tan\theta)}$$

(7) $\sec\theta + \tan\theta = 3$, $\cos\theta = ?$

$$\underbrace{(\sec\theta - \tan\theta)}_{\therefore \frac{1}{3}}\ \underbrace{(\sec\theta + \tan\theta)}_{3} = 1$$

$\left(\sec\theta - \tan\theta = \dfrac{1}{\sec\theta + \tan\theta} \right.$

$$\sec\theta + \cancel{\tan\theta} = 3$$
$$\sec\theta - \cancel{\tan\theta} = \frac{1}{3}$$
$$2\sec\theta = \frac{10}{3}$$
$$\sec\theta = \frac{5}{3} \qquad \therefore \boxed{\cos\theta = \frac{3}{5}} \quad \underline{\text{Ans}}$$

#

$$\csc^2\theta - \cot^2\theta = 1$$
$$\csc^2\theta = 1 + \cot^2\theta$$
$$\cot^2\theta = \csc^2\theta - 1$$

$$\underbrace{(\csc\theta - \cot\theta)}_{x} \times \underbrace{(\csc\theta + \cot\theta)}_{\frac{1}{x}} = 1$$

(8) $\csc\theta + \cot\theta = 2 + \sqrt{5}$, $\sin\theta = ?$

$$\csc\theta + \cancel{\cot\theta} = \sqrt{5} + 2$$
$$\csc\theta - \cancel{\cot\theta} = \sqrt{5} - 2$$
$$\cancel{2}\csc\theta = \cancel{2}\sqrt{5}$$
$$\csc\theta = \sqrt{5}$$
$$\therefore \boxed{\sin\theta = \frac{1}{\sqrt{5}}} \quad \underline{\text{Ans}}$$

(#)

$$\boxed{\begin{aligned} &\sin^2\theta+\cos^2\theta=1\\ &\sin^2\theta = 1-\cos^2\theta\\ &\cos^2\theta = 1-\sin^2\theta\end{aligned}}$$

(9) if $\sin\theta+\sin^2\theta=1$

$\cos^{12}\theta+3\cos^{10}\theta+3\cos^8\theta+\cos^6\theta+64=?$

$a^3 + 3a^2b + 3ab^2 + b^3 + 64$

$(\cos^4\theta+\cos^2\theta)^3+64$ $\left[\begin{aligned} a&=\cos^4\theta\\ b&=\cos^2\theta\end{aligned}\right.$

(*) अगर दो जगह 3 हो तो Try to make cube of $(a+b)$ or $(a-b)$

$\Rightarrow \sin\theta+\sin^2\theta=1$

$\sin\theta = 1-\sin^2\theta$

$\sin\theta = \cos^2\theta$

$\sin^2\theta = \cos^4\theta$

$\therefore (\sin^2\theta+\cos^2\theta)^3+64 = 65$ Ans.

(10) if $\sin\theta+\sin^2\theta+\sin^3\theta=1$, $\cos^6\theta-4\cos^4\theta+8\cos^2\theta=?$

$\sin\theta+\sin^3\theta = 1-\sin^2\theta$

$\sin\theta(1+\sin^2\theta) = \cos^2\theta$

$\sin\theta(1+1-\cos^2\theta)=\cos^2\theta$

$\sin\theta(2-\cos^2\theta)=\cos^2\theta$

squaring. (for making $\sin\theta$ into $\cos\theta$)

$\Rightarrow \sin^2\theta(2-\cos^2\theta)^2=\cos^4\theta$

$\Rightarrow (1-\cos^2\theta)[4+\cos^4\theta-4\cos^2\theta]=\cos^4\theta$

$\Rightarrow 4+\cancel{\cos^4\theta}-4\cos^2\theta-4\cos^2\theta-\cos^6\theta+4\cos^4\theta=\cancel{\cos^4\theta}$

$\Rightarrow -\cos^6\theta+4\cos^4\theta-8\cos^2\theta=-4$

$\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$ **Ans**

(11) if $\cos\theta + \cos^2\theta = 1$, $\sin^8\theta + a\sin^6\theta + \sin^4\theta$

$\downarrow a^2$ $\downarrow 2ab$ $\downarrow b^2$

$\cos\theta = 1 - \cos^2\theta$

$\cos\theta = \sin^2\theta$

$\cos^2\theta = \sin^4\theta$

$(\sin^4\theta + \sin^2\theta)^2$

$(\cos^2\theta + \sin^2\theta)^2 = 1$ **Ans**

(12) If $(1+\sin\theta)(1+\sin\alpha)(1+\sin\beta) = (1-\sin\theta)(1-\sin\alpha)(1-\sin\beta) =$

A) $\pm \cos\theta \cdot \cos\alpha \cdot \cos\beta$.

B) $\pm \cos^2\theta \cdot \cos^2\alpha \cdot \cos^2\beta$

c) $\pm \sec\theta \cdot \sec\alpha \cdot \sec\beta$

D) $\pm \sin\theta \cdot \sin\alpha \cdot \sin\beta$.

$(1+\sin\theta)(1+\sin\alpha)(1+\sin\beta) = (1-\sin\theta)(1-\sin\alpha)(1-\sin\beta) = x$

$\Rightarrow x = (1+\sin\theta)(1+\sin\alpha)(1+\sin\beta)$

$x = (1-\sin\theta)(1-\sin\alpha)(1-\sin\beta)$

$x^2 = \cos^2\theta \cdot \cos^2\alpha \cdot \cos^2\beta$

$x = \pm \cos\theta \cos\alpha \cos\beta$. **Ans**

$\because (1+\sin\theta)(1-\sin\theta)$

$= 1^2 - \sin^2\theta$

$= \cos^2\theta$.

(#) if $ax + by = m$ (same coff.)

$bx - ay = n$

Then $(a^2+b^2)(x^2+y^2) = m^2+n^2$

(#) $a\sin\theta + b\cos\theta = m$ (same coff.)

$b\sin\theta - a\cos\theta = \sqrt{a^2+b^2-m^2}$

(13) $\frac{x}{a}\sin\theta + \frac{y}{b}\cos\theta = \frac{1}{2}$

$\frac{y}{b}\sin\theta - \frac{x}{a}\cos\theta = ?$

$\frac{y}{b}\sin\theta - \frac{x}{a}\cos\theta = \sqrt{\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{1}{4}}$ Ans.

---

(14) $1\sin\theta + 1\cos\theta = \frac{2}{3}$

$1\sin\theta - 1\cos\theta = ?$

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

$= \sqrt{2-\frac{4}{9}} = \sqrt{\frac{14}{9}} = \frac{\sqrt{14}}{3}$ Ans.

---

(15) $1\sin\theta + 1\cos\theta = \frac{17}{13}$

$1\sin\theta - 1\cos\theta = ?$

$\sin\theta - \cos\theta = \sqrt{1^2+1^2-\left(\frac{17}{13}\right)^2}$

$= \sqrt{2-\frac{289}{169}} = \sqrt{\frac{338-289}{169}}$

$= \sqrt{\frac{49}{169}} = \frac{7}{13}$ Ans.

---

(16) $3\sin\theta + 4\cos\theta = 5.$, $\tan\theta = ?$

$4\sin\theta - 3\cos\theta = \sqrt{3^2+4^2-5^2} = 0$

$4\sin\theta - 3\cos\theta = 0$

$4\sin\theta = 3\cos\theta$

$\frac{\sin\theta}{\cos\theta} = \frac{3}{4}$

$\tan\theta = \frac{3}{4}$

OR $3\sin\theta + 4\cos\theta = 5$ (3, 4, 5 Triplet बन रहा।)

$\downarrow P$ $\downarrow B$

अगर Triplet बन रहा हो तो sin के साथ वाला Perpendicular होता है और cos के साथ वाला Base होता है।

$\therefore \tan\theta = \frac{P}{B} = \frac{3}{4}$ Ans.

CLASS 66

(17) $(a^2-b^2)\sin\theta + 2ab\cos\theta = a^2+b^2$, $\tan\theta = ?$

$(a^2-b^2) \rightarrow P$, $2ab \rightarrow B$

Triplet बन रहा है।

$\tan\theta = \frac{P}{B} = \frac{a^2-b^2}{2ab}$ Ans.

(18) $x\sin\theta - y\cos\theta = \sqrt{x^2+y^2}$

$\frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$

Then which option is right.

A) $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$

B) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

C) $\frac{x^2}{b^2} - \frac{y^2}{a^2} = 1$

D) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$x\sin\theta - y\cos\theta = \sqrt{x^2+y^2}$

$\underbrace{\frac{x}{\sqrt{x^2+y^2}}}_{\sin\theta}\sin\theta + \underbrace{\frac{(-y)}{\sqrt{x^2+y^2}}}_{\cos\theta}\cos\theta = 1$

$\Rightarrow \frac{\cos^2\theta}{a^2} + \frac{\sin^2\theta}{b^2} = \frac{1}{x^2+y^2}$

$\frac{y^2}{(x^2+y^2)a^2} + \frac{x^2}{(x^2+y^2)b^2} = \frac{1}{x^2+y^2}$

$\Rightarrow \frac{1}{\cancel{x^2+y^2}}\left(\frac{y^2}{a^2} + \frac{x^2}{b^2}\right) = \frac{1}{\cancel{x^2+y^2}}$

(*) $\sin^2\theta + \cos^2\theta = 1$

$\underbrace{\sin\theta}_{\frac{x}{\sqrt{x^2+y^2}}}\sin\theta + \underbrace{\cos\theta}_{\frac{-y}{\sqrt{x^2+y^2}}}\cos\theta = 1$

$\therefore \frac{y^2}{a^2} + \frac{x^2}{b^2} = 1$ Ans.

(18) $3\sin\theta + 4\cos\theta = 5$

$\left(\frac{3}{5}\right)\sin\theta + \left(\frac{4}{5}\right)\cos\theta = 1$

$\downarrow$ $\sin\theta$ $\downarrow$ $\cos\theta$

$\sin^2\theta + \cos^2\theta = 1$

$\therefore \sin\theta = \frac{3}{5}, \quad \cos\theta = \frac{4}{5}$

(19) $10\sin^4\theta + 15\cos^4\theta = 6$

find $27\operatorname{cosec}^6\theta + 8\sec^6\theta$

$\Rightarrow \frac{10}{6}\sin^4\theta + \frac{15}{6}\cos^4\theta = 1$

$\left(\frac{5}{3}\right)\sin^4\theta + \left(\frac{5}{2}\right)\cos^4\theta = 1$

$\downarrow \frac{1}{\sin^2\theta}$ $\downarrow \frac{1}{\cos^2\theta}$ $\left(\because \sin^2\theta + \cos^2\theta = 1\right)$

$\frac{1}{\sin^2\theta} = \operatorname{cosec}^2\theta = \frac{5}{3}$

$\frac{1}{\cos^2\theta} = \sec^2\theta = \frac{5}{2}$

$\Rightarrow 27(\operatorname{cosec}^2\theta)^3 + 8(\sec^2\theta)^3$

$= 27\left(\frac{5}{3}\right)^3 + 8\left(\frac{5}{2}\right)^3$

$= \cancel{27} \times \frac{125}{\cancel{27}} + \cancel{8} \times \frac{125}{\cancel{8}}$

$= 250$ Ans.

OR

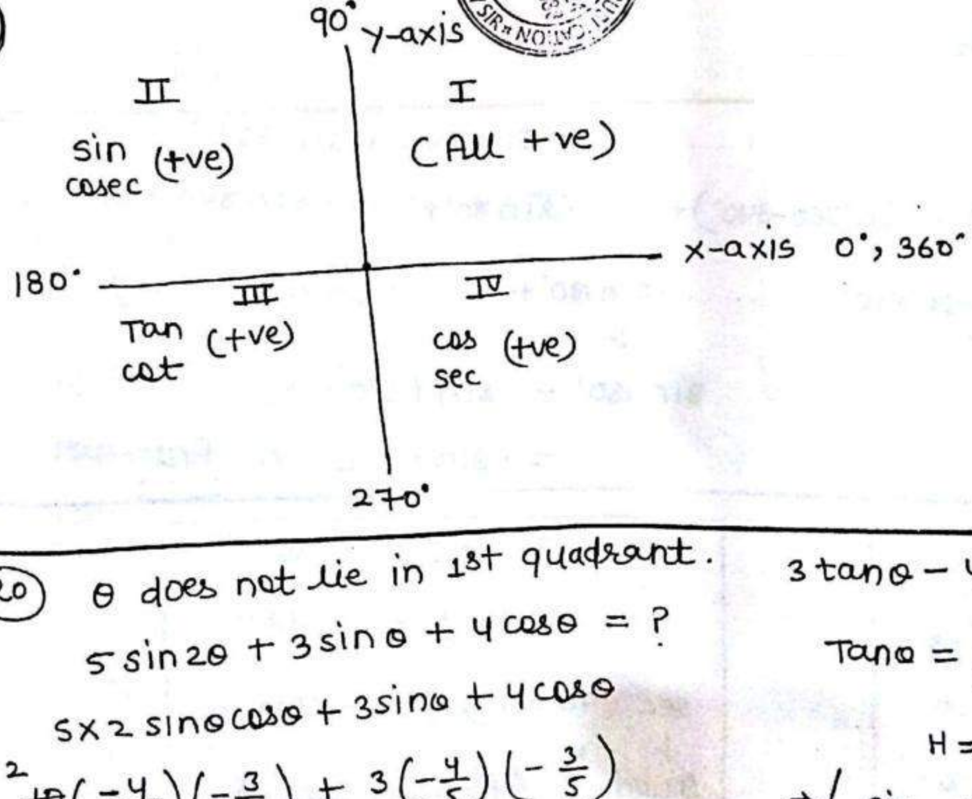
$$10\frac{\sin^4\theta}{\cos^4\theta} + 15\frac{\cos^4\theta}{\cos^4\theta} = \frac{6}{\cos^4\theta}$$

$$10\tan^4\theta + 15 = 6\sec^4\theta$$
$$= 6(\sec^2\theta)^2$$
$$= 6(1+\tan^2\theta)^2$$
$$10\tan^4\theta + 15 = 6(1+\tan^4\theta+2\tan^2\theta)$$

$$\Rightarrow 4\tan^4\theta - 12\tan^2\theta + 9 = 0$$
$$(2\tan^2\theta - 3)^2 = 0$$
$$\therefore\ 2\tan^2\theta - 3 = 0$$
$$\tan^2\theta = \frac{3}{2}$$
$$\Rightarrow \cot^2\theta = \frac{2}{3}$$

$$27(\csc^2\theta)^3 + 8(\sec^2\theta)^3$$
$$= 27(1+\cot^2\theta)^3 + 8(1+\tan^2\theta)^3$$
$$27\left(1+\frac{2}{3}\right)^3 + 8\left(1+\frac{3}{2}\right)^3$$
$$\cancel{27}\times\frac{125}{\cancel{27}} + \cancel{8}\times\frac{125}{\cancel{8}}$$
$$125+125 = 250 \quad \text{Ans.}$$

#



---

(20) θ does not lie in 1st quadrant. $\quad 3\tan\theta - 4 = 0$

$$\tan\theta = \frac{4}{3}\ \frac{P}{B} \quad \left(\because \theta \text{ is in } 3^{rd} \text{ quad}\right)$$
$$H = 5$$

$$5\sin 2\theta + 3\sin\theta + 4\cos\theta = ?$$
$$5\times 2\sin\theta\cos\theta + 3\sin\theta + 4\cos\theta$$
$$\overset{2}{\cancel{10}}\left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right) + 3\left(-\frac{4}{5}\right)\left(-\frac{3}{5}\right)$$
$$\frac{24}{5} - \frac{12}{5} - \frac{12}{5} = 0 \quad \text{Ans}$$

$\Rightarrow$ (sin, cos are (−ve) in 3rd quad., so (−ve) value is taken)

$$\boxed{\begin{array}{l} (x\text{-axis} \pm \theta) \rightarrow \text{No change} \\ \sin(360+\theta) = +\sin\theta \\ \cos(180-\theta) = -\cos\theta \\ \tan(180+\theta) = +\tan\theta \end{array}}$$

⇒ Sign (+ or −) will be determined acc. to the quadrant.

---

(21) A, B, C, D are the vertex of a cyclic quadrilateral. find $\cos A + \cos B + \cos C + \cos D$ -

$A + C = 180^\circ$	$B + D = 180^\circ$
$C = 180^\circ - A$	$D = 180^\circ - B$

$\cos A + \cos B + \cos(180 - A) + \cos(180 - B)$

$\cancel{\cos A} + \cancel{\cos B} - \cancel{\cos A} - \cancel{\cos B}$

$= 0$ **Ans.**

(180 − A = 2nd quad. 2nd quad. में cos (−ve) होता है)

---

(22) $\sin 10^\circ + \sin 20^\circ + \ldots\ldots\ldots\ldots + \sin 340^\circ + \sin 350^\circ$

$\sin(360^\circ - 350^\circ) + \sin(360 - 340^\circ) + \ldots\ldots \sin 180^\circ + \ldots\ldots \sin 340 + \sin 350$

$-\cancel{\sin 350^\circ} - \cancel{\sin 340^\circ} \ldots\ldots\ldots + \sin 180^\circ + \ldots\ldots + \cancel{\sin 340^\circ} + \cancel{\sin 350^\circ}$

↓

$\sin 180^\circ = \sin(180 + 0)$

$= -\sin 0 = 0$ **Ans.**

$$\boxed{\begin{array}{l} (y\text{-axis} \pm \theta) \\ \text{changes like} \\ \sin\theta \rightleftarrows \cos\theta \\ \tan\theta \rightleftarrows \cot\theta \\ \text{cosec}\,\theta \rightleftarrows \sec\theta \end{array}}$$

$$\boxed{\begin{array}{l} \tan(270+\theta) = -\cot\theta \\ \sin(270+\theta) = -\cos\theta \\ \sec(90+\theta) = -\text{cosec}\,\theta \\ \downarrow \\ \text{Quad. में इसको check करना है।} \end{array}}$$

(23) if $A+B = 90^\circ$

$\sin^2 A + \sin^2 B = ?$

$A+B = 90^\circ \Rightarrow B = 90 - A$

$\sin^2 A + \sin^2(90-A)$

$\sin^2 A + \cos^2 A$

$= 1$ Ans.

(#)

$$\boxed{\begin{array}{l} \text{if } A+B = 90^\circ \\ \sin^2 A + \sin^2 B = 1 \\ \cos^2 A + \cos^2 B = 1 \end{array}}$$

(#)

$$\boxed{\begin{array}{l} \text{if } A+B = 90^\circ \\ \sin A \cdot \sec B = 1 \\ \cos A \cdot \operatorname{cosec} B = 1 \end{array}}$$

(24) if $A+B = 90^\circ$

$\sin A \cdot \sec B = ?$

$A+B = 90^\circ$

$B = 90 - A$

$\sin A \cdot \sec(90-A)$

$\sin A \cdot \operatorname{cosec} A$

$\cancel{\sin A} \cdot \frac{1}{\cancel{\sin A}}$

$= 1$ Ans.

(#)

$$\boxed{\begin{array}{l} \text{if } A+B = 90^\circ \\ \tan A \cdot \tan B = 1 \\ \cot A \cdot \cot B = 1 \end{array}}$$

(#)

$$\boxed{\begin{array}{l} \text{if } A+B = 90^\circ \\ \sin A = \cos B \\ \tan A = \cot B \\ \operatorname{cosec} A = \sec B \end{array}}$$

(25) if $A+B = 90^\circ$

$\tan A \cdot \tan B = ?$

$\tan A \cdot \tan(90-A)$

$\tan A \cdot \cot A$

$\cancel{\tan A} \cdot \frac{1}{\cancel{\tan A}} = 1$

(26) $\sin(3x-6) = \cos(6x-3)$,

$x = ?$

$\sin A = \cos B$, $\therefore A+B = 90^\circ$

$\therefore 3x-6+6x-3 = 90^\circ$

$9x = 99$

$\boxed{x = 11}$ Ans

(27) $\operatorname{cosec} 51^\circ = x$

$$\frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 39^\circ - \underbrace{\frac{1}{\sin 51^\circ \sec 39^\circ}}_{1}$$

$(\because 51+39 = 90^\circ)$

$$\underbrace{\sin^2 51^\circ + \sin^2 39^\circ}_{1}$$

$(\because 51+39 = 90^\circ)$

$\Rightarrow \cancel{1} + \tan^2 39^\circ - \cancel{1}$

$\Rightarrow \tan^2 39^\circ$

$\operatorname{cosec} 51^\circ = x$

$\operatorname{cosec}(90-39) = x$

$\sec 39^\circ = x$

$\tan^2 39^\circ = \sec^2\theta - 1$

$= \sec^2 39 - 1$

$= \boxed{x^2-1}$ Ans.

---

(28) $\cot 18^\circ \left[\cos^2 68^\circ . \cot 72^\circ + \frac{1}{\sec^2 22^\circ . \tan 72^\circ}\right]$

$\Rightarrow \cot 18^\circ \left[\cos^2 68^\circ . \cot 72^\circ + \cos^2 22^\circ . \cot 72^\circ\right]$

$\Rightarrow \underbrace{\cot 18 \cdot \cot 72}_{1} \left[\underbrace{\cos^2 68 + \cos^2 22}_{1}\right]$

$(\because 18+72 = 90)$ $(\because 68+22 = 90)$

$\Rightarrow 1 \times 1 = 1$ Ans.

---

(29) $\sin^2 1 + \sin^2 5 + \cdots\cdots + \sin^2 90$

$\sin^2 1 + \sin^2 5 + \sin^2 9 + \cdots\cdots \sin^2 89 + \sin^2 90^\circ$

no. of terms $= \frac{\text{last term} - \text{first term}}{d} + 1$

$= \frac{89-1}{4} + 1 = 23$

sum of series = $\frac{23}{2} = 11\frac{1}{2}$

$\therefore\ 11\frac{1}{2} + \sin^2 90$.

$= 11\frac{1}{2} + 1 \quad = \quad \frac{25}{2}$ Ans.

---

(30) $\sin^2 10 + \sin^2 20 + \cdots\cdots + \sin^2 90$.

$\sin^2 10 + \sin^2 80 = 1$ $\quad$ ($\because \sin^2 A + \sin^2 B = 1$ if $A+B = 90^\circ$)

$\sin^2 20 + \sin^2 70^\circ = 1$

$\sin^2 30 + \sin^2 60 = 1$

$\sin^2 40 + \sin^2 50 = 1$

$\sin^2 90^\circ \quad = 1$

$\overline{\quad 5 \quad}$ Ans.

No of terms = $\frac{80-10}{10}$ = ... = 8

Sum of ... = $\frac{8}{2}$ = 4

Total Sum = 4 + $\sin^2 90$ = 4 + 1 = 5

(OR)

$\underbrace{\sin^2 10 + \sin^2 20 + \cdots\cdots \sin^2 80} + \sin^2 90$.

हम वहाँ तक series देखते हैं जहां तक $\theta_1 + \theta_2$ का pair बन रहा हो 90° का.

No. of terms = $\frac{\text{Last term} - \text{first term}}{\text{diff}} + 1$

$= \frac{80-10}{10} + 1 = 8$

और इस series का sum = $\frac{\text{no. of terms}}{2} = \frac{8}{2} = 4$

उपर $\sin^2 90^\circ$ series से अलग बचा हुआ है ।

$\therefore\ \sin^2 90 = 1$

So, the sum of above ques is = 4+1 = 5 Ans.

CLASS
67

(31) $\cos^2 1 + \cos^2 3 + \dots\dots + \cos^2 90.$

$$\underbrace{\cos^2 1 + \cos^2 3 + \cos^2 5 + \dots\dots \cos^2 89} + \cos^2 90.$$

$n = \frac{89-1}{2} + 1 = 45$

2 से divide इसलिए करते हैं क्योंकि दो pairs का sum 1 आयेगा
$(\cos^2 1 + \cos^2 89 = 1$
$\because (89+1=90))$

$\text{sum} = \frac{45}{2}$

$\therefore \frac{45}{2} + \underbrace{\cos^2 90}_{0} = \frac{45}{2}$ **Ans.**

---

(32) $\sin^2\frac{\pi}{40} + \sin^2\frac{2\pi}{40} + \sin^2\frac{3\pi}{40} + \dots\dots \sin^2\frac{20\pi}{40}$

$$\underbrace{\sin^2\frac{\pi}{40} + \sin^2\frac{2\pi}{40} + \dots\dots \sin^2\frac{19\pi}{40}} + \sin^2\frac{20\pi}{40}$$

$n = 19$

$\text{sum} = \frac{19}{2}$

$\therefore \frac{19}{2} + \sin^2\frac{20\pi}{40}$

(*)
$\frac{\pi}{40} + \frac{19\pi}{40}$
$\frac{\pi + 19\pi}{40} = \frac{20\pi}{40}$
$= \frac{\pi}{2}$ (pair बन रहा है 90° का)

$= \frac{19}{2} + \sin^2 90° \Rightarrow \frac{19}{2} + 1 = \frac{21}{2}$ **Ans**

---

(33) A, B and C are the vertex of a triangle. find

$$\cos^2\frac{A}{2} + \cos^2\frac{B}{2} + \cos^2\frac{C}{2} + \cos^2\left(\frac{A+B}{2}\right) + \cos^2\left(\frac{B+C}{2}\right) + \cos^2\left(\frac{C+A}{2}\right)$$

$\underbrace{\cos^2\left(\frac{A}{2}\right) + \cos^2\left(\frac{B+C}{2}\right)}_{\text{pair बन रहा है}}$

$\frac{A}{2} + \frac{B+C}{2}$

$\frac{A+B+C}{2} = \frac{180}{2} = 90°$

$\cos^2 A + \cos^2 B = 1.$
(if $A+B=90°$)

$\therefore \cos^2 \frac{A}{2} + \cos^2 \frac{B+C}{2} = 1$

There are 3 such pairs

$\therefore 1+1+1 = 3$ Ans.

$\cos(-\theta) = +\cos\theta$
$\sec(-\theta) = +\sec\theta$
$\sin(-\theta) = -\sin\theta$
$\operatorname{cosec}(-\theta) = -\operatorname{cosec}\theta$
$\tan(-\theta) = -\tan\theta$
$\cot(-\theta) = -\cot\theta$

(34) $\dfrac{\cos(90+A)\cdot\sec(360-A)\cdot\tan(180-A)}{\sec(A-720)\cdot\sin(A+540)\cdot\cot(A-90)}$

$\Rightarrow \dfrac{(-)\cancel{\sin A}\cdot\cancel{\sec A}\cdot(-)\cancel{\tan A}}{\cancel{\sec A}\cdot(-)\cancel{\sin A}\cdot(-)\cancel{\tan A}}$

$\because \sin(540+A) \rightarrow 3^{rd}$ quadrant

$\therefore \sin = (-ve)$

$\Rightarrow 1$ Ans.

(*) $\sec(A-720)$
$= \sec(-(720-A))$
$= \sec(720-A)$
$= \sec A$

(*) $\cot(A-90)$
$\cot[-(90-A)]$
$-\cot(90-A)$
$= -\tan A$

(35) $x = y\cos\frac{2\pi}{3} = z\cos\frac{4\pi}{3}$

$xy+yz+zx = ?$

$x = y\cos\frac{2\pi}{3} = z\cos\frac{4\pi}{3}$

$\Rightarrow \cos\frac{2\pi}{3} = \cos 120 = \cos(180-60) = -\cos 60 = -\frac{1}{2}$

$\Rightarrow \cos\frac{4\pi}{3} = \cos 240 = \cos(180+60) = -\cos 60 = -\frac{1}{2}$

$x = \frac{-y}{2} = \frac{-z}{2} = K$

$x = K \quad | \quad y = -2K \quad | \quad z = -2K$

$xy+yz+zx = K(-2K) + (-2K)(-2K) + (-2K)K$

$= -2K^2 + 4K^2 - 2K^2 = 0$ Ans.

(or) put values.

$x = 1$	$-\frac{y}{2}$	$-\frac{z}{2}$
	$y = -2$	$z = -2$

$$xy + yz + zx = -2 \times 1 + (-2)(-2) + (-2) \times 1$$

$$-2 + 4 - 2 = 0 \text{ Ans}$$

---

(36) $\sin(A+B-C) = \cos(A+C-B) = \tan(B+C-A) = 1$

$A+B+C = ?$

$\sin(A+B-C) = 1$	$\cos(A+C-B) = 1$	$\tan(B+C-A) = 1$
$\sin 90^\circ = 1$	$\cos 0 = 1$	$\tan 45 = 1$
$\therefore A+B-C = 90^\circ$	$\therefore A+C-B = 0$	$\therefore B+C-A = 45$

$$A + \cancel{B} - \cancel{C} = 90$$
$$A + \cancel{C} - \cancel{B} = 0$$
$$2A = 90$$
$$\boxed{A = 45}$$

$$\cancel{B} + C - \cancel{A} = 45$$
$$\cancel{A} + C - \cancel{B} = 0$$
$$2C = 45$$
$$\boxed{C = \frac{45}{2}}$$

$$\Rightarrow A + C - B = 0$$

$$45 + \frac{45}{2} = B \quad \Rightarrow \quad \boxed{B = \frac{135}{2}}$$

$$A+B+C = 45 + \frac{45}{2} + \frac{135}{2}$$

$$= \frac{90 + 45 + 135}{2}$$

$$= \frac{270}{2} = 135 \text{ Ans}$$

(37) $\dfrac{\text{Tan } 57^\circ + \cot 37^\circ}{\text{Tan } 33 + \cot 53^\circ}$ A) Tan33 . cot 53 . B) Tan 53 . cot 37. C) Tan 33 . cot 57. D) Tan 57 . cot 37.

$$\frac{\text{Tan } 57 + \cot 37}{\text{Tan}(90-57) + \cot 53}$$

$$\Rightarrow \frac{\text{Tan } 57 + \frac{1}{\text{Tan } 37}}{\cot 57 + \cot(90-53)} \Rightarrow \frac{\text{Tan } 57 + \frac{1}{\text{Tan } 37^\circ}}{\frac{1}{\text{Tan } 57} + \tan 37^\circ}$$

$$\Rightarrow \frac{\frac{(\cancel{\text{Tan } 57 \cdot \text{Tan } 37}) + 1}{\text{Tan } 37^\circ}}{\frac{(\cancel{\text{Tan } 57 \cdot \text{Tan } 37}) + 1}{\text{Tan } 57^\circ}} \Rightarrow \frac{1}{\text{Tan } 37} \times \text{Tan } 57^\circ$$

$$\Rightarrow \text{Tan } 57 . \cot 37^\circ$$ Ans.

---

(38) $\text{Tan } 40 + 2 \text{ Tan } 10^\circ = ?$ A) Tan 40. B) Cot 40 C) sin 40 D) cos 40

$40 + 10 = 50$

$\text{Tan}(40+10) = \text{Tan } 50^\circ$

$$\frac{\text{Tan } 40 + \text{Tan } 10}{1 - \text{Tan } 40 \text{ Tan } 10} = \text{Tan } 50$$

$$\boxed{\text{Tan}(A+B) = \frac{\text{Tan } A + \text{Tan } B}{1 - \text{Tan } A \cdot \text{Tan } B}}$$

$$\text{Tan } 40 + \text{Tan } 10 = \text{Tan } 50 - \underbrace{\text{Tan } 50 \cdot \text{Tan } 40}_{1} \cdot \text{Tan } 10.$$

$(\because \text{Tan } A \cdot \text{Tan } B = 1 \text{ if } A+B = 90^\circ)$

$$\Rightarrow \text{Tan } 40 + \text{Tan } 10 = \text{Tan } 50 - \text{Tan } 10$$

$$\Rightarrow \text{Tan } 40 + 2 \text{ Tan } 10 = \text{Tan } 50$$
$$= \text{Tan}(90-40)$$
$$= \cot 40$$ Ans

#

$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$$

$$\tan(45+\theta) = \frac{1+\tan\theta}{1-\tan\theta} = \frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta}$$

$$\tan(45-\theta) = \frac{1-\tan\theta}{1+\tan\theta} = \frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta}$$

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \cdot \tan B}$$

(39) $\dfrac{\cos 15 - \sin 15}{\cos 15 + \sin 15}$

$\Rightarrow \tan(45-15)$

$\Rightarrow \tan 30 = \dfrac{1}{\sqrt{3}}$ Ans.

#

$$\sin\theta \cdot \sin(60-\theta) \cdot \sin(60+\theta) = \frac{1}{4}\sin 3\theta$$

$$\cos\theta \cdot \cos(60-\theta) \cdot \cos(60+\theta) = \frac{1}{4}\cos 3\theta$$

$$\tan\theta \cdot \tan(60-\theta) \cdot \tan(60+\theta) = \tan 3\theta$$

(40) $\sin(\underset{\theta}{\underset{\downarrow}{20}}) \sin(\underset{60-\theta}{\underset{\downarrow}{40}}) \cdot \sin(\underset{60+\theta}{\underset{\downarrow}{80}}) = ?$

$\Rightarrow \dfrac{1}{4}\sin 3\theta = \dfrac{1}{4}\sin 60$

$= \dfrac{1}{4} \times \dfrac{\sqrt{3}}{2} = \dfrac{\sqrt{3}}{8}$ Ans.

(41) $\cos 12^\circ \cos 24^\circ \cos 36^\circ \cos 48^\circ \cos 60^\circ \cos 72^\circ \cos 84^\circ = ?$

$\theta \quad \phi \quad 60-\phi \quad 60-\theta \quad 60+\theta \quad 60+\phi$

$\cos 36^\circ = \frac{\sqrt{5}+1}{4}$

$\frac{1}{4}\cos 3\theta \times \frac{1}{4}\cos 3\phi \times \cos 60$

$\cos 72^\circ = \frac{\sqrt{5}-1}{4}$

$\Rightarrow \frac{1}{4}\cos(3\times 12) \times \frac{1}{4}\cos(3\times 24) \times \cos 60$

$\Rightarrow \frac{1}{4}\cos 36^\circ \times \frac{1}{4}\cos 72^\circ \times \cos 60^\circ$

$\Rightarrow \frac{1}{4} \times \frac{(\sqrt{5}+1)}{4} \times \frac{1}{4}\frac{(\sqrt{5}-1)}{4} \times \frac{1}{2}$

$\Rightarrow \frac{1}{4} \times \frac{(\sqrt{5})^2-(1)^2}{4\times 4} \times \frac{1}{4} \times \frac{1}{2}$

$\Rightarrow \frac{1}{\cancel{4}} \times \frac{\cancel{4}}{4\times 4} \times \frac{1}{4} \times \frac{1}{2} = \frac{1}{128}$ Ans.

---

(42)

$\sin\frac{\pi}{9} \cdot \sin\frac{5\pi}{9} \cdot \sin\frac{7\pi}{9} \cdot \sin\frac{3\pi}{9}$

$\sin 20^\circ \cdot \sin 100 \cdot \sin 140 \cdot \sin 60$

$\sin 20 \cdot \sin(180-80) \cdot \sin(180-40) \cdot \frac{\sqrt{3}}{2}$

$\Rightarrow \sin 20 \cdot \sin 40 \cdot \sin 80 \cdot \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4}\sin 60 \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{1}{4} \times \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$

$\Rightarrow \frac{3}{16}$ Ans.

CLASS
68

(43) $\dfrac{\sin 2x}{\sin \frac{x}{4}}$ $\boxed{\sin 2\theta = 2\sin\theta \cos\theta}$

$\Rightarrow 2\sin x \cdot \cos x \Rightarrow 2\sin 2\left(\frac{x}{2}\right)\cdot \cos x \Rightarrow 4\sin\frac{x}{2}\cdot\cos\frac{x}{2}\cdot\cos x$

$\Rightarrow 4\sin 2\left(\frac{x}{2\times 2}\right)\cdot \cos\frac{x}{2}\cdot \cos x$

$\Rightarrow \dfrac{4\times 2\,\cancel{\sin\frac{x}{4}}\cdot\cos\frac{x}{4}\cdot\cos\frac{x}{2}\cdot\cos x}{\cancel{\sin\frac{x}{4}}}$

$\Rightarrow 8\cos\frac{x}{4}\cdot\cos\frac{x}{2}\cdot\cos x$ Ans

(OR) ये देखो formula कितनी बार Apply हुआ है।

$2x$ से x पे गए	एक बार $\cos\frac{x}{4}$ बचेगा
x से $\frac{x}{2}$ पे गए	एक बार $\cos\frac{x}{2}$ बचेगा
$\frac{x}{2}$ से $\frac{x}{4}$ पे गए	और $\cos x$ बचेगा।
3 बार apply किया है।	

$2\times 2\times 2\times \cos\frac{x}{4}\cdot\cos\frac{x}{2}\cdot\cos x$ Ans

(44) $\dfrac{\sin x}{\sin\frac{x}{16}}$

$2\times 2\times 2\times 2\cdot\cos\frac{x}{2}\cdot\cos\frac{x}{4}\cdot\cos\frac{x}{8}\cdot\cos\frac{x}{16}$

$16\cdot\cos\frac{x}{2}\cdot\cos\frac{x}{4}\cdot\cos\frac{x}{8}\cdot\cos\frac{x}{16}$ Ans.

(45) if $A+B = \frac{\pi}{4}$

$(\cot A-1)(\cot B-1) = ?$

$A+B = \frac{\pi}{4}$

$\cot(A+B) = \cot 45^\circ$

$\Rightarrow \frac{\cot A \cot B - 1}{\cot A + \cot B} = \frac{1}{1}$

$\Rightarrow \cot A \cot B - 1 = \cot A + \cot B$

$\Rightarrow \cot A \cot B - 1 - \cot A - \cot B = 0$

$\Rightarrow \cot A[\cot B - 1] - 1 - \cot B + 1 - 1 = 0$

$\Rightarrow \cot A[\cot B - 1] - 1[\cot B - 1] = 2$

$\Rightarrow (\cot A - 1)(\cot B - 1) = 2$ Ans

---

(46) if $A+B+C = 180^\circ$ | $\tan A + \tan B + \tan C = ?$

$A+B = 180 - C$

$\tan(A+B) = \tan(180 - C)$

$= \frac{\tan A + \tan B}{1 - \tan A \tan B} = \frac{-\tan C}{1}$

$= \tan A + \tan B = -\tan C + \tan A \tan B \tan C$

$$\boxed{\begin{array}{l} \text{i) } \tan A + \tan B + \tan C = \tan A \cdot \tan B \cdot \tan C \\ \text{ii) } \frac{1}{\tan B \cdot \tan C} + \frac{1}{\tan A \cdot \tan C} + \frac{1}{\tan A \cdot \tan B} = 1 \\ \text{iii) } \cot A \cot B + \cot B \cot C + \cot C \cdot \cot A = 1 \end{array}}$$

(47) $1+\sin x+\sin^2 x+\sin^3 x+\cdots\cdots\infty = 4+2\sqrt{3}$ | $x=?$

$S_\infty = \frac{a}{1-r}$ (GP series)

$$\Rightarrow \frac{1}{1-\sin x} = 4+2\sqrt{3} \times \frac{(4-2\sqrt{3})}{4-2\sqrt{3}}$$

$$\Rightarrow \frac{1}{1-\sin x} = \frac{4}{4-2\sqrt{3}}$$

$$\Rightarrow \frac{1}{1-\sin x} = \frac{\frac{4}{4}}{\frac{4}{4}-\frac{2\sqrt{3}}{4}}$$ (divide by 4)

$$\Rightarrow \frac{1}{1-\sin x} = \frac{1}{1-\frac{\sqrt{3}}{2}}$$

(*) comparision करने के लिए R.H.S को L.H.S वाली form में लाना है।

comparing both sides

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

$\cancel{\sin} x = \cancel{\sin} 60^\circ$

$\boxed{x = 60^\circ}$ Ans

---

(48) $\sin^2(40+2x)+\sin^2(50-2x) = ?$

$40+\cancel{2x}+50-\cancel{2x} = 90^\circ$

$\sin^2 A+\sin^2 B = 1$ if $A+B = 90^\circ$

$\therefore \sin^2(40+2x)+\sin^2(50-2x) = 1$ Ans.

---

(49) $\cos 15^\circ . \cos 7\frac{1}{2} \cdot \sin 7\frac{1}{2} \cdot = ?$

$\Rightarrow \cos 15^\circ \cdot \frac{1}{2}\left[2\cos 7\frac{1}{2}\cdot \sin 7\frac{1}{2}\right]$

$\Rightarrow \frac{1}{2}\cos 15^\circ \times \sin \cancel{2}\cdot\frac{15}{\cancel{2}}$

$\Rightarrow \frac{1}{2}\cos 15 . \sin 15^\circ$

$\frac{1}{2\times 2} \times 2\sin 15 \cdot \cos 15 \cdot$

$\Rightarrow \frac{1}{4} \cdot \sin 30^\circ \Rightarrow \frac{1}{4} \times \frac{1}{2} \Rightarrow \frac{1}{8}$ Ans

---

(50) $\cos(20^\circ) \cdot \cos(40^\circ) \cdot \cos 60^\circ \cdot \cos(80^\circ) = ?$

$\underbrace{20^\circ}_{\theta}$, $\underbrace{40^\circ}_{(60-\theta)}$, $\underbrace{80^\circ}_{(60+\theta)}$

$\Rightarrow \frac{1}{4} \cos 3\times 20^\circ \cdot \cos 60^\circ$

$\Rightarrow \frac{1}{4} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{16}$ Ans.

---

(51) $\sin 12^\circ \cdot \sin 48^\circ \cdot \sin 54^\circ = ?$

$\sin(12) \sin(48) \cdot \sin(72) \times \frac{1}{\sin 72^\circ} \cdot \sin 54^\circ$

$\underbrace{12}_{\theta}$, $\underbrace{48}_{(60-\theta)}$, $\underbrace{72}_{(60+\theta)}$

$\Rightarrow \frac{1}{4} \sin 3\times 12^\circ \times \frac{1}{\sin 72^\circ} \cdot \sin(90-36)$

$\Rightarrow \frac{1}{4} \sin 36 \cdot \cos 36 \cdot \times \frac{1}{\sin 72^\circ}$

$\Rightarrow \frac{1}{4\times 2} \cdot 2\sin 36 \cdot \cos 36 \times \frac{1}{\sin 72}$

$\Rightarrow \frac{1}{8} \cancel{\sin 72} \times \frac{1}{\cancel{\sin 72}} \Rightarrow \frac{1}{8}$ Ans.

MAXIMA & MINIMA

	min	max.
$\sin\theta, \cos\theta$ (odd power)	-1	$+1$
$\sin^2\theta, \cos^2\theta$ (even power)	0	$+1$

	min	max
$\tan\theta, \cot\theta$ (odd power)	$-\infty$	$+\infty$
$\tan^4\theta, \cot^2\theta$ (even power)	0	$+\infty$
$\sec\theta, \operatorname{cosec}\theta$ (odd power)	$-\infty$	$+\infty$
$\sec^4\theta, \operatorname{cosec}^{10}\theta$ (even power)	$+1$	$+\infty$

(52) find minimum & maximum value of $15+\sin^2\theta$

min. value $= 15+0 = 15$

max. value $= 15+1 = 16$

(53) find minimum & max. value of $15-\sin^2\theta$

$\sin^2\theta$

min 0 max. $+1$

$15-0 = 15$ $15-1 = 14$

$\therefore$ min. value $= 14$

max. value $= 15$

(54) find min & max value of $10+\sec^2\theta$

$\sec^2\theta$

min $+1$ max $+\infty$

min value $= 10+1 = 11$

max. can't be determined.

(55) find min & max. value of $15\sin^2\theta + 10\cos^2\theta$

$= 15\sin^2\theta + 10(1-\sin^2\theta)$

(*) एक Tangent में convert करना पड़ेगा।

$= 15\sin^2\theta + 10 - 10\sin^2\theta$

$= 10 + 5\sin^2\theta$

$\sin^2\theta$: min 0, max +1

$10 + 0 = 10 \rightarrow$ min.

$10 + 5 = 15 \rightarrow$ max. Ans.

(#)

$a\sin^2\theta + b\cos^2\theta$

if $a > b$	if $a < b$
max = a	max = b
min = b	min = a

---

(56) $\sin^{110}\theta \cdot \cos^{110}\theta$. find min & max. value.

$= \frac{1}{2^{110}} \times 2^{110} \sin^{110}\theta \cdot \cos^{110}\theta$

$= \frac{1}{2^{110}} \left[2\sin\theta\cos\theta\right]^{110}$

$= \frac{1}{2^{110}} \sin^{110} 2\theta$

$= \frac{1}{2^{110}} \times 1 = \frac{1}{2^{110}} \rightarrow$ max.

$\Rightarrow \frac{1}{2^{110}} \times 0 = 0 \rightarrow$ min

$\sin^n\theta \cdot \cos^n\theta$
max. $\rightarrow \frac{1}{2^n}$
if n is even: min $\rightarrow 0$
if n is odd: min $\rightarrow -\frac{1}{2^n}$

(57) $\sin^5\theta \cdot \cos^5\theta$. find min. value

min value $= -\frac{1}{2^n} = -\frac{1}{2^5} = -\frac{1}{32}$ Ans

---

(#)

$$\boxed{\begin{array}{l} \sin^{2n}\theta + \cos^{2m}\theta \le 1 \\ \therefore \text{max} = 1 \end{array}}$$

---

(58) max. value of $\sin^8\theta + \cos^{14}\theta$

max value $= 1$.

(59) find max. value of $\sin^6\theta + \cos^6\theta$

max. value $= 1$.

(#)

$$\boxed{\begin{array}{l} \sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta\cos^2\theta \\ \sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta \end{array}}$$

---

(60) find min. and max. value of $\sin^4\theta + \cos^4\theta$

$\sin^4\theta + \cos^4\theta = 1 - 2\sin^2\theta\cos^2\theta$

$\Rightarrow 1 - 2(0) = 1$

$\sin^2\theta\cos^2\theta$

min $= 0$

max $= \frac{1}{2^n} = \frac{1}{4}$

And $1 - 2\left(\frac{1}{4}\right)$

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

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

max. value $= 1$

Scanned by CamScanner

#
$\sin^{2n}\theta + \cos^{2m}\theta$

max = +1

min = put $\theta = 45^\circ$

Because 45° पर इसका local minima बनता है।

#
$a\sin\theta + b\cos\theta$

max $= +\sqrt{a^2+b^2}$

min $= -\sqrt{a^2+b^2}$

---

(61) $\sin^2\theta + \cos^4\theta$. find max. and min. value.

max = 1.

for min put $\theta = 45^\circ$

min $= \sin^2 45^\circ + \cos^4 45^\circ$

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

$= \frac{1}{2} + \frac{1}{4} = \frac{3}{4}$ Ans

---

(62) $\sin^6\theta + \cos^6\theta$. find max. and min. value.

max = 1

for min. put $\theta = 45^\circ$

min $= \left(\frac{1}{\sqrt{2}}\right)^6 + \left(\frac{1}{\sqrt{2}}\right)^6$

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

$\Rightarrow \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^3$

$\Rightarrow \frac{1}{8} + \frac{1}{8} = \frac{1}{4}$ Ans.

---

(63) $3\sin\theta + 4\cos\theta$. find min. value

$-\sqrt{3^2+4^2}$

-5 Ans.

(64) $27^{\sin\theta} \times 81^{\cos\theta}$. find max. and min. value.

$\Rightarrow 3^{3\sin\theta} \times 3^{4\cos\theta}$

$\Rightarrow 3^{(3\sin\theta + 4\cos\theta)}$

$\therefore$ max $= 3^{5}$

min $= 3^{-5}$ Ans.

(*) $3\sin\theta + 4\cos\theta$

max $= \sqrt{3^2 + 4^2} = 5$

min $= -5$

---

(65) $10\sin\theta \cdot \cos\theta + 1 - 2\sin^2\theta$. find max. & min value.

$\Rightarrow 5 \times 2\sin\theta\cos\theta + \underbrace{1 - 2\sin^2\theta}$

$\Rightarrow 5\sin 2\theta + 1.\cos 2\theta$

max $= +\sqrt{5^2+1^2} = +\sqrt{26}$

min $= -\sqrt{26}$ Ans.

#

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= 2\cos^2\theta - 1$

$= 1 - 2\sin^2\theta$

$= \frac{1-\tan^2\theta}{1+\tan^2\theta}$

$1 + \cos 2\theta = 2\cos^2\theta$

#

$a\tan^2\theta + b\cot^2\theta$

min $= 2\sqrt{ab}$

max $= \infty$

---

(66) $4\tan^2\theta + 25\cot^2\theta$. find min. value.

min value $= 2\sqrt{4 \times 25}$

$= 2\sqrt{100}$

$= 20$ Ans.

(67) $4\sec^2\theta + 25\csc^2\theta$. find min. value.

$\Rightarrow 4(1+\tan^2\theta) + 25(1+\cot^2\theta)$

$\Rightarrow 4 + 4\tan^2\theta + 25 + 25\cot^2\theta$

$\Rightarrow 29 + \underbrace{4\tan^2\theta + 25\cot^2\theta}_{\text{min value} = 20 \text{ (in last que.)}}$

$\Rightarrow 29 + 20 = 49$ Ans.

$a\sin^2\theta + b\csc^2\theta$	$a\cos^2\theta + b\sec^2\theta$
if $a < b$	if $a < b$
min $= a+b$	min $= a+b$
if $a > b$	if $a > b$
min $= 2\sqrt{ab}$	min $= 2\sqrt{ab}$

(68) $4\sin^2\theta + 25\csc^2\theta$. find min. value.

min $= 4+25 = 29$.

(69) $4\csc^2\theta + 25\sin^2\theta$. find min. value.

min $= 2\sqrt{4\times25} = 20$.

(70) $25\csc^2\theta + 25\sin^2\theta$. find min value.

$2\sqrt{25\times25}$	$25+25$
2×25	$= 50$
$= 50$	Ans.
Ans	

(71) $\sin^2\theta + \operatorname{cosec}^2\theta$. find min value

$\min = 1+1 = 2$

or $2\sqrt{1\times 1} = 2$

---

(72) $\cos^2\theta + \sec^2\theta$. find min value .

$\min = 1+1 = 2$

(73) $\tan^2\theta + \cot^2\theta$. find min value .

$\min = 2\sqrt{1\times 1} = 2$

---

(74) $\sin^2\theta + \operatorname{cosec}^2\theta + \cos^2\theta + \sec^2\theta + \tan^2\theta + \cot^2\theta$. find min. value

$1 + 1 + \cot^2\theta + 1 + \tan^2\theta + \tan^2\theta + \cot^2\theta$

$3 + 2\tan^2\theta + 2\cot^2\theta$

$3 + 2\sqrt{2\times 2}$

$3 + 4 = 7$ Ans.

$\operatorname{cosec}^2\theta = 1+\cot^2\theta$

$\sec^2\theta = 1+\tan^2\theta$

#

$$\frac{1}{\cos 2\theta} = \frac{1+\tan^2\theta}{1-\tan^2\theta}$$

$$(a+b)^2 + (a-b)^2 = 2(a^2+b^2)$$

$$(a+b)^2 - (a-b)^2 = 4ab$$

CLASS
69

(#) value putting

i) sin, cos हो तो try to put $\theta = 0°, 90°, \ldots$

ii) sin, cos, tan हो तो put $\theta = 45°$

(*) denominator में zero नहीं बनना चाहिए ।

(75) find numerical value of

$$(1-2\sin^2\theta)\left[\frac{1+\tan\theta}{1-\tan\theta} + \frac{1-\tan\theta}{1+\tan\theta}\right]$$

$$\cos 2\theta \left[\frac{(1+\tan\theta)^2 + (1-\tan\theta)^2}{(1-\tan\theta)(1+\tan\theta)}\right]$$

$$\cos 2\theta \left[\frac{2(1+\tan^2\theta)}{(1-\tan^2\theta)}\right]$$

$$\cancel{\cos 2\theta} \times 2 \cdot \frac{1}{\cancel{\cos 2\theta}} = 2 \quad \underline{\text{Ans}}$$

(OR) put $\theta = 0°$

$$1\left[\frac{1}{1} + \frac{1}{1}\right] = 2 \quad \underline{\text{Ans}}$$

(76) $\sqrt{2+\sqrt{2+2\cos 4\theta}}$

A) $2\tan\theta$ B) $2\sin\theta$
C) $2\cos\theta$ ✓ D) $\cos\theta$

$$= \sqrt{2+\sqrt{2(1+\cos 4\theta)}}$$

$$= \sqrt{2+\sqrt{2\times 2\cos^2 2\theta}}$$

$$= \sqrt{2+2\cos 2\theta}$$

$$= \sqrt{2(1+\cos 2\theta)}$$

$$= \sqrt{2\times 2\cos^2\theta}$$

$$= 2\cos\theta \quad \underline{\text{Ans}}$$

(OR) put $\theta = 0°$

$$\sqrt{2+\sqrt{2+2}} = \sqrt{4} = 2$$

option c satisfies.

(77) if $x = \sin\theta + \cos\theta$, $y = \sec\theta + \csc\theta$, $y = ?$

✓A) $\frac{2x}{x^2-1}$ B) $\frac{2x}{x^2+1}$

C) $\frac{x}{x^2+1}$ D) $\frac{x}{x^2-1}$

$$y = \frac{1}{\cos\theta} + \frac{1}{\sin\theta}$$

$$y = \frac{\sin\theta + \cos\theta}{\cos\theta \cdot \sin\theta}$$

$$x^2 = \sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta$$

$$x^2 - 1 = 2\sin\theta\cos\theta$$

$$y = \frac{2(\sin\theta + \cos\theta)}{2\sin\theta\cos\theta}$$

$$y = \frac{2x}{x^2-1}$$

OR put $\theta = 45^\circ$

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

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

option A satisfies.

---

(78) $(1 + \csc\theta + \cot\theta)(1 - \sec\theta + \tan\theta) = ?$ [redacted]

$$\Rightarrow \left(1 + \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}\right)\left(1 - \frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}\right)$$

$$\Rightarrow \left(\frac{\sin\theta + 1 + \cos\theta}{\sin\theta}\right)\left(\frac{\cos\theta - 1 + \sin\theta}{\cos\theta}\right)$$

$$\Rightarrow \frac{[(\sin\theta + \cos\theta) + 1][(\sin\theta + \cos\theta) - 1]}{\sin\theta \cdot \cos\theta}$$

$$\Rightarrow \frac{(\sin\theta + \cos\theta)^2 - (1)^2}{\sin\theta \cdot \cos\theta} \Rightarrow \frac{\cancel{1} + 2\sin\theta\cos\theta - \cancel{1}}{\sin\theta\cos\theta}$$

$$\Rightarrow \frac{2\cancel{\sin\theta\cos\theta}}{\cancel{\sin\theta\cos\theta}} \Rightarrow 2 \text{ Ans.}$$

OR Put $\theta = 45^\circ$

$$(2+\sqrt{2})(2-\sqrt{2})$$

$$4 - 2$$

$$= 2 \text{ Ans.}$$

---

(79) $u_n = \cos^n\theta + \sin^n\theta$. find value of $2u_6 - 3u_4 + 1$

$$\Rightarrow 2(\cos^6\theta + \sin^6\theta) - 3(\cos^4\theta + \sin^4\theta) + 1$$

$$\Rightarrow 2[1 - 3\sin^2\theta\cos^2\theta] - 3[1 - 2\sin^2\theta\cos^2\theta] + 1$$

$$\Rightarrow 2 - 6\cancel{\sin^2\theta\cos^2\theta} - 3 + \cancel{6\sin^2\theta\cos^2\theta} + 1 = 0 \text{ Ans.}$$

(OR) put $\theta = 0$

$2(1+0) - 3(1+0) + 1$

$= 2-3+1 = 0$ Ans.

---

(80) if $\tan^2\theta = 1-e^2$

$\sec\theta + \tan^3\theta \cdot \operatorname{cosec}\theta = ?$

A) $(2-e^2)^{3/2}$ B) $(2-e^2)^{1/2}$

C) $(1-e^2)^{1/2}$ D) $(1+e^2)^{5/2}$

$\frac{1}{\cos\theta} + \frac{\sin^3\theta}{\cos^3\theta} \cdot \frac{1}{\cancel{\sin\theta}}$

$\frac{\cos^2\theta + \sin^2\theta}{\cos^3\theta} = \frac{1}{\cos^3\theta} = \sec^3\theta$

$\Rightarrow \sec^2\theta = 1 + \tan^2\theta$

$= 1 + 1 - e^2$

$\sec^2\theta = 2 - e^2$

$\sec^3\theta = (2-e^2)^{3/2}$ Ans.

(OR) put $\theta = 45°$

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

$\sqrt{2} + \sqrt{2}$

$2 \times \sqrt{2}$

$2^1\, 2^{1/2} = 2^{3/2}$

$\tan^2\theta = 1-e^2$

$1 = 1-e^2$

$\boxed{e^2=0} \rightarrow$ put in options

इसका square Ans. होगा | option A satisfies.

---

(81) $x\sin^3\theta + y\cos^3\theta = 4\sin\theta\cos\theta$ | $x\sin\theta - y\cos\theta = 0$ | $x^2+y^2=?$

$\cos\theta \neq 0$

$\sin\theta \neq 0$

$\Rightarrow x\sin\theta \cdot \sin^2\theta + y\cos^3\theta = 4\sin\theta\cos\theta$

$\Rightarrow y\cos\theta \cdot \sin^2\theta + y\cos^3\theta = 4\sin\theta\cos\theta$

$\cancel{\cos\theta}(y\sin^2\theta + y\cos^2\theta) = 4\sin\theta\,\cancel{\cos\theta}$

$\Rightarrow y(\sin^2\theta + \cos^2\theta) = 4\sin\theta$

$\boxed{y = 4\sin\theta}$

$x\sin\theta = y\cos\theta$

put value of Y

$x\,\cancel{\sin\theta} = 4\,\cancel{\sin\theta} \cdot \cos\theta$

$\boxed{x = 4\cos\theta}$

$x^2+y^2 = 16\cos^2\theta + 16\sin^2\theta$

$= 16(\cos^2\theta + \sin^2\theta)$

$= 16$ Ans.

(OR) put $\theta = 45°$

$x\sin\theta = y\cos\theta$

$\boxed{x = y}$

$\frac{x}{2\sqrt{2}} + \frac{y}{2\sqrt{2}} = 4 \times \frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}$

$\frac{x+y}{\sqrt{2}} = 4$

$x+y = 4\sqrt{2}$

$2y = 4\sqrt{2}$

$y = 2\sqrt{2}$

$\therefore x = 2\sqrt{2}$

$x^2+y^2 = (2\sqrt{2})^2 + (2\sqrt{2})^2$

$= 8+8 = 16$

(82) A, B, C are the angles of ΔABC w[C are in A.P

find $\dfrac{\sin A - \sin C}{\cos C - \cos A}$.

A) $\sin B$ B) $\tan B$

C) $\cot B$ D) $\tan\left(\frac{A+B}{2}\right)$

A	B	C
30	60	90

$$\frac{\sin 30 - \sin 90}{\cos 90 - \cos 30} = \frac{1-\frac{1}{2}}{0-\frac{\sqrt{3}}{2}}$$

$$= \frac{\cancel{-}\frac{1}{\cancel{2}}}{\cancel{-}\frac{\sqrt{3}}{\cancel{2}}} = \frac{1}{\sqrt{3}}$$ → option C satisfies.

---

(83) $a = \operatorname{cosec}\theta - \sin\theta$ $a^2b^2(a^2+b^2+3) = ?$

$b = \sec\theta - \cos\theta$

Put $\theta = 45°$

$a = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

$b = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

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

$\frac{1}{\cancel{4}} \times \cancel{4}$

$= 1$ Ans.

---

(84) $\dfrac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = ?$

A) $\dfrac{1+\sin\theta}{\cos\theta}$ B) $\dfrac{1+\cos\theta}{\sin\theta}$

C) $\dfrac{2}{\cos\theta}$ D) $2\tan\theta$

$\theta = 0, 90°$ पर ∞ आ रहा है।

$\theta = 45°$ पर option A & B contradict करेंगे

so. put $\theta = 30°$

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

$= \sqrt{3}$

option A satisfies.

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

~~84~~ $\cancel{\dfrac{\sin\theta - [\cos\theta + 1]}{\sin\theta + [\cos\theta - 1]}}$

(85) $a = \dfrac{\cos\alpha}{\cos\beta}$, $b = \dfrac{\sin\alpha}{\sin\beta}$

find value of $\sin^2\beta$

A) $\dfrac{a^2+1}{a^2-b^2}$ B) $\dfrac{a^2-1}{a^2-b^2}$

C) $\dfrac{a^2-1}{a^2+b^2}$ D) $\dfrac{a^2-b^2}{a^2+b^2}$

$a^2 = \dfrac{\cos^2\alpha}{\cos^2\beta}$ | $b^2 = \dfrac{\sin^2\alpha}{\sin^2\beta}$

$\cos^2\alpha = a^2\cos^2\beta$

$+ \sin^2\alpha = b^2\sin^2\beta$

$1 = a^2(1-\sin^2\beta) + b^2\sin^2\beta$

$1 = a^2 - a^2\sin^2\beta + b^2\sin^2\beta$

$1 - a^2 = -\sin^2\beta(a^2-b^2)$

$-\sin^2\beta = \dfrac{a^2-b^2}{1-a^2}$

$\sin^2\beta = \dfrac{a^2-1}{a^2-b^2}$

Radians

(85) π radian $(\pi^c) = 180^\circ$

$$1^c = \frac{180^\circ}{\pi} = \frac{\overset{90}{\cancel{180}} \times 7}{\underset{11}{\cancel{22}}}$$

$$\boxed{1^c = \frac{630^\circ}{11} = 57^\circ 16' 21''}$$

$$11 \overline{)630^\circ}(57 \quad 55,\ 80,\ 77,\ 3^\circ \times 60 = 180'$$

$$11 \overline{)180'}(16 \quad 11,\ 70,\ 66,\ 4' \times 60$$

$$11 \overline{)240''}(21'' \quad 22,\ 20,\ 11,\ 9''$$

(86) $\frac{5\pi}{3}^c$. convert in degree.

$$\frac{5\cancel{\pi}}{3} \times \frac{180^\circ}{\cancel{\pi}} = 300^\circ$$

(87) $\frac{4\pi}{15}^c$. convert in degree.

$$\frac{4\cancel{\pi}}{\cancel{15}} \times \frac{\overset{12}{\cancel{180^\circ}}}{\cancel{\pi}} = 48^\circ$$

(88) $\left(\frac{1}{6}\right)^c$. convert in degree.

$$\frac{1}{\cancel{6}} \times \frac{\overset{15}{\cancel{90}}\ \cancel{180^\circ} \times 7}{\underset{11}{\cancel{22}}} = \frac{105^\circ}{11}$$

$$11\overline{)105^\circ}(9^\circ \quad 99,\ 6^\circ \times 60 \Rightarrow 11\overline{)360'}(32' \quad 33,\ 30,\ 22,\ 8' \times 60 \Rightarrow 11\overline{)480''}(43 \quad 44,\ 40'',\ 33,\ 7''$$

$\Rightarrow 9^\circ 32' 43''$ Ans.

(89) $11^\circ 15'$. convert in radian.

$$11^\circ \frac{\cancel{15}'}{\underset{4}{\cancel{60}}} = 11\frac{1}{4}^\circ = \frac{45}{4}^\circ$$

$$180^\circ = \pi^c$$

$$1^\circ = \frac{\pi}{180}^c$$

$$\frac{\cancel{45}^\circ}{4} \times \frac{\pi}{\underset{4}{\cancel{180}}} = \frac{\pi}{16}^c \text{ Ans}$$

(90) $13^\circ 7' 30''$. convert in radian.

$13^\circ 7' \frac{30}{60}'$

$13^\circ 7\frac{1}{2}' \Rightarrow 13^\circ \frac{15}{2}' \Rightarrow 13^\circ \frac{15}{2\times 60}^\circ \Rightarrow 13\frac{1}{8}^\circ = \frac{105}{8}^\circ$

$\Rightarrow \frac{\cancel{105}^{\cancel{21}\,7}}{8} \times \frac{\pi}{\cancel{180}_{\cancel{36}\,12}} \Rightarrow \frac{7\pi}{96}^c$

---

(91) $63^\circ 14' 51''$. convert in radian.

A) $\left(\frac{2811\pi}{8000}\right)^c$ ✓ B) $\left(\frac{3811\pi}{8000}\right)^c$

C) $\left(\frac{4811\pi}{8000}\right)^c$ D) $\left(\frac{5811\pi}{8000}\right)^c$

सारे option दूर-2 है approx value से हो जाएगा।

$180^\circ = \pi^c$

$1^\circ = \frac{\pi}{180^\circ}$

$60^\circ = \frac{\pi}{\cancel{180}_3} \times \cancel{60} = \left(\frac{1}{3}\pi\right)^c$

Take approx. (near to 63°)

option A is nearly $\left(\frac{1}{3}\right)$

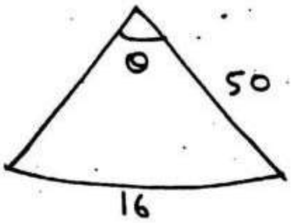
OR

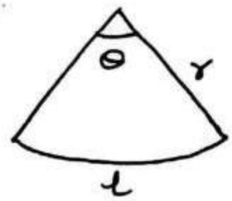
$63^\circ 14' \frac{\cancel{51}^{17}}{\cancel{60}_{20}} \Rightarrow 63^\circ 14\frac{17}{20}'$

$\Rightarrow 63^\circ \frac{\cancel{297}^{99}}{20\times\cancel{60}_{20}}^\circ \Rightarrow 63\frac{99}{400}^\circ \Rightarrow \frac{\cancel{25299}^{2811}}{400} \times \frac{\pi}{\cancel{180}_{20}}$

$\Rightarrow \left(\frac{2811}{8000}\pi\right)^c$ Ans.

(92) When a pendulam of length 50 cm oscillates produce an arc of 16 cm. find the angle formed in degree.





$$\theta^c = \frac{l}{r}$$

$$\theta^c = \frac{l}{r} = \frac{16}{50} = \frac{8}{25}^c$$

---

(93) A wheel rotate 3.5 times in one second. In what time the wheel rotates 55^c of angle.

$180^\circ = \pi^c$

$360^\circ = 2\pi^c$

एक rotation में 360° का angle बनता है।

$1\text{ sec} \text{ —— } \cancel{2}\pi \times \frac{7}{\cancel{2}} = 7\pi = 22^c$

$22^c \text{ —— } 1\text{ sec}$

$1^c \text{ —— } \frac{1}{22}\text{ sec}$

$55^c \text{ —— } \frac{1}{\cancel{22}_{2}} \times \cancel{55}^{5} = 2.5\text{ sec.}$

---

(94) two angles of a Δ are $\frac{1}{2}^c$ and $\frac{1}{3}^c$. find the 3rd angle in degree measure.

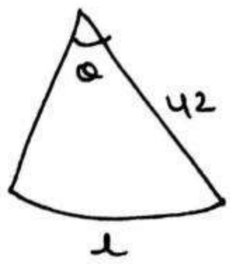
$$\frac{1}{2} + \frac{1}{3} = \frac{5}{6}^c$$

$$\frac{5}{\cancel{6}} \times \frac{\cancel{180}^{30} \times 7}{22}^\circ = \frac{1050}{22}^\circ = 47\frac{8}{11}$$

3^{rd} angle $= 180^\circ - 47\frac{8}{11} = 132\frac{3}{11}^\circ$ Ans.

(95) Find the arc of a circle of radius 42 cm subtends an angle of 15° at the centre.

$$15^\circ = \cancel{15} \times \frac{\pi}{\cancel{180}_{12}} = \frac{\pi}{12}^c = \frac{22}{7\times 12} = \frac{11}{42}^c$$



$$\frac{11}{\cancel{42}}^c = \frac{l}{\cancel{42}}$$

$\boxed{l = 11\text{ cm}}$ Ans

(96) Find the angle between the minute hand and hour hand of a clock when the time is 5:20 A.M.

$$\left|\frac{11}{2}\times 20 - 30\times 5\right|$$

$$\boxed{\text{Angle} = \left|\frac{11}{2}m - 30H\right|}$$

$$|110 - 150|$$

$$40^\circ$$