

152. Evaluate: $8\sec^2 45^\circ + 20\sin^2 30^\circ + 15\tan 45^\circ$

$8 \sec^2 45^\circ + 20\sin^2 30 + 15\tan 45^\circ$ का मान ज्ञात कीजिए।

SSC CHSL 2023 PRE

[A] 43

[B] 28

[C] 36 ✓

[D] 42

$$8 \times 2 + \overset{5}{\cancel{20}} \times \frac{1}{4} + 15 \times 1$$
$$= 36$$

153. The value of $\frac{\operatorname{cosec}^2 30^\circ \sin^2 45^\circ + \sec^2 60^\circ}{\tan 60^\circ \operatorname{cosec}^2 45^\circ - \sec^2 60^\circ \tan 45^\circ}$ is:

$\frac{\operatorname{cosec}^2 30^\circ \sin^2 45^\circ + \sec^2 60^\circ}{\tan 60^\circ \operatorname{cosec}^2 45^\circ - \sec^2 60^\circ \tan 45^\circ}$ का मान ज्ञात कीजिए।

[A] $3(2 + \sqrt{3})$

[B] $2(\sqrt{3} - 2)$

[C] $-2\sqrt{3} - 2$

[D] $-3(2 + \sqrt{3})$

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

3-4

$$= \frac{6}{2\sqrt{3} - 4} = \frac{3}{\sqrt{3} - 2} \times \frac{\sqrt{3} + 2}{\sqrt{3} + 2} = \frac{3 \cdot (\sqrt{3} + 2)}{-1} = -3 \cdot (\sqrt{3} + 2)$$

154. The value of $\frac{4 \tan^2 30^\circ + \frac{1}{4} \sin^2 90^\circ + \frac{1}{8} \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$ is:

$\frac{4 \tan^2 30^\circ + \frac{1}{4} \sin^2 90^\circ + \frac{1}{8} \cot^2 60^\circ + \sin^2 30^\circ \cos^2 45^\circ}{\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ}$ का मान है:

[A] $1\frac{3}{4}$

[B] 4

[C] $2\frac{1}{2}$

[D] $3\frac{1}{2}$

155. If $\frac{k - k \cot^2 30^\circ}{1 + \cot^2 30^\circ} = \sin^2 60^\circ + 4 \tan^2 45^\circ - \operatorname{cosec}^2 60^\circ$, then the value of k (correct to two decimal places) is?

यदि $\frac{k - k \cot^2 30^\circ}{1 + \cot^2 30^\circ} = \sin^2 60^\circ + 4 \tan^2 45^\circ - \operatorname{cosec}^2 60^\circ$ है, तो k का मान (दो दशमलव स्थानों तक सही) है?

[A] ~~5.55~~

[B] ~~-6.83~~

[C] ~~-5.58~~

[D] ~~6.83~~

$$k = -\frac{41}{6}$$

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

$$\frac{-2k}{4} = \frac{9 + 48 - 16}{12}$$

$$-2k = \frac{41}{3}$$

156. The value of $m[\sin\theta + 2\cos^2\phi + 3\sin\theta + 4\cos^2\phi + \dots + 18\cos^2\phi]$ is a perfect square of an integer, $\theta = 30^\circ$, $\phi = 45^\circ$ and $150 \leq m \leq 180$. Find the value of m .

यदि $m[\sin\theta + 2\cos^2\phi + 3\sin\theta + 4\cos^2\phi + \dots + 18\cos^2\phi]$ का मान एक पूर्णांक का एक पूर्ण वर्ग है, $\theta = 30^\circ$, $\phi = 45^\circ$ और $150 \leq m \leq 180$, तो m का मान ज्ञात करें।

[A] 161

[B] 152

[C] 168

[D] 176

$$m \left[\frac{1}{2} + 2 \cdot \frac{1}{2} + 3 \cdot \frac{1}{2} + 4 \cdot \frac{1}{2} + \dots + 18 \cdot \frac{1}{2} \right]$$

$$\frac{m}{2} [1 + 2 + 3 + 4 + \dots + 18]$$

$$m = 2 \times 19 \times 4$$

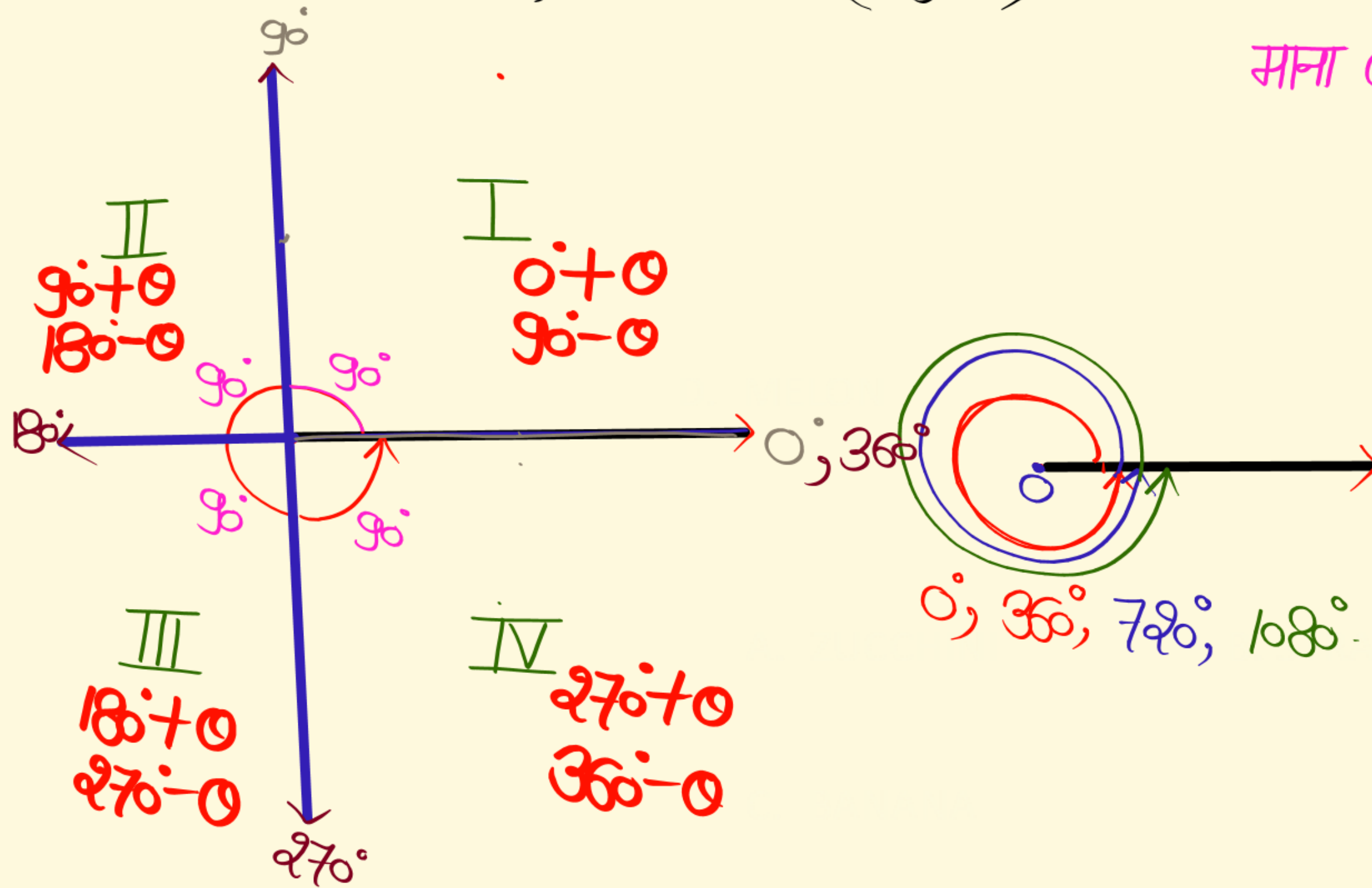
$$\frac{m}{2} \times \frac{19 \times 19}{2} = \frac{9 \times 19 \times m}{2} = \text{Perfect square}$$

$$1+2+3+4+\dots+n = \frac{n(n+1)}{2}$$



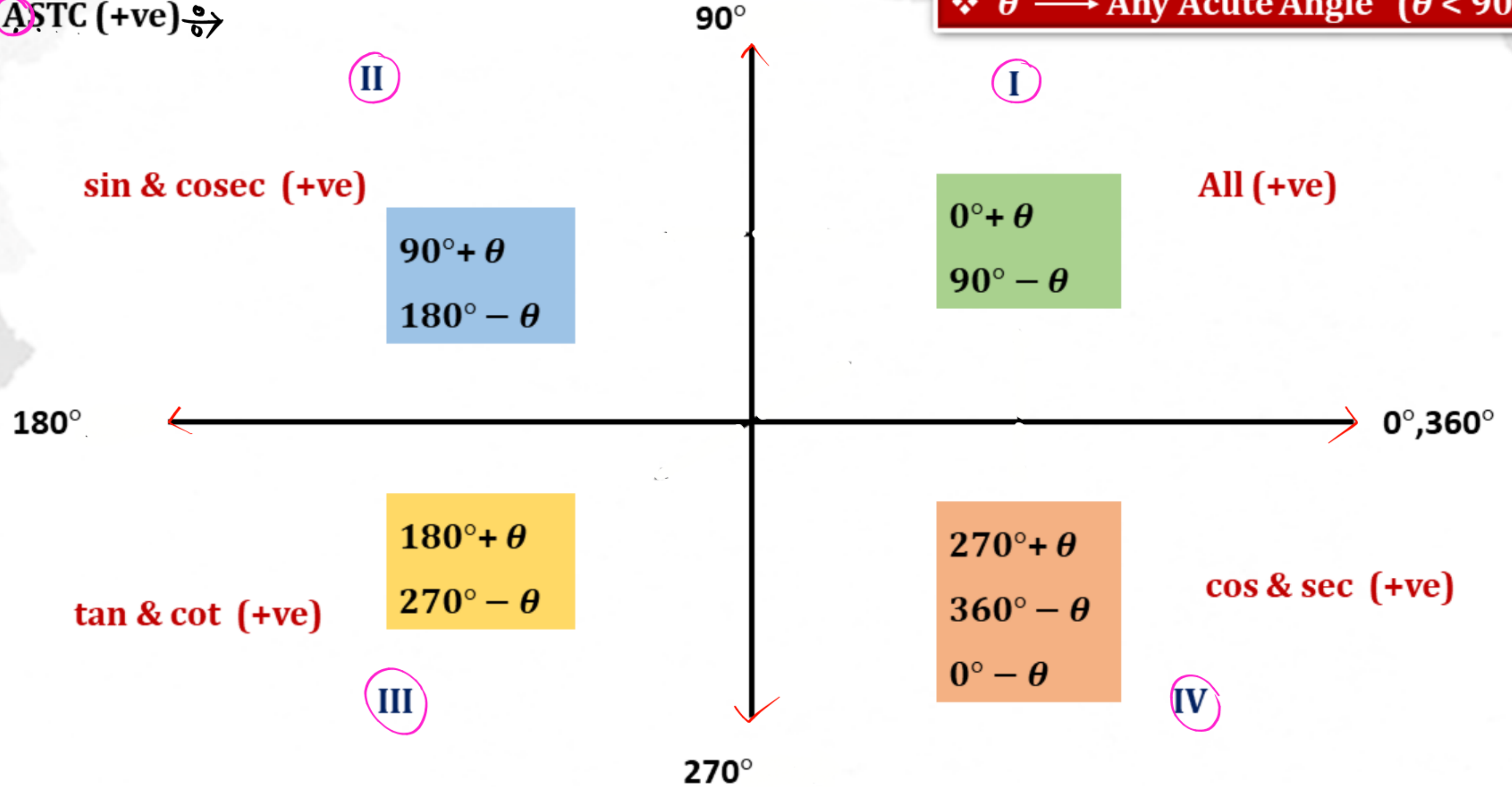
Quadrant (चरुथैश)

माना $0 = \text{acute angle}$



ASTC (+ve) $\rightarrow$

❖ $\theta \rightarrow$ Any Acute Angle ($\theta < 90^\circ$)



90°, 270°, 450° पर change होता है।

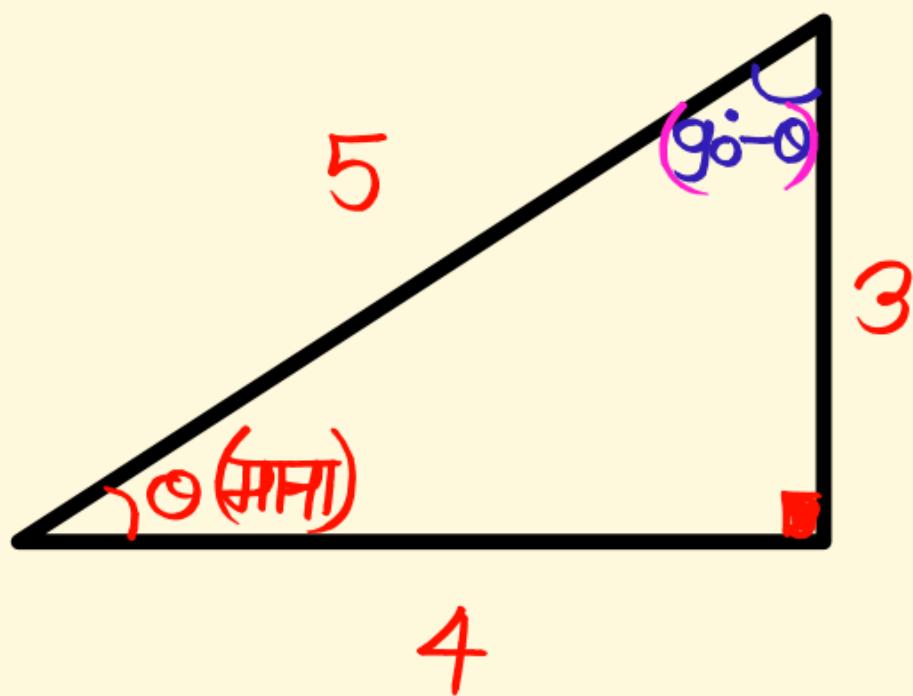
$\sin \longleftrightarrow \csc$

$\tan \longleftrightarrow \cot$

$\sec \longleftrightarrow \csc$

180°, 360°, 540° पर no change





$$\tan 60^\circ = \tan(90^\circ - 30^\circ) = \cot 30^\circ$$

$$\sec(90^\circ - \theta) = +\sec \theta$$

$$\sin \theta = \frac{3}{5}$$

$$\cos(90^\circ - \theta) = \frac{3}{5}$$

$$\cos(90^\circ - \theta) = +\sin \theta$$

$$\sin(90^\circ - \theta) = +\cos \theta$$

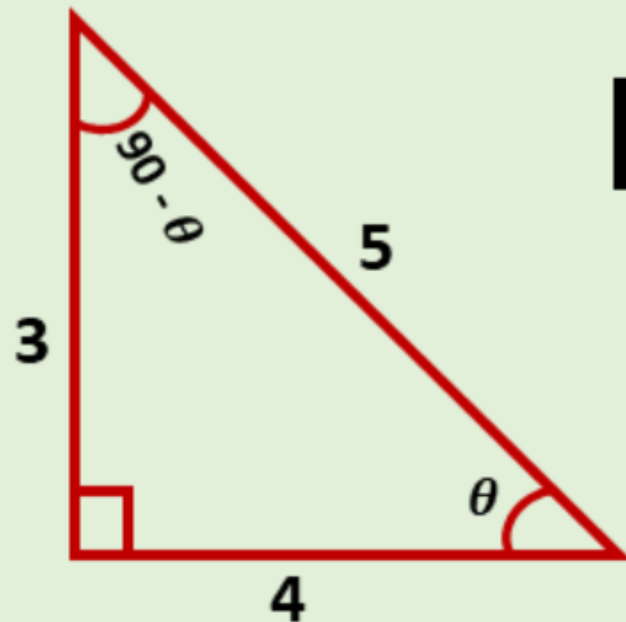
$$\tan(90^\circ - \theta) = +\cot \theta$$

$$\cot(90^\circ - \theta) = +\tan \theta$$

CHANGE OF T-RATIO

$90^\circ, 270^\circ$ change (90 के odd multiple पर change)

$180^\circ, 360^\circ$ no change (90 के even multiple पर No change)



$\sin \longleftrightarrow \cos$

$\tan \longleftrightarrow \cot$

$\sec \longleftrightarrow \csc$

$$\sin(90^\circ - \theta) = \frac{4}{5} = \cos \theta$$

$$\cos(90^\circ - \theta) = \frac{3}{5} = \sin \theta$$

$$\sin(90^\circ - \theta) = \cos \theta$$

$$\tan(90^\circ - \theta) = \cot \theta$$

$$\sec(90^\circ - \theta) = \csc \theta$$

$$\cos(90^\circ - \theta) = \sin \theta$$

$$\cot(90^\circ - \theta) = \tan \theta$$

$$\csc(90^\circ - \theta) = \sec \theta$$

☆ ☆ (90°+θ) → IInd quadrant (sin & cosec +ve)

$$\sin(90^\circ + \theta) = +\cos\theta$$

$$\cos(90^\circ + \theta) = -\sin\theta$$

$$\tan(90^\circ + \theta) = -\cot\theta$$

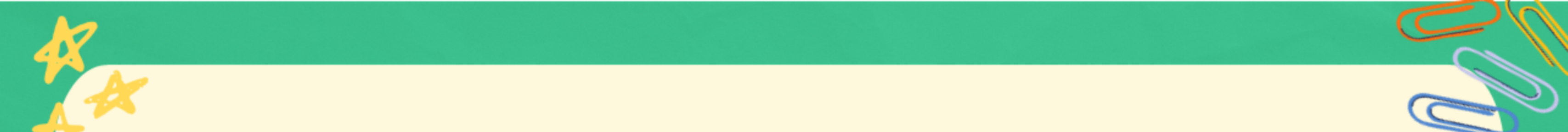
$$\cot(90^\circ + \theta) = -\tan\theta$$

$$\sec(90^\circ + \theta) = -\operatorname{cosec}\theta$$

$$\operatorname{cosec}(90^\circ + \theta) = +\sec\theta$$

$$\begin{aligned}\cos 120^\circ &= \cos(90^\circ + 30^\circ) \\ &= -\sin 30^\circ \\ &= -\frac{1}{2}\end{aligned}$$

$$\begin{aligned}\tan 15^\circ &= \tan(90^\circ + 60^\circ) \\ &= -\cot 60^\circ \\ &= -\frac{1}{\sqrt{3}}\end{aligned}$$


$$\text{Gsec } 135^\circ = \text{Gsec } (90^\circ + 45^\circ)$$

$$= +\text{sec } 45^\circ$$

$$= +\sqrt{2}$$




$(180^\circ - \theta) = \text{II}^{\text{nd}} \text{ quadrant}$

$$\sin(180^\circ - \theta) = +\sin\theta$$

$$\cos(180^\circ - \theta) = -\cos\theta$$

$$\tan(180^\circ - \theta) = -\tan\theta$$

$$\sec(180^\circ - \theta) = -\sec\theta$$

$$\begin{aligned}\sin 120^\circ &= \sin(90^\circ + 30^\circ) \\ &= +\cos 30^\circ \\ &= \frac{\sqrt{3}}{2}\end{aligned}$$

$$\begin{aligned}\sin 120^\circ &= \sin(180^\circ - 60^\circ) \\ &= +\sin 60^\circ \\ &= \frac{\sqrt{3}}{2}\end{aligned}$$


$$\begin{aligned}\cot 135^\circ &= \cot (180^\circ - 45^\circ) \\ &= -\cot 45^\circ \\ &= -1\end{aligned}$$


$$\begin{aligned}\sec 120^\circ &= \sec (180^\circ - 60^\circ) \\ &= -\sec 60^\circ \\ &= -2\end{aligned}$$



$$\begin{cases} 180^\circ + 0 \\ 270^\circ - 0 \end{cases} \Rightarrow \text{III}^{\text{rd}} \text{ quadrant}$$

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

$$\cos(180^\circ + 0) = -\cos 0$$

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

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

$$\sec(180^\circ + 0) = -\sec 0$$

$$\sin(270^\circ - 0) = -\cos 0$$

$$\cos(270^\circ - 0) = -\sin 0$$

$$\tan(270^\circ - 0) = +\cot 0$$



$$\begin{aligned}\sin 225^\circ &= \sin(180^\circ + 45^\circ) \\ &= -\sin 45^\circ \\ &= -\frac{1}{\sqrt{2}}\end{aligned}$$

$$\begin{aligned}\sec 240^\circ &= \sec(270^\circ - 30^\circ) \\ &= -\sec 30^\circ \\ &= -2\end{aligned}$$



$$\begin{aligned}\tan 210^\circ &= \tan(180^\circ + 30^\circ) \\ &= +\tan 30^\circ \\ &= \frac{1}{\sqrt{3}}\end{aligned}$$

$\left. \begin{array}{l} 270^\circ + \theta \\ 360^\circ - \theta = -\theta \end{array} \right\} \Rightarrow \text{IV quadrant (or } \theta \text{ sec +ve)}$

$$\sin(270^\circ + \theta) = -\cos \theta$$

$$\cos(270^\circ + \theta) = +\sin \theta$$

$$\cot(270^\circ + \theta) = -\tan \theta$$

$$\sin(-\theta) = -\sin \theta$$

$$\cos(-\theta) = \cos \theta$$

$$\tan(-\theta) = -\tan \theta$$

$$\cot(-\theta) = -\cot \theta$$

$$\sec(-\theta) = \sec \theta$$

$$\csc(-\theta) = -\csc \theta$$


$$\cos(-30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\tan(-60^\circ) = -\tan 60^\circ \\ = -\sqrt{3}$$

$$\sin 330^\circ = \sin(270^\circ + 60^\circ) \\ = -\cos 60^\circ \\ = -\frac{1}{2}$$

या

$$\sin 330^\circ = \sin(\cancel{360^\circ} - 30^\circ) \\ = -\sin 30^\circ \\ = -\frac{1}{2}$$

