NEET ULTIMATE CRASH COURSE 2.0 2024

Lecture - 01

Physics

BASIC MATHS & CALCULUS

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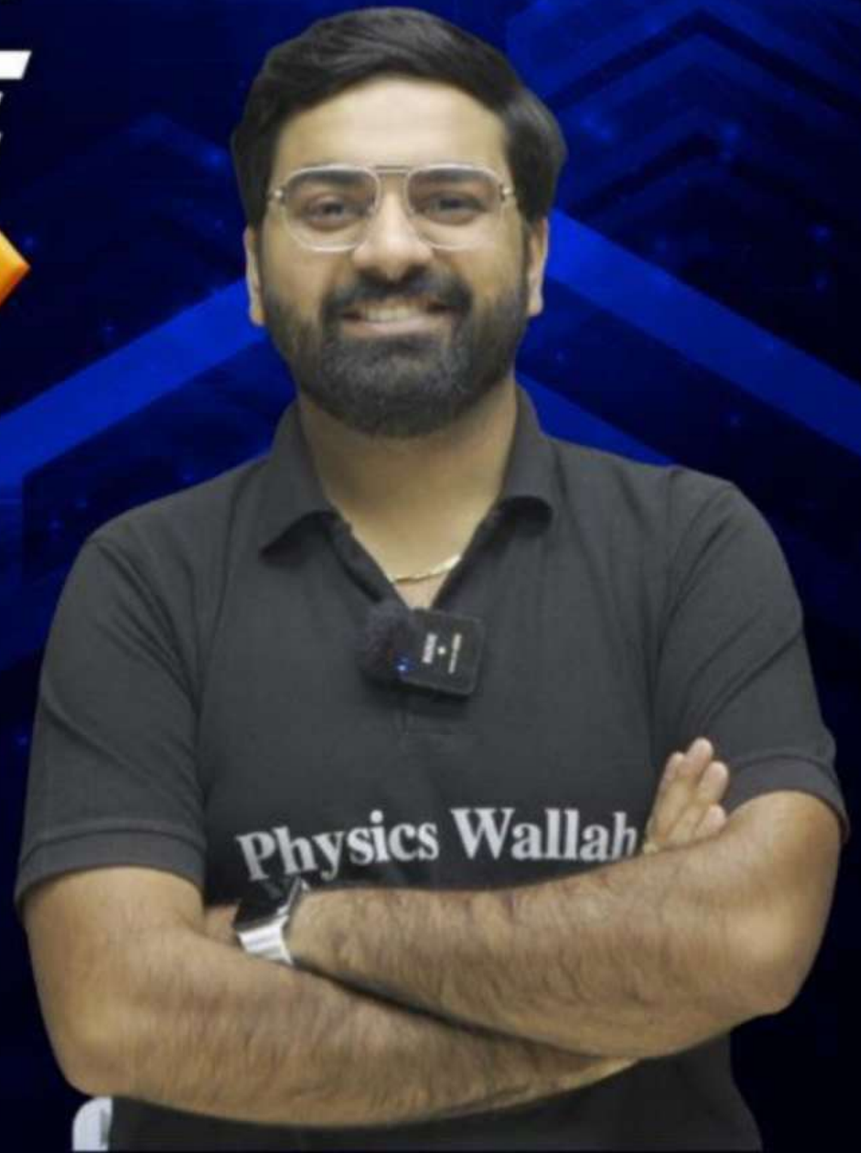


TOPICS to be covered

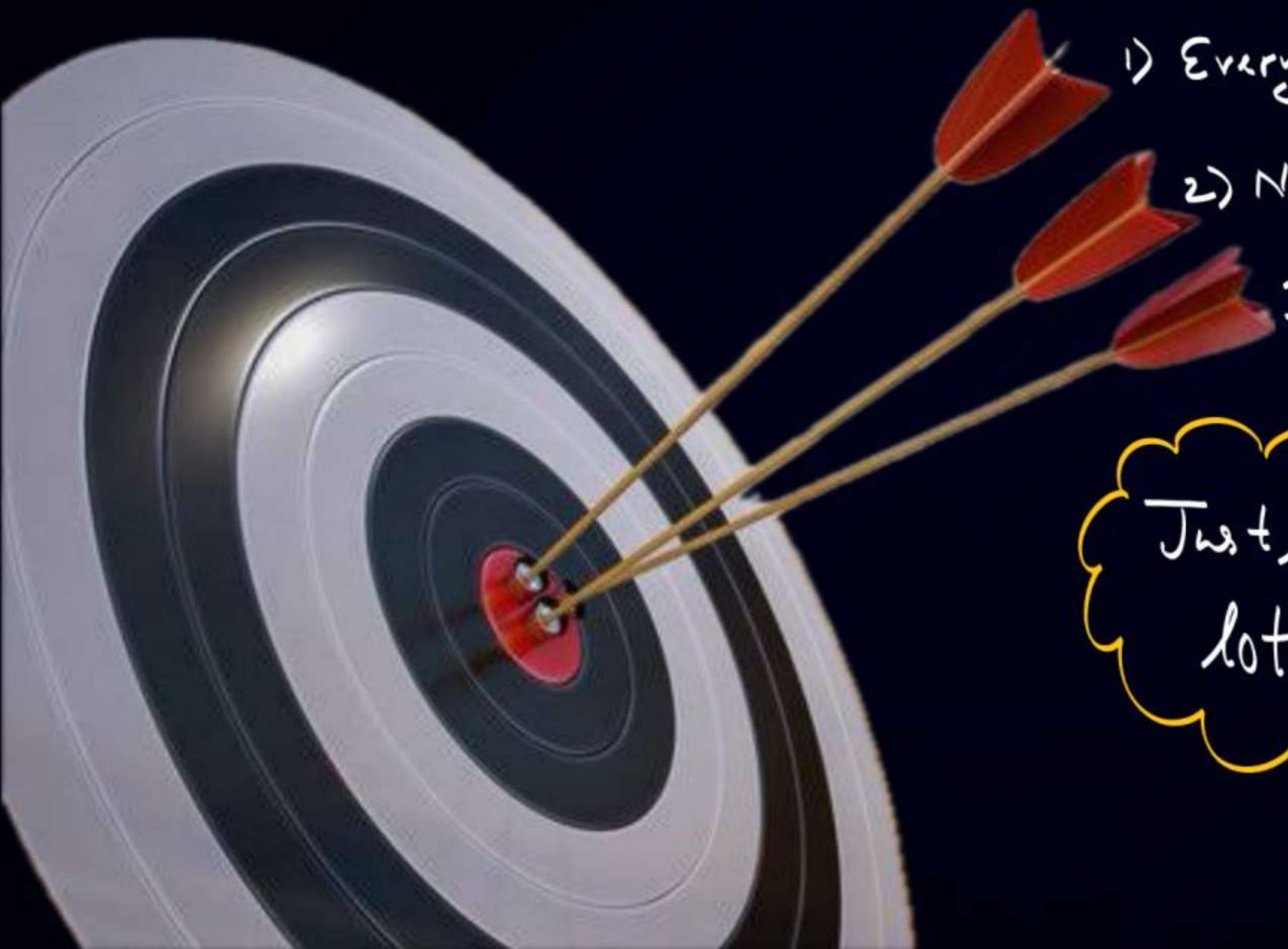
1. Math Table, squares and cube
2. Basic Formula
3. Trigonometry
4. Radian Degree conversion
5. Geometric Progression

6. Binomial Approximation
7. Algebra
8. Graphs

next class

वक्त से लड़कर जो नसीब बदल दे,
इंसान वही जो अपनी तकदीर बदल दे,
कल क्या होगा कभी मत सोचो,
क्या पता कल वक्त खुद अपनी तस्वीर बदल ले।

2-लड़के से उठाकर ★ STAR कैसे बनाऊँगा ??



1) Everything will be covered

2) NEET RELEVANT CONTENT

3) Sufficient Practice

Just have some patience & lots of faith

WHY BASIC MATHS ?

On a logarithmic scale, the relationship of species richness and area is a straight line described by the equation

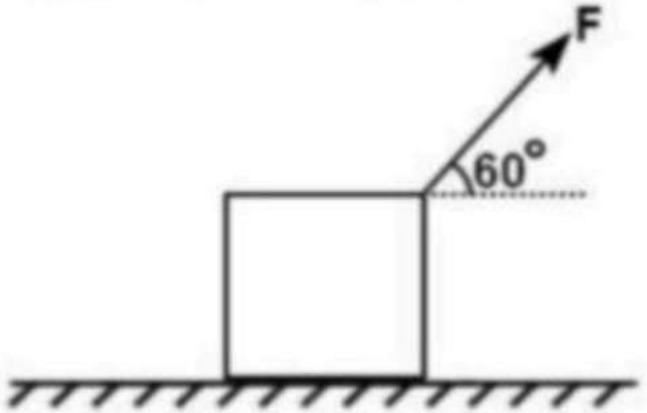
(1) $\log S = \log C + \log Z$

(2) $\log S = \log Z + \log A$

(3) $\log S = \log C + Z \log A$

(4) $\log S = \log Z + C \log A$

A child pulls a box with a force of 200 N at an angle 60° above the horizontal. Then the horizontal and vertical components of the force will be:



1. 100 N, 175 N
2. 86.6 N, 100 N
3. 100 N, 86.6 N
4. 100 N, 0 N

Ball ● 20 m/s

60 m

Que Find
1) Time of Flight
2) Max. Height from ground
3) t_a and t_d
4) Find velocity with which ball strikes ground

Sol 1) $s = ut + \frac{1}{2}at^2$

$-60 = 20(t) + \frac{1}{2} \times 10 \times t^2$

$-60 = 20t - 5t^2$

$5t^2 - 20t - 60 = 0$

$t^2 - 4t - 12 = 0$

$t^2 - 6t + 2t - 12 = 0$

$t(t-6) + 2(t-6)$

$t = -2, 6$

$\boxed{t = 6}$

2) $v^2 = u^2 + 2as$] can directly use $H = \frac{u^2}{2g}$ and then add tower height

$0 = 400 + 2 \times 10 \times H$

$0 = 400 - 20H$

$H = 20\ m$ + Height of tower $= 20 + 60 = 80\ m$

3) t_a — $v = u + at_a$

$0 = 20 - 10t_a$

$t_a = 2s$

t_d — $v = u + at_d$

(in mod) $-40 = 0 + -10\,t_d$

$t_d = 4s$

6. A particle travels 10m during the 4th second and 9.2m during the 6th second .Find the initial velocity and acceleration?

Illustration :

The acceleration of a particle is given by $a = 2t^4\ m/s^2$. If it is at rest at the origin at time $t = 0$, find its position, velocity, and acceleration at time $t = 1s$.

+ Table

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
3	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
4	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80
5	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
6	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
7	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140
8	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160
9	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180
10	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200

Square/Cube

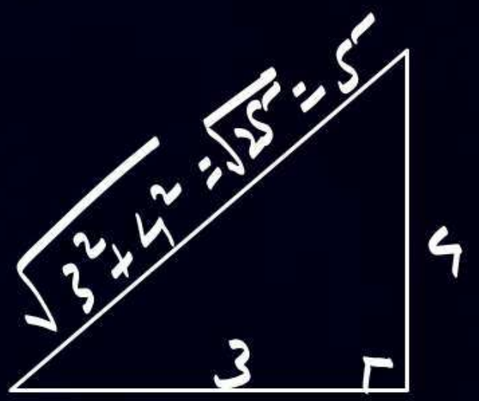
Number	Square	Cube
1	1	1
2	4	8
3	9	27
4	16	64
5	25	125
6	36	216
7	49	343
8	64	512
9	81	729
10	100	1000
11	121	
12	144	
13	169	
14	196	
15	225	

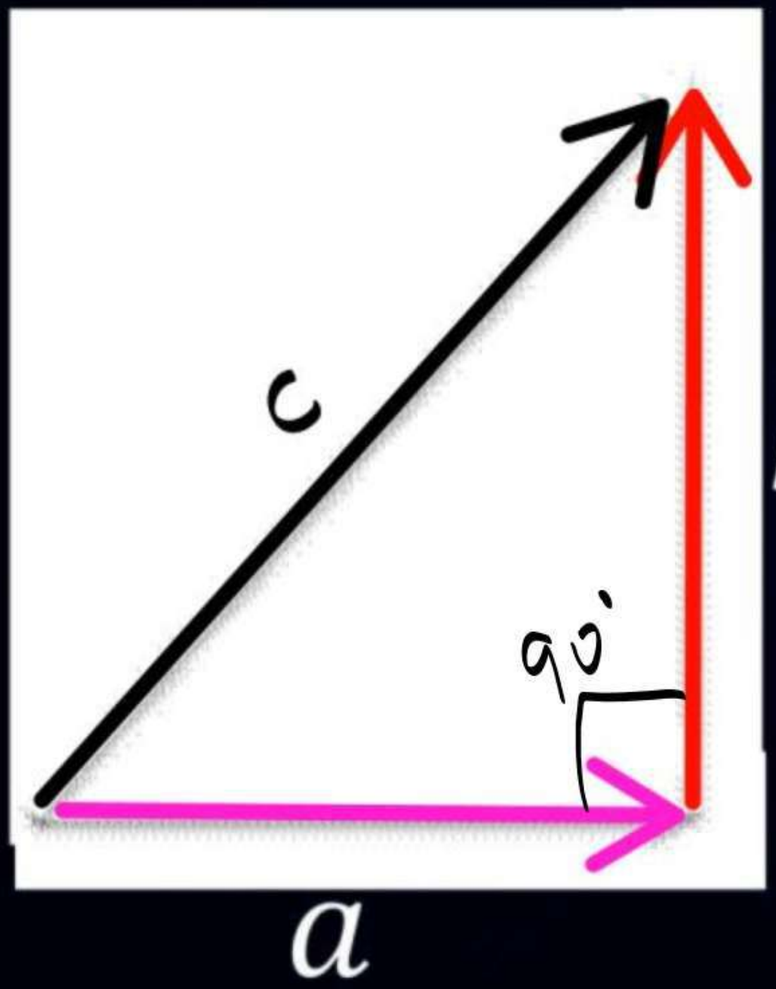
Number	Square
16	256
17	289
18	324
19	361
20	400
21	441
22	484
23	529
24	576
25	625

Basic Formulae

1. $(a + b)^2 = a^2 + b^2 + 2ab$
2. $(a - b)^2 = a^2 + b^2 - 2ab$
3. $(a^2 - b^2) = (a - b)(a + b)$
4. $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$
5. $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$

Pythagoras Theorem





Here: $c^2 = a^2 + b^2$

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

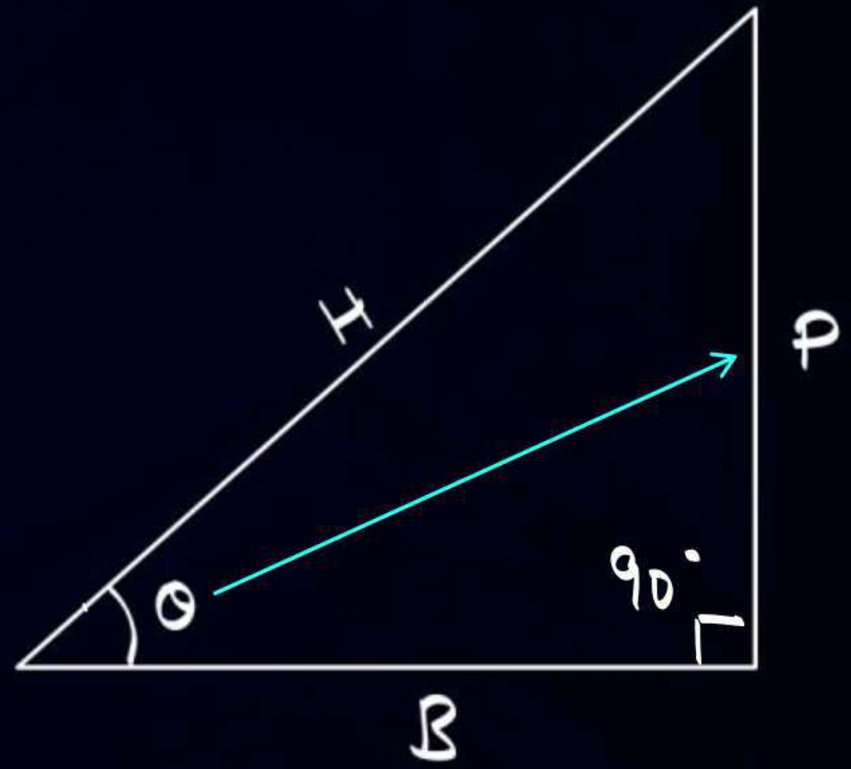
3, 4, 5	$3^2+4^2=5^2$
6, 8, 10	$6^2+8^2=10^2$
5, 12, 13	$5^2+12^2=13^2$

Basic Trigonometric Ratio

$$\sin\theta = \frac{\text{Perpendicular}\,(P)}{\text{hypotenuse}\,(H)}$$

$$\cos\theta = \frac{\text{Base}\,(B)}{\text{hypotenuse}\,(H)}$$

$$\tan\theta = \frac{\text{Perpendicular}\,(P)}{\text{Base}\,(B)} = \frac{\sin\theta}{\cos\theta}$$



Also:

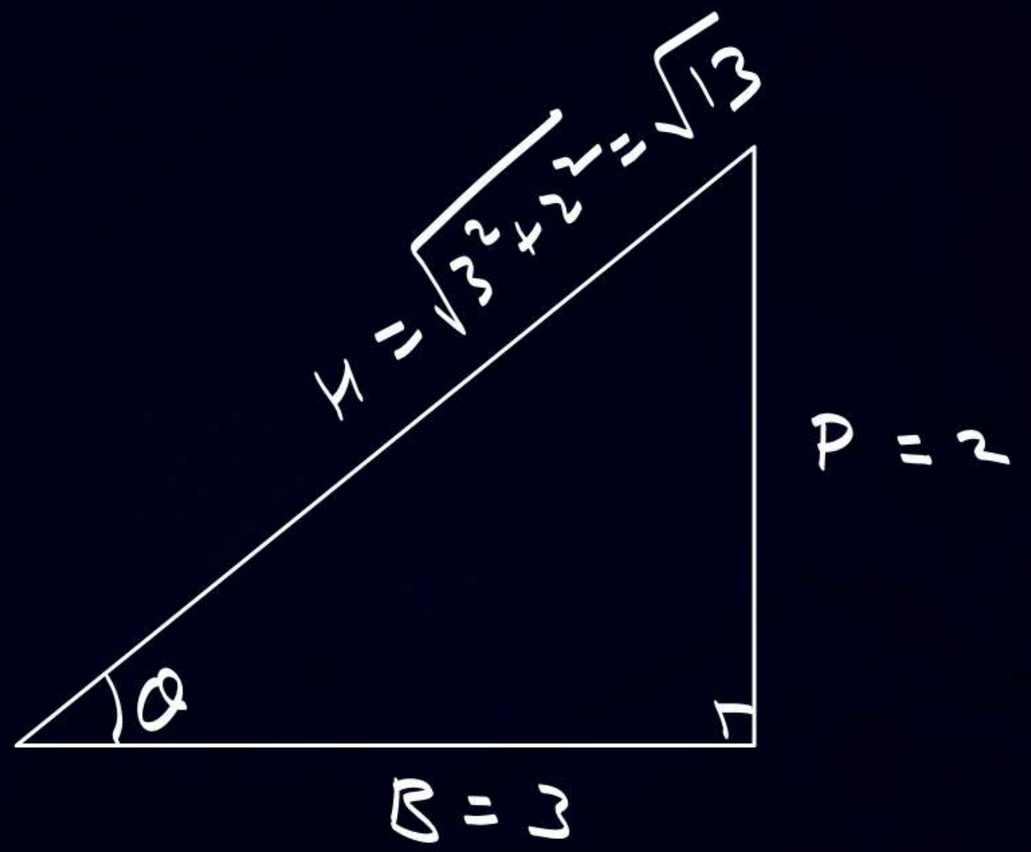
$$\cot\theta = \frac{1}{\tan\theta}$$

$$\sec\theta = \frac{1}{\cos\theta}$$

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

QUESTION

If $\tan\theta = \frac{2}{3}$ find $\sin\theta$ and $\cos\theta$

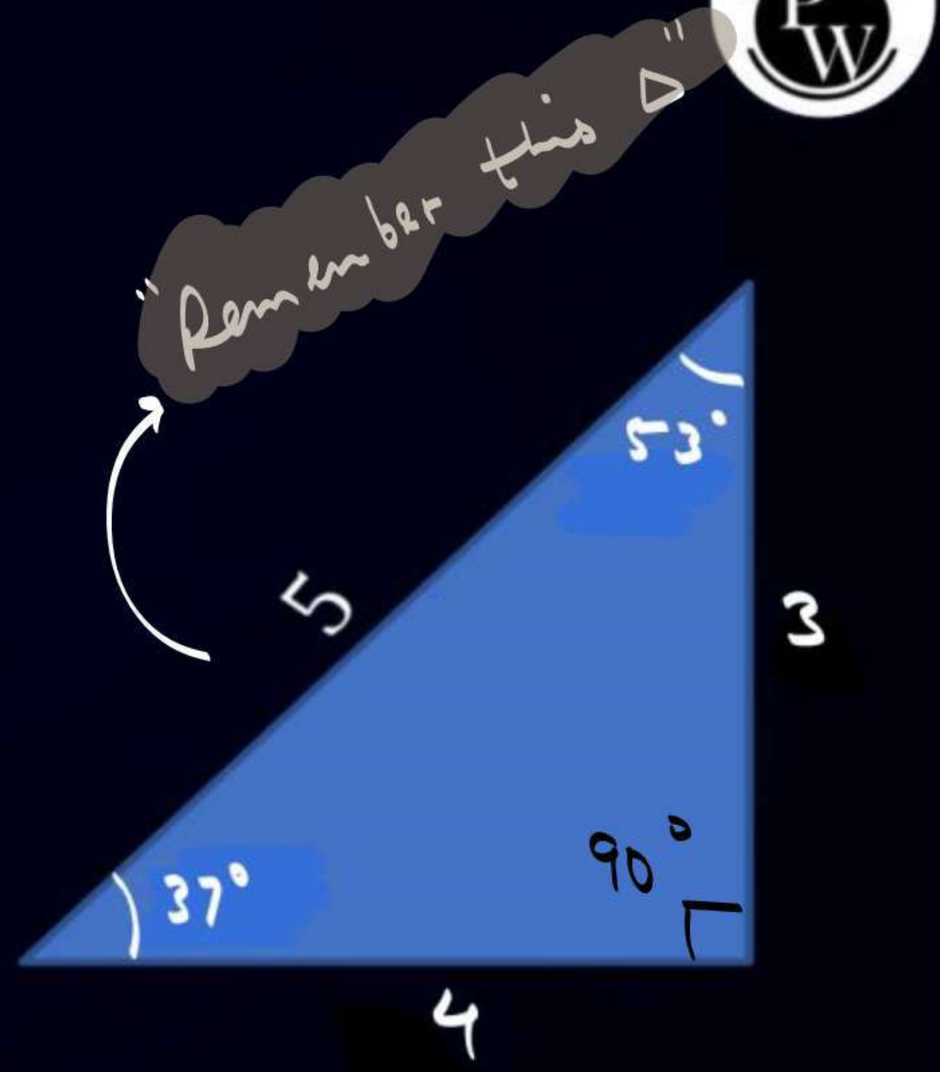


Soln. $\tan\alpha = \frac{2}{3} = \frac{P}{B}$

Ans. $\sin\alpha = \frac{P}{H} = \frac{2}{\sqrt{13}}$; $\cos\alpha = \frac{3}{\sqrt{13}}$

Trigonometric Table

Angle	Sin	Cos	Tan
0°	0	0	0
30°	1/2	$\sqrt{3}/2$	$1/\sqrt{3}$
37°	3/5	4/5	3/4
45°	$1/\sqrt{2}$	$1/\sqrt{2}$	1
53°	4/5	3/5	4/3
60°	$\sqrt{3}/2$	1/2	$\sqrt{3}$
90°	1	0	∞



Basic Inverse Trigonometry

if $\sin(\theta) = \frac{1}{2}$

$\Rightarrow \theta = \sin^{-1}\left(\frac{1}{2}\right)$

$\Rightarrow \theta = 30^\circ$

if $\cos(\theta) = \frac{3}{5}$

$\Rightarrow \theta = \cos^{-1}\left(\frac{3}{5}\right)$

$\Rightarrow \theta = 53^\circ$

if $\tan(\theta) = \frac{1}{3}$

$\Rightarrow \theta = \tan^{-1}\left(\frac{1}{3}\right)$

QUESTION

If $\sin\theta = \frac{2}{3}$ Find θ

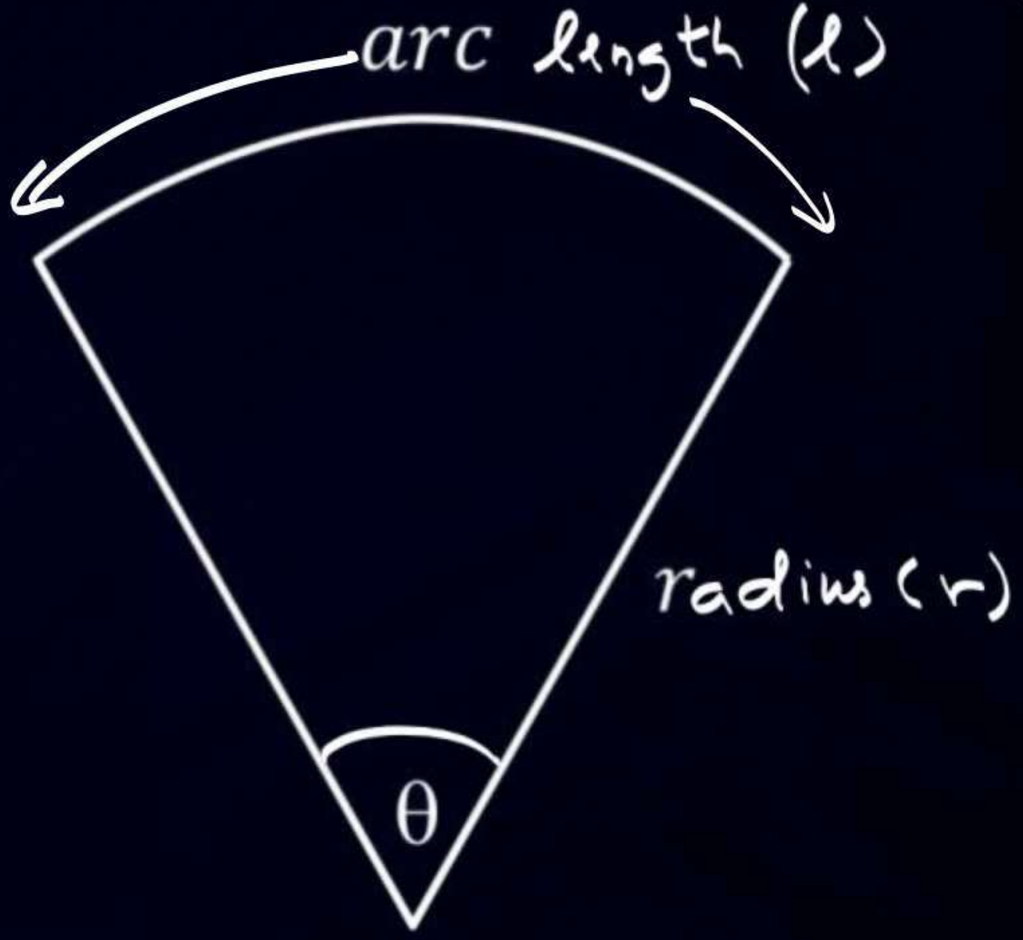
$\theta = \sin^{-1}\left(\frac{2}{3}\right)$

Radian

$\Rightarrow l = r\theta$

$\Rightarrow \boxed{\theta = \frac{l}{r}}$

→ S.I unit:- Radian



Degree to Radian

$180^\circ \longrightarrow \pi$ radian

$180 \times 1^\circ \longrightarrow \pi$ radian

$$1^\circ \longrightarrow \frac{\pi}{180} \text{ radian}$$

QUESTION

Convert following angles into radian

1. 360°
2. 180°
3. 90°
4. 60°
5. 45°
6. 30°
7. 120°

$360 \times \frac{\pi}{180} = 2\pi$

$180 \times \frac{\pi}{180} = \pi$

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

$60 \times \frac{\pi}{180} = \frac{\pi}{3}$

H.W

Radian to Degree

QUESTION

Convert following Radian to degree

1. $2\pi = 2 \times 180^\circ = 360^\circ$
2. $\pi = 180^\circ$
3. $\pi/2 = 180^\circ/2 = 90^\circ$
4. $\pi/3 = 180^\circ/3 = 60^\circ$
5. $\pi/4$
6. $\pi/5$
7. $\pi/6$
8. $2\pi/3$

HW

KEY-POINT 🔑

$$\sin 15^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}$$

&

$$\cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

KEY-POINT

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

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

QUESTION

I. $\sin(-90°) = -\sin 90° = -1$

II. $\cos(-60°) = \cos 60° = \frac{1}{2}$

Maximum & Minimum value of sin θ & cos θ

$$-1 \leq \sin\alpha \leq +1$$

$$-1 \leq \cos\alpha \leq +1$$

$$0 \leq \sin^2\theta \leq 1$$

$$0 \leq \cos^2\theta \leq 1$$

KEY-POINT

Average Values

Symbol of average

$< \quad >$

$\langle \sin\theta \rangle = 0$

$\langle \cos\theta \rangle = 0$

$\langle \sin^2\theta \rangle = \frac{1}{2}$

$\langle \cos^2\theta \rangle = \frac{1}{2}$

Basic Formulae

1. $\sin(A+B) = \sin A \cos B + \cos A \sin B$
2. $\sin(A-B) = \sin A \cos B - \cos A \sin B$
3. $\cos(A+B) = \cos A \cos B - \sin A \sin B$
4. $\cos(A-B) = \cos A \cos B + \sin A \sin B$
5. $\tan(A+B) = (\tan A + \tan B)/(1 - \tan A \tan B)$
6. $\tan(A-B) = (\tan A - \tan B)/(1 + \tan A \tan B)$

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

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

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

Basic Formulae

1. $\sin(2\theta) = 2\sin\theta\cos\theta$
2. $\cos(2\theta) = \cos^2\theta - \sin^2\theta$
3. $\tan(2\theta) = \dfrac{2\tan\theta}{1-\tan^2\theta}$

Also,

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

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

Basic Formulae

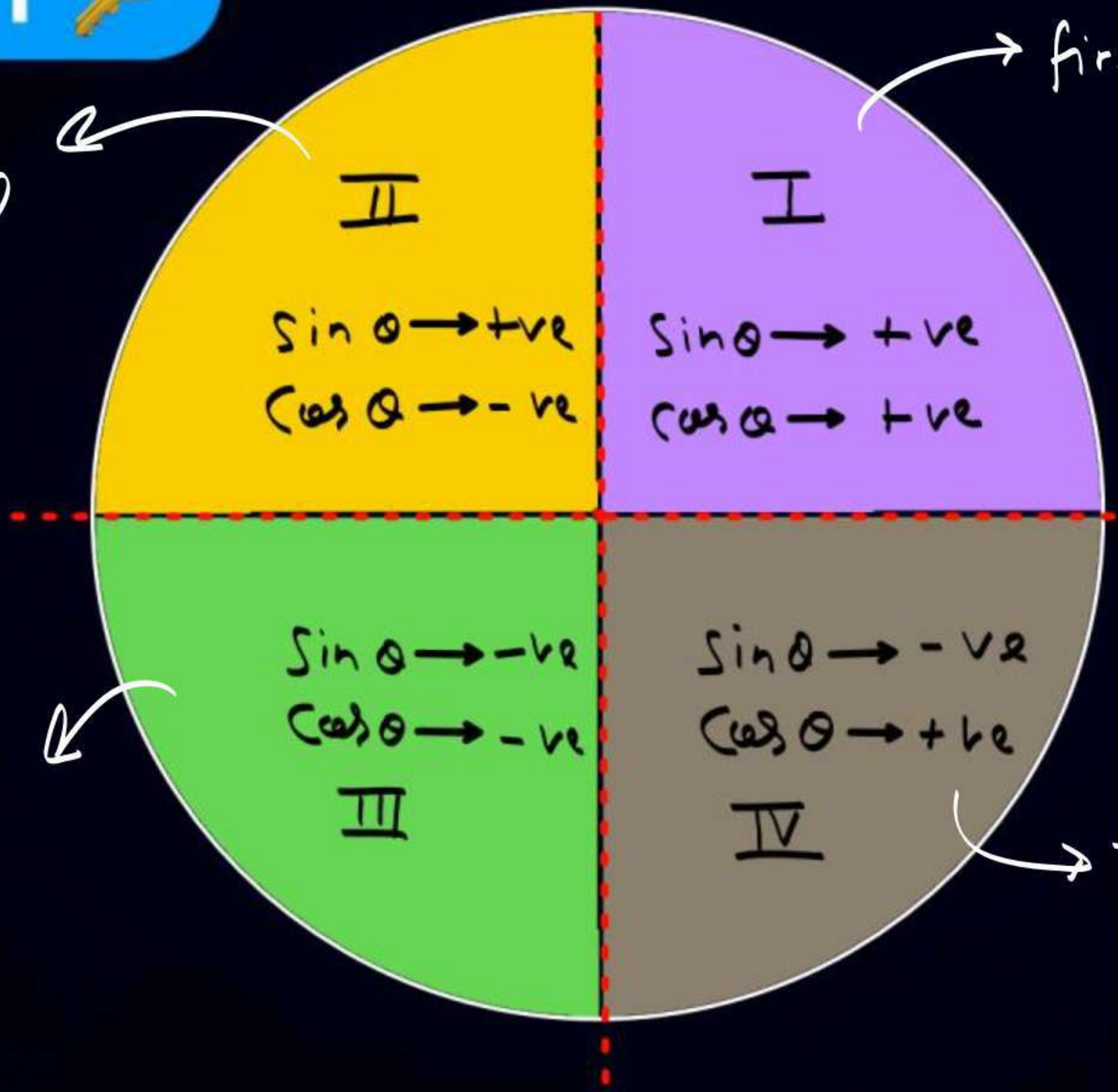
#Extra

1. $\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right)\cos\left(\frac{C-D}{2}\right)$
2. $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$

Four Quadrant Rule

KEY-POINT

Slice → quadrant



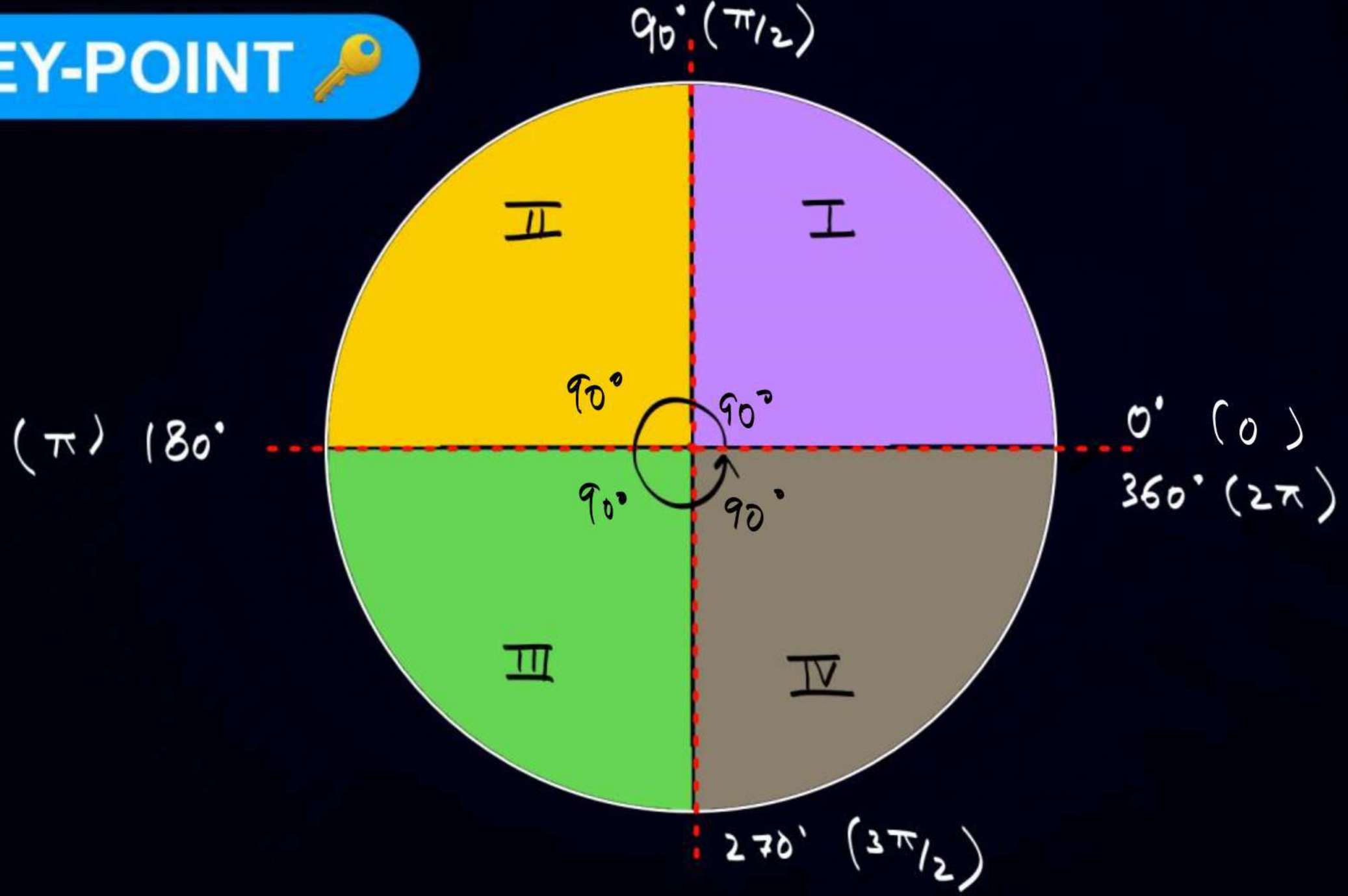
Second quad.

first quadrant

third quad.

fourth quad.

KEY-POINT



KEY-POINT 🔑

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

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

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

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

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

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

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

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

KEY-POINT 🔑

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

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

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

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

$\sin(360^\circ - \theta) = -\sin\theta$

$\sin(360^\circ + \theta) = +\sin\theta$

$\cos(360^\circ - \theta) = +\cos\theta$

$\cos(360^\circ + \theta) = +\cos\theta$

QUESTION

Find value of cos 120°

$\cos(90^\circ + 30^\circ) = -\sin 30^\circ = -\frac{1}{2}$

$\cos 120^\circ = -\frac{1}{2}$

QUESTION

Find value of sin 300°

$\hookrightarrow \sin(270° + \overset{\theta}{30°}) = -(\cos 30°$

$= -\frac{\sqrt{3}}{2}$

QUESTION

Find value of $\sin\frac{2\pi}{3}$

Soln:

$\frac{2\pi}{3} \rightarrow \frac{2}{3}\times 180^\circ = 120^\circ$

$\sin(120^\circ)$

$\sin(90^\circ + 30^\circ) = +\cos 30^\circ = \frac{\sqrt{3}}{2}$

(θ)

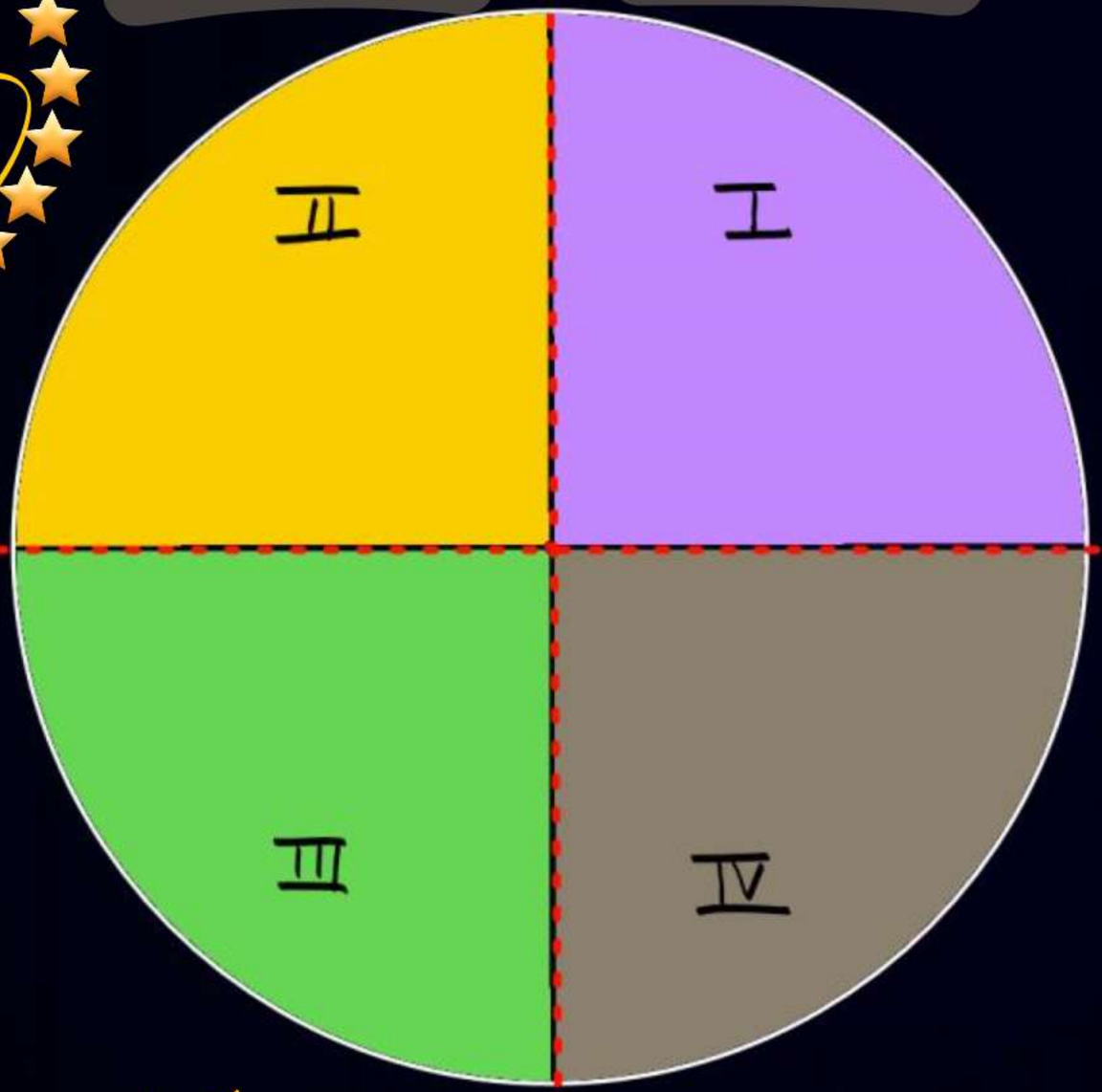
QUESTION

H.W

Find value of cos 135°

Must remember

$\cos 90^\circ = 0$ | $\sin 90^\circ = +1$



$\sin 180^\circ = 0$

$\cos 180^\circ = -1$

$\sin 0^\circ = 0$

$\cos 0^\circ = +1$

$\sin 360^\circ = 0$

$\cos 360^\circ = +1$

$\cos 270^\circ = 0$ | $\sin 270^\circ = -1$

If θ is small (Small Angle Approximation)

if θ is very small

then $\sin\theta \simeq \tan\theta \simeq \theta$

θ is in radian

$\pi \longrightarrow 180^\circ$

$\frac{\pi}{2} \longrightarrow 90^\circ$

$\frac{\pi}{3} \longrightarrow 60^\circ$

$\frac{\pi}{4} \longrightarrow 45^\circ$

$\frac{\pi}{6} \longrightarrow 30^\circ$

$2\pi \longrightarrow 360^\circ$

KEY-POINT

$1+2+3+4+5+6+7+8+9+10 = \frac{10(11)}{2} = 55$

1. Sum of first n natural numbers $= \frac{n(n+1)}{2}$

2. Sum of square of first n natural numbers $= \frac{n(n+1)(2n+1)}{6}$

$1^2+2^2+3^2+4^2+---+10^2$

3. Sum of cube of first n natural numbers $= \left(\frac{n(n+1)}{2}\right)^2$

$1^3+2^3+3^3+4^3+---+n^3$

Binomial Approximation

$$(1+x)^n \approx 1+nx \text{ if } x \ll 1$$

Geometric Progression (G.P.)

Series = $a, ar, ar^2, ar^3, ar^4, ar^5, \ldots\ldots \infty$

First Term $\longrightarrow$ a

Common Product $\longrightarrow$ r

Sum of G.P upto ∞ terms $= \dfrac{a}{1-r}$

where $r < 1$

QUESTION

Find sum of the series $3F + F + \frac{F}{3} + \frac{F}{9} + \frac{F}{27} + \cdots$ upto ∞

Soln. $a = 3F$

$r = \frac{1}{3}$

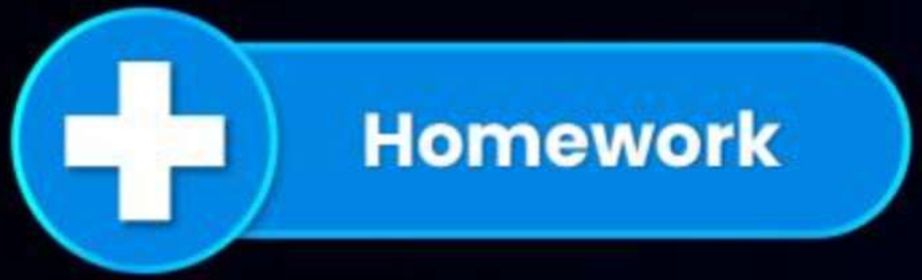
$\text{Sum}_\infty = \frac{a}{1-r} = \frac{3F}{1-\frac{1}{3}}$

$= 3F \times \frac{3}{2} = \frac{9F}{2}$

QUESTION

H.W

Find sum of the series $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$ upto ∞



DPP + Class Questions

THANK You