ARJUNA NEET BATCH

TRIGONOMETRY

LECTURE - 01

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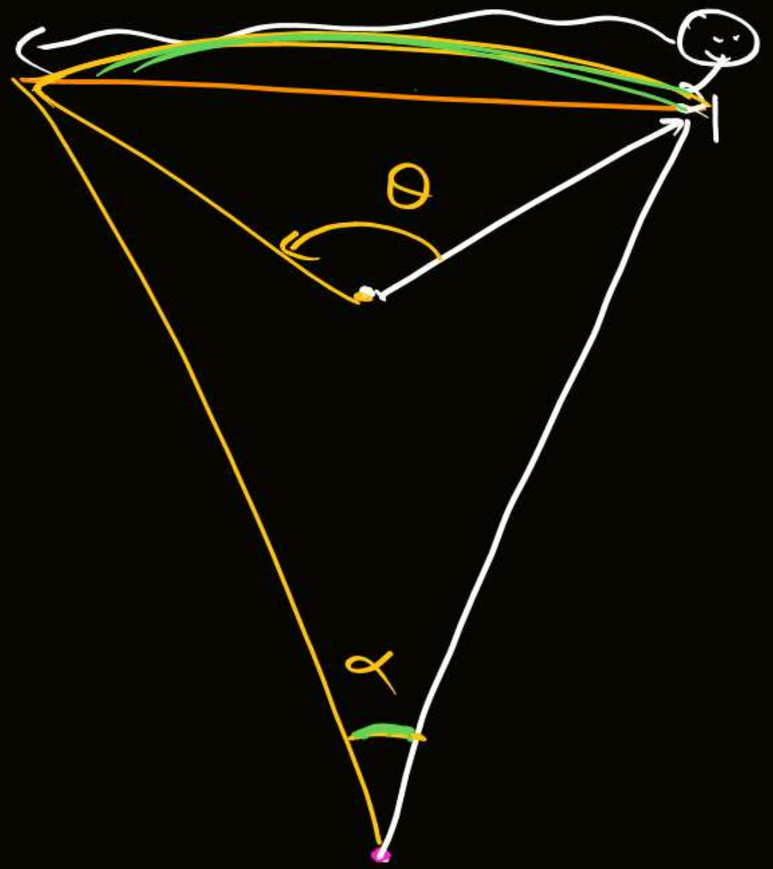
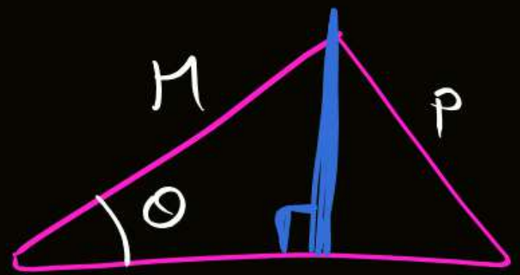
TODAY'S GOAL

- Basic Concept of Trigonometry
- Basic algebra
- Binominal Theorem
- G/P Series



Angle α $\frac{\text{Arcc}}{R}$

Angle $(\theta) = \frac{\text{Arcc}}{R}$

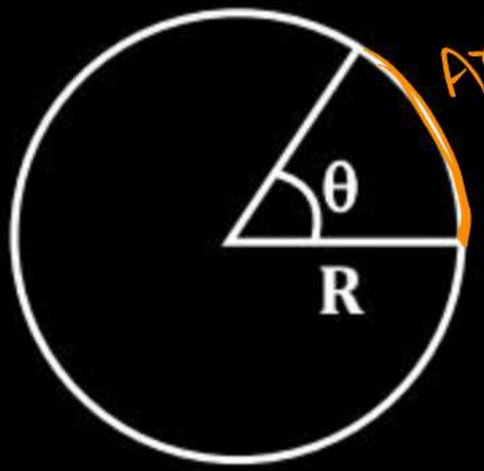


$\sin\theta = \frac{P}{H}$

ANGLE

Angle → Algebraic function (Arc = Rθ)

Angle → Trigonometric function $H = \sqrt{P^2 + B^2}$

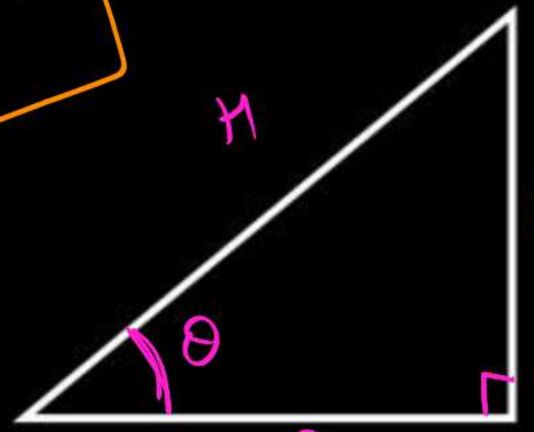


Arc

$$\frac{Arc}{R} = \theta$$

$$Arc = R\theta$$

S.I unit (rad)



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

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

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

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Unit circle

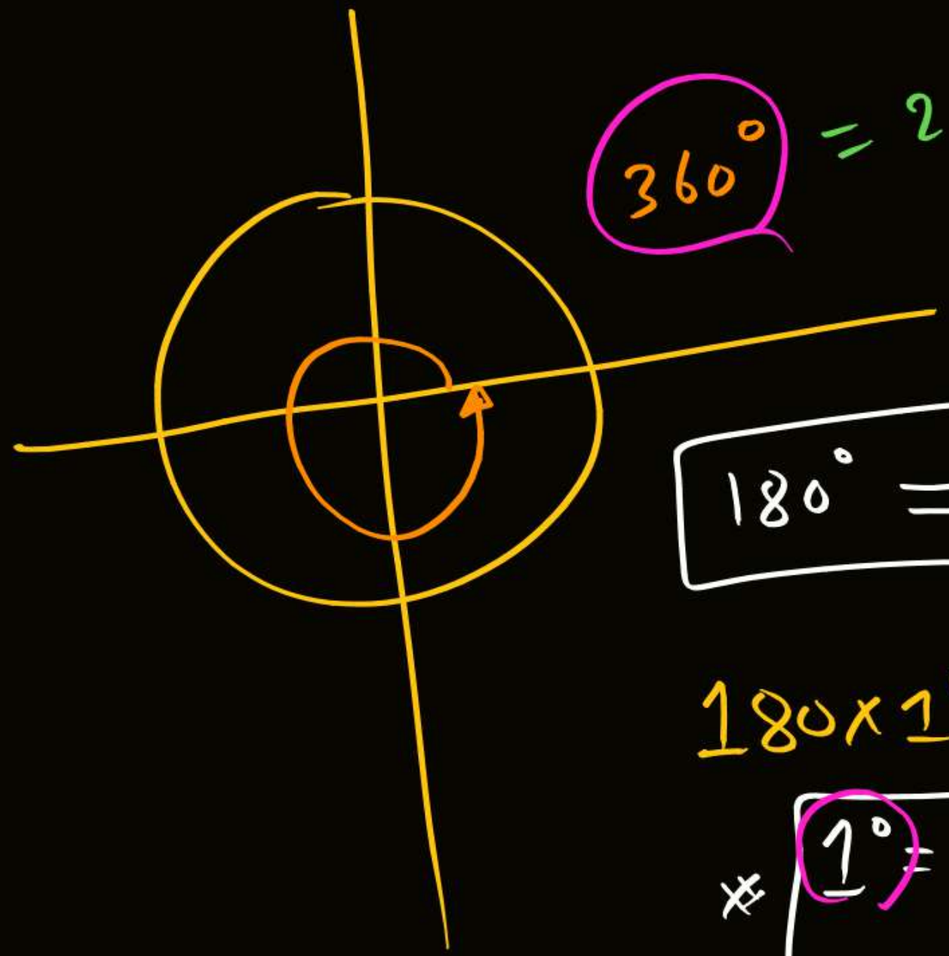
$$\sin\theta = \frac{P}{H} \qquad \operatorname{cosec}\theta = \frac{H}{P}$$

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

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

UNIT OF ANGLE

- **Rad (S.I. Unit)**
  - $y = \theta$
  - Unit of Angle(θ) must be in rad.
  - $y = \theta = 30°$ ✗
- **Degree**
  - for Trigonometric Funct.
  - $\sin\theta$ → Angle maybe in rad/degree
  - $360° = 2\pi$ rad
  - $180° = \pi$ rad
  - $1° = \frac{\pi \text{ rad}}{180}$
  - $1 \text{ rad} = \frac{180°}{\pi}$
- **min/sec (For small angle)**
  - $1° = 60'$ (min)
  - $1' = \frac{1°}{60}$



$360^\circ = 2\pi \text{ rad}$ ← S.I unit of Angle

$180^\circ = \pi \text{ rad}$

$180 \times 1^\circ = \pi \text{ rad}$

$\# \quad 1^\circ = \frac{\pi \text{ rad}}{180}$

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

$1 \text{ m} = 100 \text{ cm}$

$1 \text{ Km} = 1000 \text{ m}$

Convert angle from rad to degree.

(i) $\frac{\pi}{2}$ rad (ii) $\frac{\pi}{4}$ rad (iii) $\frac{\pi}{3}$ rad

(iv) $\frac{5\pi}{6}$ rad (v) $\frac{2\pi}{3}$ rad (vi) $\frac{4\pi}{3}$ rad $= 240^\circ$

π rad $= 180^\circ$

(i) $\frac{\pi}{2}$ rad $= \frac{180^\circ}{2} = 90^\circ$

(ii) $\frac{\pi}{4}$ rad $= \frac{180}{4} = 45^\circ$

(iii) $\frac{\pi}{3}$ rad $= \frac{180}{3} = 60^\circ$

(iv) $\frac{5\pi}{6}$ rad

$= \frac{5}{6} \times 180^{30}$

$= 150^\circ$

(v) $\frac{2\pi}{3}$ rad $= \frac{2}{3} \times \overset{60}{\cancel{180}} = 120^\circ$

Convert Angle from degree to rad

(i) $30^\circ = 30 \times 1^\circ = \cancel{30} \times \frac{\pi \text{ rad}}{\cancel{180}\ 6}$ (Majdari)

$\rightarrow$ MR $\cancel{30^\circ} \times \frac{\pi \text{ rad}}{\cancel{180}\ 6}$

(ii) $180^\circ = \pi \text{ rad}$

(iii) $\cancel{60^\circ} \times \frac{\pi \text{ rad}}{\cancel{180}\ 3} = \frac{\pi}{3} \text{ rad} = 60^\circ$

(iv) $90^\circ = \cancel{90^\circ} \times \frac{\pi \text{ rad}}{\cancel{180}\ 2} = \frac{\pi}{2} \text{ rad}$

(iv) $240^\circ = \cancel{240}^{4} \times \frac{\pi \text{ rad}}{\cancel{180}_{3}} = \frac{4\pi}{3}$

(v) $45^\circ = \cancel{45^\circ \times \frac{\pi \text{ rad}}{180}}\ 4$

(vi) $135^\circ = \cancel{135^\circ}^{3} \times \frac{\pi \text{ rad}}{\cancel{180}\ 4} = \frac{3\pi}{4}$

(vii) $150^\circ =$

If θ increases from 0° to 90° then $\sin\theta \uparrow$

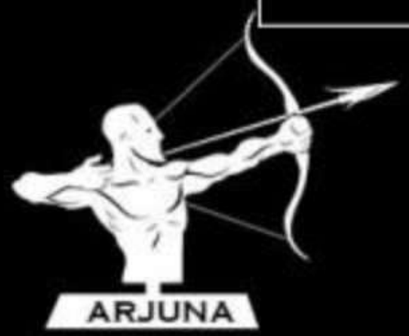
If $\theta \uparrow$ from 0° to 90° then $\cos\theta \downarrow$

	0°	30°	45°	60°	90°	120°	135°	150°	180°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$-\frac{1}{2}$	$-\frac{1}{\sqrt{2}}$	$-\frac{\sqrt{3}}{2}$	-1
$\tan\theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞	$-\sqrt{3}$	-1	$-\frac{1}{\sqrt{3}}$	0

$\leq \sin\theta \leq$ $\quad$ $\leq \cos\theta \leq$ $\quad$ $\leq \tan\theta \leq$

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

m_R*



If $\tan\theta = 2$ then find $\sin\theta$ and $\cos\theta$.

$$\tan\theta = \frac{2}{1} = \frac{P}{B}$$

$$\frac{P}{B} = \frac{2}{1}$$

If $P = 2$ then $B = 1$

$$H = \sqrt{P^2 + B^2}$$

$$H = \sqrt{5}$$

$$\sin\theta = \frac{P}{H} = \frac{2}{\sqrt{5}}$$

$$\cos\theta = \frac{B}{H} = \frac{1}{\sqrt{5}}$$

(θ) If $\boxed{\sin\theta = 2}$ then find $\tan\theta = ??$

→ Not Possible

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→ Wrong question

$\boxed{-1 \le \sin\theta \le 1}$

oscillate b/w -1 to $+1$

$\boxed{-1 \le \cos\theta \le +1}$

$-\infty \le \tan\theta < +\infty$

If $\sin\theta = 3/5$ then find $\cos\theta$, $\tan\theta$.

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

Soln $\sin\theta = \frac{P}{H} = \frac{3}{5}$

Gf $P = 3$

then $H = 5$

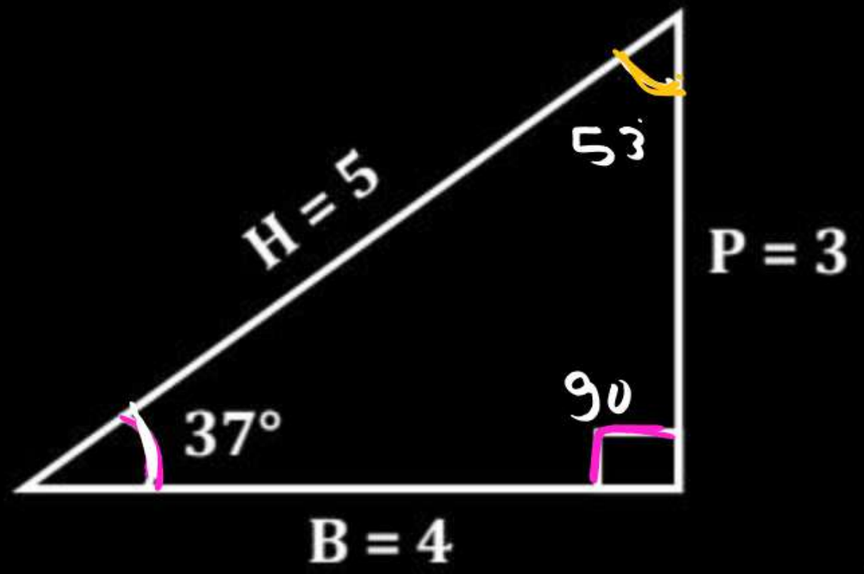
$H^2 = P^2 + B^2$

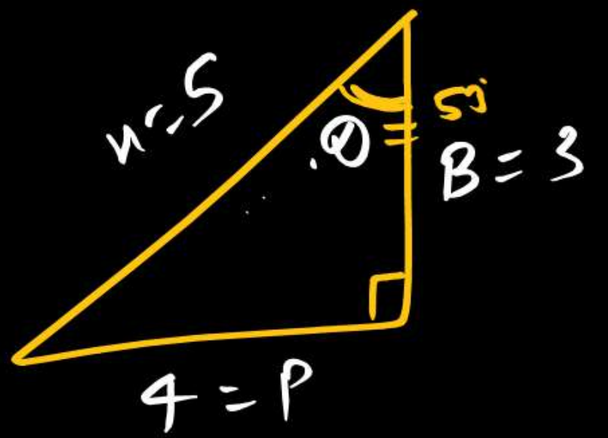
$B^2 = H^2 - P^2$

$B = \sqrt{25 - 9}$

$\boxed{B = 4}$

Find :





$\tan 37^\circ = \frac{3}{4} = \frac{P}{B}$

$\sin 37^\circ = \frac{3}{5}$

$\cos 37^\circ = \frac{4}{5}$

$\tan 53^\circ = \frac{4}{3}$ *

H=5

$\sin 53^\circ = \frac{4}{5}$

$\cos 53^\circ = \frac{3}{5}$

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If $y = \frac{\sin\theta}{\theta}$ then find value of y if $\theta = 30°$.

$$y = \frac{(\sin\theta)}{\theta} = \frac{\sin 30^\circ}{30^\circ}$$

$$y = \frac{\sin 30^\circ}{(\pi/6)} = \frac{1}{\frac{2\pi}{6}} = \frac{3}{\pi}$$

SMALL ANGLE APPROXIMATION

θ is vary small

$$\sin\theta = \frac{P}{H} = \frac{\cancel{R}\,\theta}{\cancel{R}}$$

$$H = \sqrt{\cancel{P^2}^{\,0} + B^2}$$

$$H = B$$

$H = R$ (Let)

$P = R\theta = R\,\text{arc}$

$B = R$

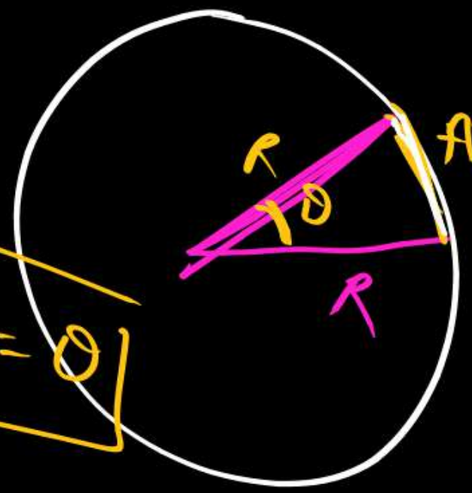
If θ is vary small

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

$$\boxed{\cos\theta = \frac{B}{H} = \frac{\cancel{R}}{\cancel{R}} = 1}$$

θ is small

$$\boxed{\sin\theta = \frac{\cancel{R}\theta}{\cancel{R}} = \theta}$$



Arc $= R\theta$

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$$|\tan\theta| = \frac{\sin\theta}{\cos\theta} = \frac{\theta}{1}$$

Small Angle

$\theta = 1^\circ$ to 5°

$$\tan\theta = \theta = \sin\theta$$

↳ for small angle

Find value :

(i) $\sin 2°$ (ii) $\tan 3° = 3° \frac{\pi \text{ rad}}{180} = \frac{\pi}{60}$ (iii) $\cos 3° = 1$

(iv) $\sin(88.5°) = 1$ (v) $\sin(89°) = 1$

$90°$

Soln

$\sin 2 = 2°$

$\sin 2° = 2° \times \frac{\pi}{180} = \frac{\pi}{90}$

$\sin 2° = \frac{\pi}{90}$

$\sin\theta = \theta = \tan\theta$

$\cos\theta = 1$

$(P^2 + B^2 = H^2)$

If divided by ~~P^2~~ both size.

$$P^2 + B^2 = H^2$$

divided by H^2 on both side

$$\left(\frac{P^2}{H^2}\right) + \frac{B^2}{H^2} = 1$$

$$\boxed{\sin^2\theta + \cos^2\theta = 1}$$ ✳ Ratio

$$P^2 + B^2 = H^2$$

divided by P^2

$$1 + \left(\frac{B}{P}\right)^2 = \left(\frac{H}{P}\right)^2$$

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

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

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

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

Find value :

(i) $\sin(A+B) =$ (ii) $\sin(A-B) =$ (iii) $\cos(A+B) =$

(iv) $\cos(A-B) =$ (v) $\tan(A+B) =$

$$\sin(A+B) = \sin A \cdot \cos B + \sin B \cdot \cos A$$ → Rakta

$$\sin(A-B) = \sin A \cdot \cos B - \sin B \cos A$$

$$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$$

$$\cos(A-B) = \cos A \cdot \cos B + \sin A \cdot \sin B$$

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

If A = B then sin (A + A) =

If $A = B = \theta$

$$\sin(2\theta) = \sin\theta \cdot \cos\theta + \sin\theta \cdot \cos\theta$$

$$\boxed{\sin(2\theta) = 2\sin\theta \cdot \cos\theta}$$

$$\cos(A+B) = \cos A \cdot \cos B - \sin A \cdot \sin B$$

$$\boxed{\cos(2\theta) = \cos^2\theta - \sin^2\theta}$$

Find value of :

(i) sin (75°) (ii) sin (105°) (iii) cos (120°)

$\sin(75^\circ) = \sin(45^\circ + 30^\circ) =$ ✓

$\sin(105^\circ) = \sin(60^\circ + 45^\circ)$ ✓

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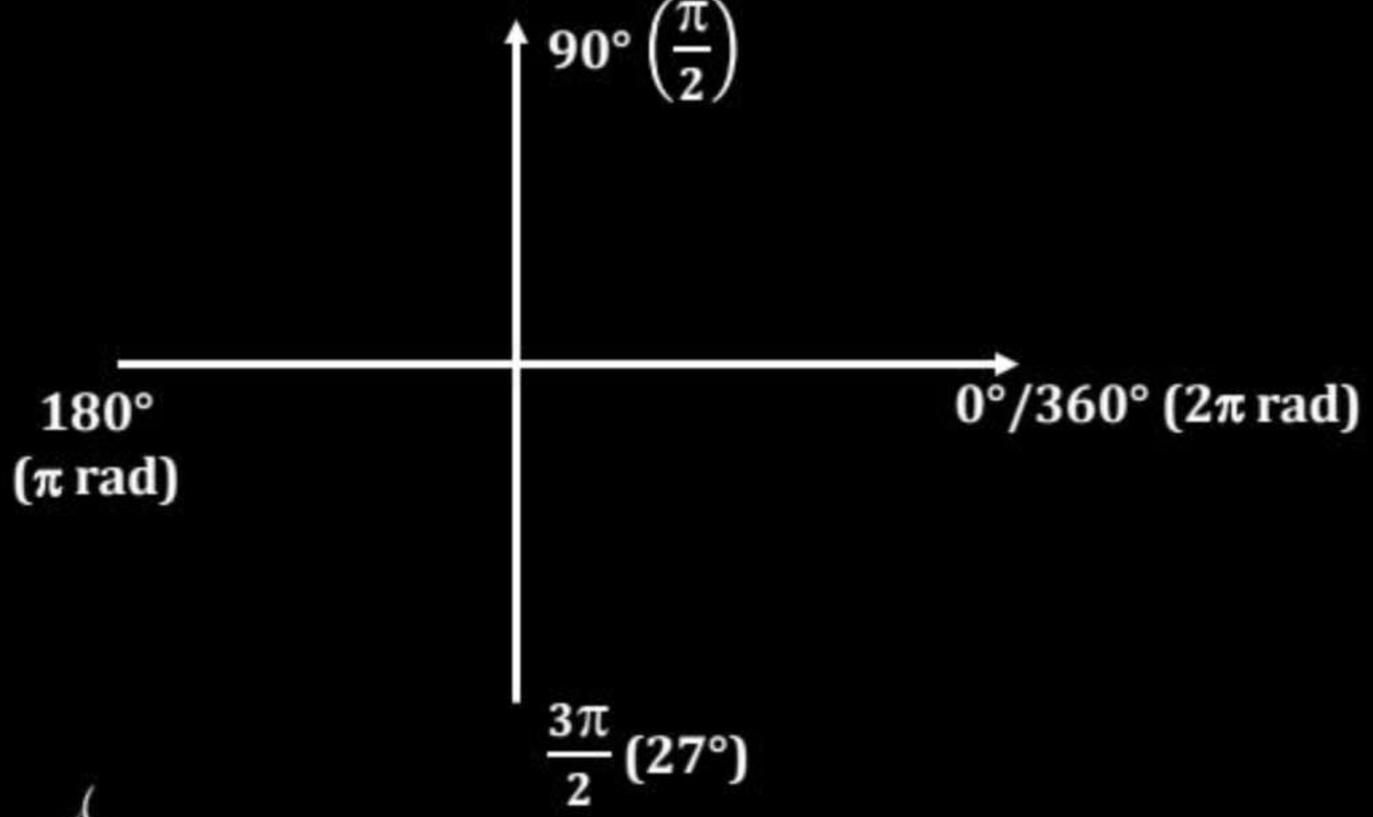
TRIGONOMETRY FUNCTION CHARGE



$\sin(90 - \theta) =$

$\cos(90 - \theta) =$

$\sin(90 + \theta) =$

$\cos(90 + \theta) =$

$\sin(180 - \theta) =$

$\cos(180 - \theta) =$

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$\sin(90 - \theta) =$

$\cos(90 - \theta) =$

$\sin(90 + \theta) =$

$\cos(90 + \theta) =$

$\sin(180 - \theta) =$

$\cos(180 - \theta) =$

Find value of :

(i) $\sin(-30°)$ (ii) $\cos(-60°)$ (iii) $\sin(120°)$

(iv) $\sin(390°)$ (v) $\sin(20\pi/3)$

If $y = A \sin\theta + B \cos\theta$ then find maximum value of y.

If $y = 3 \sin\theta + 4 \cos\theta$ then find maximum value of y.

If $\frac{A_1}{A_2} = \frac{7}{3}$ then find $\frac{A_1 + A_2}{A_1 - A_2}$

If $\frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}}=\frac{5}{3}$ then find $\frac{I_1}{I_2}$.

BINOMIAL APPROXIMATION

$(1 + x)^2 =$

$(1 + x)^n =$

G.P. SERIES

$a + ar + ar^2 + ar^3 + ...$

Sum = ??

Find sum of 100 term.

$$1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ldots.$$

thanks
for watching