

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

$$\textcircled{i} \max^m \rightarrow 1 \quad (\theta \rightarrow 0^\circ/90^\circ)$$

$$\textcircled{ii} \min^m \rightarrow \boxed{\theta = 45^\circ}$$

$$\textcircled{1} \sin^2 \theta + \cos^4 \theta = A$$

$$\textcircled{i} \max^m \rightarrow 1$$

$$\textcircled{ii} \min^m \rightarrow \sin^2 45^\circ + \cos^4 45^\circ$$

$$\theta = 45^\circ$$

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

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

A's Range

$$\boxed{\frac{3}{4} \leq A \leq 1}$$

सम सं (Even no)

$$\sin^4 \theta + \cos^4 \theta = A$$

$$\textcircled{i} \max^m \rightarrow 1$$

$$\textcircled{ii} \min^m \rightarrow \left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4$$

$\theta = 45^\circ$

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

$$\frac{1}{2} \leq A \leq 1$$

15. Find the maximum value of $3 \cos x + 4 \sin x$: —

$3 \cos x + 4 \sin x$ का अधिकतम मान क्या होगा ?

- (A) -5 (B) $\sqrt{5}$ (C) 5 (D) $-\sqrt{5}$

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

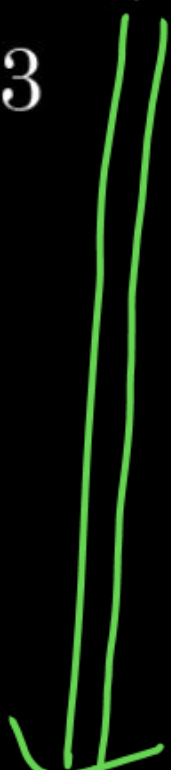
$$\textcircled{i} \max^m = \sqrt{a^2 + b^2} = \sqrt{3^2 + 4^2} = 5$$

$$\textcircled{ii} \min^m = -\sqrt{a^2 + b^2} = -5$$

16. Find the minimum value of $5 \sin \theta + 12 \cos \theta$: —

$5 \sin \theta + 12 \cos \theta$ का न्यूनतम मान क्या होगा ?

- (A) 12 (B) 13 (C) ~~-13~~ (D) 5


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

$$-\sqrt{5^2+12^2}$$

$$-\sqrt{25+144}$$

$$-\sqrt{169} = \textcircled{-13}$$

17. Find the maximum value of $7 \sin^2 \alpha + 9 \cos^2 \alpha$: —

$7 \sin^2 \alpha + 9 \cos^2 \alpha$ का अधिकतम मान क्या होगा?

- (A) 16 (B) 2 (C) 7 ~~(D) 9~~

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

① $\max^m \rightarrow$ अधिकतम गुणांक = 9

② $\min^m \rightarrow$ न्यूनतम गुणांक = 7

18. Find minimum value of expression $3 \cos^2 \theta + 6 \sec^2 \theta$:—

$3 \cos^2 \theta + 6 \sec^2 \theta$ का न्यूनतम मान ज्ञात करें ?

(A) $6\sqrt{2}$ (B) $3\sqrt{2}$ (C) 6 ~~(D)~~ **9**

$$3 \cos^2 \theta + 6 \sec^2 \theta$$

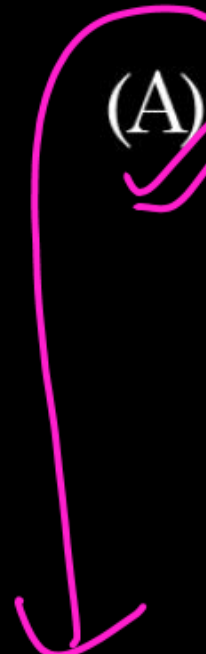
$$\textcircled{i} \min^m = 2\sqrt{ab} \quad [a > b]$$

$$\textcircled{ii} \min^m = a+b \quad [a < b] \Rightarrow 3+6=9$$

19. Find minimum value of expression $2 \tan^2 \theta + 6 \cot^2 \theta$
:—

$2 \tan^2 \theta + 6 \cot^2 \theta$ का न्यूनतम मान ज्ञात करें ?

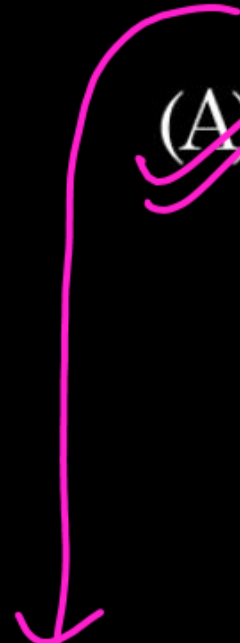
- (A) $4\sqrt{3}$ (B) $-4\sqrt{3}$ (C) $2\sqrt{3}$ (D) 6


$$\begin{aligned}\min^m &= 2\sqrt{ab} \\ &= 2\sqrt{2 \times 6} \\ &= 2\sqrt{4 \times 3} \\ &= 2 \times 2 \times \sqrt{3} \\ &= 4\sqrt{3}\end{aligned}$$

20. Find minimum of expression $5 \sin^2 \beta + 4 \operatorname{cosec}^2 \beta$:—

$5 \sin^2 \beta + 4 \operatorname{cosec}^2 \beta$ का न्यूनतम मान क्या होगा ?

- (A) $4\sqrt{5}$ (B) $-4\sqrt{5}$ (C) 4 (D) 5


$$2\sqrt{5 \times 4}$$

$$2 \times 2\sqrt{5}$$

$$4\sqrt{5}$$

$$\max^m \rightarrow \infty$$

21. Find the minimum value of Expression $4\sec^2\theta + \operatorname{cosec}^2\theta$: —

$4\sec^2\theta + 1\operatorname{cosec}^2\theta$ का न्यूनतम मान होगा : —

- (A) -9 (B) 4 (C) 9 (D) 1

$$\min^m \rightarrow (\sqrt{4} + \sqrt{1})^2$$

$$= (2+1)^2$$

$$= 9 \text{ Ans.}$$

$$a\sec^2\theta + b\operatorname{cosec}^2\theta$$

$$\textcircled{i} \max^m \rightarrow \infty$$

$$\textcircled{ii} \min^m \rightarrow (\sqrt{a} + \sqrt{b})^2$$

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

22. Find the maximum value of $\sin^4 x + \cos^4 x$

$\sin^4 x + \cos^4 x$ का अधिकतम मान ज्ञात करें : —

- (A) 2 (B) $\frac{1}{2}$ ~~(C) 1~~ (D) $\frac{1}{4}$

① $\max^m \rightarrow 1$
② $\min^m \rightarrow \theta = 45^\circ$
 $\left(\frac{1}{\sqrt{2}}\right)^4 + \left(\frac{1}{\sqrt{2}}\right)^4$
 $\frac{1}{4} + \frac{1}{4} = \left(\frac{1}{2}\right)$

concept

$$\textcircled{i} \sin A = \cos B \Rightarrow \sin A - \cos B = 0$$

$$\textcircled{ii} \tan A = \cot B \Rightarrow \tan A - \cot B = 0$$

$$\textcircled{iii} \sec A = \operatorname{cosec} B \Rightarrow \sec A - \operatorname{cosec} B = 0$$

$$\boxed{A+B=90^\circ}$$

$$\underbrace{\sec(\cancel{x}-25^\circ)}_A - \underbrace{\operatorname{cosec}(115^\circ-\cancel{x})}_B + 5$$

कामान निकालें।

$$0+5=5 \text{ Ans.}$$

$$A+B = \cancel{x}-25^\circ + 115^\circ - \cancel{x}$$

$$\textcircled{A+B=90^\circ}$$

$$\underbrace{\tan(A+20^\circ) - \cot(70^\circ-A)}_0 + \underbrace{\sin(B+30^\circ) - \cos(60^\circ-B)}_0 + 7 = \underline{\underline{7 \text{ Ans}}}$$

23. If $\sin 3A = \cos (A - 18^\circ)$, where $0 < 3A < 90^\circ$, then find 'A' : —

यदि $\sin 3A = \cos (A - 18^\circ)$, जहाँ $0 < 3A < 90^\circ$, तो 'A' का मान बताएँ : —

- (A) 45° (B) 30° (C) 60° (D) 27°

$$\sin 3A = \cos (A - 18^\circ)$$

$$3A + A - 18 = 90$$

$$4A = 108$$

$$A = \frac{108}{4} = 27^\circ$$

concept

$$\textcircled{i} \tan A \cdot \tan B = 1$$

$$\textcircled{ii} \cot A \cdot \cot B = 1$$

$$\boxed{A + B = 90^\circ}$$

$$\tan 2^\circ \times \tan 18^\circ \times \tan 88^\circ \times \tan 72^\circ \times \tan 60^\circ$$

$$1 \times 1 \times \sqrt{3} = \underline{\underline{\sqrt{3} \text{ Ans.}}}$$

24. If $\tan(x+y) \cdot \tan(x-y) = 1$, then find $\tan\left(\frac{2x}{3}\right) : -$

यदि $\tan(x+y) \cdot \tan(x-y) = 1$ हो, तो $\tan\left(\frac{2x}{3}\right)$ को ज्ञात करें:—

- (A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\frac{1}{2}$ (D) 1

$$\tan(x+y) \times \tan(x-y) = 1$$

$$x+y+x-y=90$$

$$2x=90^\circ$$

$$\boxed{x=45^\circ}$$

$$\tan \frac{2x}{3}$$

$$\tan \frac{90}{3}$$

$$\tan 30 = \frac{1}{\sqrt{3}}$$

25. $\sin 1^\circ \cdot \sin 2^\circ \cdot \sin 3^\circ \cdot \underline{\hspace{2cm}} \sin 180^\circ = ?$

~~(A)~~ 0

(B) 1

(C) -1

(D) None

$\cos 180^\circ = -1$

$$\begin{aligned}\sin 180^\circ &= \sin(90+90) \\ &= \cos 90^\circ \\ &= 0\end{aligned}$$

26. $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \cdots \cos 90^\circ = ?$

~~(A) 0~~

(B) -1

(C) 1

(D) None

$\cos 1^\circ \times \cdots \times 0 = 0$

27. $\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \dots \tan 89^\circ = ?$

- (A) ∞ (B) 1 (C) 0 (D) -1

$\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \dots \tan 89^\circ$
 $\tan 1^\circ \cdot \tan 89^\circ = 1$
 $\tan 2^\circ \cdot \tan 88^\circ = 1$
 \vdots
 $\tan 45^\circ = 1$
 $\tan 46^\circ \dots \tan 89^\circ$ (crossed out)
 $1 \times 1 \times \dots \times 1 = \underline{\underline{1 \text{ Ans.}}}$
 $\tan 90^\circ = \infty$
 $\infty \times \infty = \infty$

$$\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots \overset{\text{Sin}^2 45^\circ}{\downarrow} \dots + \sin^2 85^\circ + \sin^2 90^\circ$$

$$\boxed{n = \frac{L-F}{d} + 1}$$

$$n = \frac{85-5}{5} + 1$$

$$n = \frac{16 \times 80}{8} + 1 = 17$$

$$\frac{17}{2} = 8\frac{1}{2} + 1$$

9 $\frac{1}{2}$ Ans.

$$\cos^2 5^\circ + \cos^2 10^\circ + \cos^2 15^\circ + \cos^2 20^\circ + \dots + \cos^2 85^\circ + \cos^2 90^\circ$$

$$\boxed{\eta = \frac{L-F}{d} + 1}$$

$$\eta = \frac{85-5}{5} + 1 = 17$$

$$\frac{17}{2} = 8\frac{1}{2}$$

$$8\frac{1}{2} + 0$$

$$8\frac{1}{2} \underline{\underline{\text{Ans.}}}$$

concept

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

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

$$(iii) \tan \theta \cdot \tan(60-\theta) \cdot \tan(60+\theta) \rightarrow \tan 3\theta$$

$$(iv) \cot \theta \cdot \cot(60-\theta) \cdot \cot(60+\theta) \rightarrow \cot 3\theta$$

Height and Distance

$$\begin{aligned} \sin 20^\circ \sin 40^\circ \sin 80^\circ &= \frac{1}{4} \sin 60^\circ \\ &= \frac{1}{4} \times \frac{\sqrt{3}}{2} \\ &= \frac{\sqrt{3}}{8} \end{aligned}$$

$$\# \tan 15^\circ \tan 45^\circ \tan 75^\circ = \tan 45^\circ = \textcircled{1}$$

$$\begin{aligned} \cos 15^\circ \cos 45^\circ \cos 75^\circ &= \frac{1}{4} \cos 45^\circ \\ &= \frac{1}{4} \times \frac{1}{\sqrt{2}} \\ &= \frac{1}{4\sqrt{2}} \end{aligned}$$