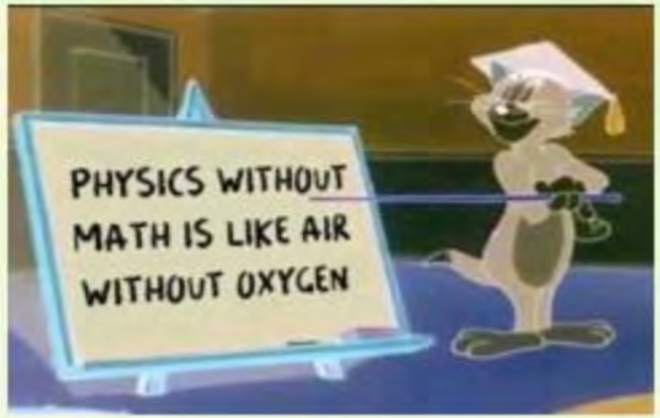
YAKEEN

NEET 2025

BASIC MATHS

AND

CALCULUS



PHYSICS | **Lecture - 05**

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Topics *to be covered*

1. Basic Calculations ✓
2. Binomial Theorem ✓
3. AP, GP ✓
4.

चलिए शुरू करते हैं

Revision Pro Max HD Prime

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

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

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

* $\tan 2\theta = \dfrac{2\tan\theta}{1-\tan^2\theta}$.

* $\sin\theta = \tan\theta \simeq \theta$

$\cos\theta \simeq 1$ $\quad (\theta < 7^\circ)$

* Algebra $\rightarrow$ $ax+b=0$

$ax^2+bx+c=0$

$x_1+x_2 = -\dfrac{b}{a}$

$x_1 x_2 = \dfrac{c}{a}$

$x_1 = \dfrac{-b-\sqrt{b^2-4ac}}{2a}$

$x_2 = \dfrac{-b+\sqrt{b^2-4ac}}{2a}$

$\sqrt{2} = 1.41$

$\sqrt{3} = 1.73$

$\times \leftarrow \sqrt{5} = 2.24$

$\pi = 3.14 = \frac{22}{7}$

$\pi^2 \simeq 10$

$0.25 = \frac{1}{4}$

$0.5 = 0.50 = \frac{1}{2}$

$0.75 = \frac{3}{4}$

$1.25 = \frac{5}{4}$

$1.5 = 1.50 = \frac{3}{2}$

$0.33 = \frac{1}{3}$

$0.66 = 0.67 = \frac{2}{3}$

$1.33 = \frac{4}{3}$

HW

4) $2x^2 - 11x + 14 = 0$

a $\quad$ c

$ac = 2 \times 14 = 28$

$2x^2 - 7x - 4x + 14 = 0$

$x(2x-7) - 2(2x-7) = 0$

$(x-2)(2x-7) = 0$

$x = 2$ | $2x = 7$, $x = \frac{7}{2}$

$2, \frac{7}{2}$ Ans

HW

Ques $0.75 \times 1.33 = ?$ $= \frac{3}{4} \times \frac{4}{3} = 1$

Ques $\frac{1.33}{0.75} = \frac{4/3}{3/4} = \frac{4}{3} \times \frac{4}{3} = \frac{16}{9}$

Ques $\sqrt{0.64}$ $\longrightarrow$ $\sqrt{\frac{64}{100}} = \frac{8}{10} = \frac{4}{5}$

$\downarrow$

0.8

Ques $\sqrt{0.49}$ $\longrightarrow$ $\sqrt{\frac{49}{100}} = \frac{7}{10} = 0.7$

$8^2 = 64$

$\sqrt{64} = 8$

Ques Approximate value of

$$(0.49)^2$$

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{8}$ D) $\frac{1}{16}$

$(0.49)^2 \simeq (0.50)^2$

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

Kaam Ki Baat

* DPP → Solutions → My solutions (Video)

quiz format

* Today No DPP ✗

* Modules → First 2 Chapters (Free) → All Classes → Physics → Study Module → Basic Math & Calculus (Pdf) → Ex-1 (Prarambh) Page 52 → first 5 ones → HW


NO MORE HOMEWORK

Ques $3.8 \times 1.2 = 4.56$

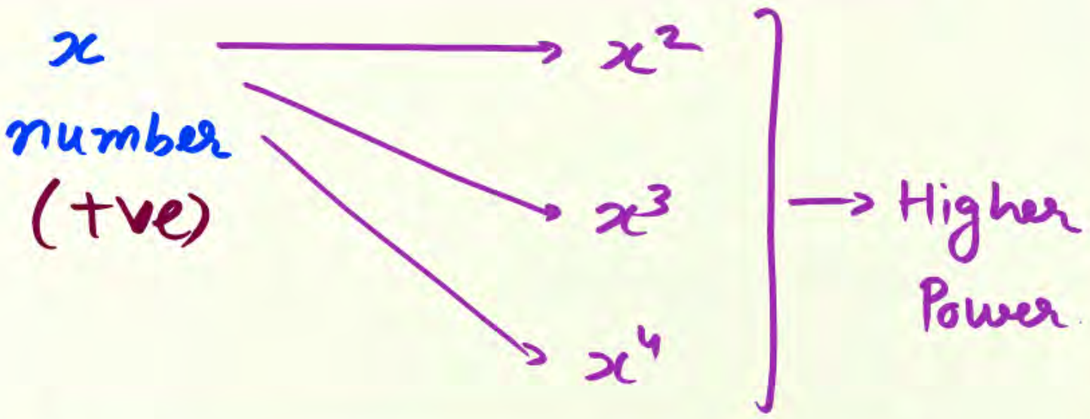
$$\begin{array}{r} 38 \\ 12 \\ \hline 76 \\ 38\times \\ \hline 456 \end{array}$$

Ques $2.5 \times 0.3 = \frac{25}{10} \times \frac{3}{10} = \frac{75}{100} = 0.75$

Ques $1.4 \times 1.1 = 1.54$

$$\begin{array}{r} 14 \\ 11 \\ \hline 14 \\ 14\times \\ \hline 154 \end{array}$$

Higher powers of a number



If $x > 1 \Rightarrow x^2 > x$

If $x < 1 \Rightarrow x^2 < x$

If $x = 1 \Rightarrow x^2 = x$

eg : $x = 2$ ✓

$\frac{x^2}{4}$ ✓ $\frac{x^3}{8}$ ✓ $\frac{x^4}{16}$ ✓

$x^2 > x$

eg : $x = \frac{1}{2} = 0.50$

$\frac{x^2}{1/4}$ $\frac{x^3}{1/8}$ $\frac{x^4}{1/16}$

$= 0.25$

$x^2 < x$

① If $x > 1 \Rightarrow x^{\infty} \Rightarrow \infty$ (infinity)

eg : $2^{\infty} \Rightarrow \infty$

↳ $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times \cdots$

② If $x < 1 \Rightarrow x^{\infty} \Rightarrow 0$ (zero)

eg : $\left(\frac{1}{2}\right)^{\infty} = \frac{1^{\infty}}{2^{\infty}} = \frac{1}{2^{\infty}} = \frac{1}{\infty} \Rightarrow 0$

③ If $x = 1 \Rightarrow x^{\infty} = 1$

$\frac{1}{0} \Rightarrow \infty$

$\frac{1}{\infty} \Rightarrow 0$

Ques $3^{\infty} \Rightarrow \infty$

Ques. $4^{\infty} \Rightarrow \infty$

Ques. $(0.63)^{\infty} \Rightarrow 0$

Ques. $2^{-\infty} \Rightarrow \frac{1}{2^{\infty}} \Rightarrow \frac{1}{\infty} \Rightarrow 0$

Ques $(0.49)^{\infty} \Rightarrow 0$

$$x^{-n} = \frac{1}{x^n}$$

$$\frac{1}{x^{-n}} = x^n$$

eg: $2^{-3} = \frac{1}{2^3}$

$$\frac{1}{3^{-4}} = 3^4$$

3. Binomial Approximation

→ used in physics derivation

& numericals

↓

Chapters → Unit & Measurements

Gravitation

etc.

* $(1+x)^2 = 1 + x^2 + 2x$ ($x^2 \to 0$) If $x << 1 \Rightarrow \underline{1+2x}$

$(1+x)^3 = 1^3 + x^3 + 3 \times 1 \times x(1+x)$

$= 1 + x^3 + 3x(1+x)$

$= 1 + x^3 + 3x + 3x^2 \simeq 1 + 3x$ ($x^3 \to 0$, $3x^2 \to 0$)

If $x << 1$ → x^2, x^3, x^4 → (bhut)^{bhut}

x → bhut Chhota

x^2, x^3, x^4 → Chhote

↓

neglect (zero)

$(1+x)^2 \simeq 1+2x$

$(1+x)^3 \simeq 1+3x$

$(1+x)^4 \simeq 1+4x$

$(1+x)^5 \simeq 1+5x$

$$\boxed{(1+x)^n \simeq 1+nx} \longrightarrow \text{if } (x<<1)$$

$n \Rightarrow$ can be -ve also

* $(1-x)^3 \simeq 1-3x$

eg :- * $(1+x)^{7} \simeq 1+7x$

* $(1+x)^{-2} \simeq 1+nx = 1+(-2)x = 1-2x$

Here $n=-2$

* $(1+x)^{1/2} \simeq 1+\frac{1}{2}x = 1+\frac{x}{2}$

QUESTION

Find the value of $\sqrt{1.04}$

BPU

$= (1.04)^{1/2} = (1 + 0.04)^{1/2}$

$x = 0.04$

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

$\sqrt{x} = x^{1/2}$

$0.04 << 1$

$x << 1$

$\simeq 1 + nx \simeq 1 + \frac{1}{2} \times 0.04$ (0.02)

$\simeq 1 + 0.02$

$\simeq 1.02$

$\sqrt{1.04} \simeq 1.02$

BPU

Ques $\sqrt{1.08} \longrightarrow (1.08)^{1/2} = (1+0.08)^{1/2}$

$= 1 + \frac{1}{2} \times 0.08$ (0.04)

$= 1 + 0.04$

$= 1.04$

A) 1.04

B) 1.02

C) 1.06

D) None

Ques

BPV

$$(1.09)^{1/3} = (1 + 0.09)^{1/3}$$

$$\simeq \left(1 + \frac{1}{3} \times 0.09\right)$$

$$= (1 + 0.03)$$

$$= 1.03 \quad \text{Ans}$$

Ques. $\sqrt{0.96} = (0.96)^{1/2} = (1-0.04)^{1/2}$

$= 1 - \frac{1}{2} \times 0.04$ (0.02)

$= 1 - 0.02$

$= 0.98$

A) 0.98

B) 0.99

C) 0.96

D) None

$$\begin{array}{r} 100 \\ -\quad 4 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 1 \\ -0.04 \\ \hline 0.96 \end{array}$$

Ques $\sqrt{0.98} = (0.98)^{1/2} = (1-0.02)^{1/2}$

$= \left(1 - \frac{1}{2} \times 0.02\right)$

$= 1 - 0.01$

$= 0.99$

A) 0.97

~~B)~~ 0.99

C) 0.95

D) None

How to take common (when it is not common)

* $4 + 4x = 4(1+x)$

* $4 + x = 4 + \frac{4 \times x}{4} = 4\left(1 + \frac{x}{4}\right)$

* $3 + x = 3\left(1 + \frac{x}{3}\right)$

* $7 + x = 7\left(1 + \frac{x}{7}\right)$

QUESTION

कभी कभी Use

Find the value of $\sqrt{4.08}$

1. 2.01
2. 2.04
3. 2.02 ✓
4. 2.08

$= (4.08)^{1/2}$

$\simeq (4+0.08)^{1/2}$

$= \left[4\left(1+\frac{0.08}{4}\right)\right]^{1/2}$

$(1+x)^n \simeq 1+nx$

$= 4^{1/2}(1+0.02)^{1/2}$

$= 2\left(1+\frac{1}{2}\times 0.02\right)$

$= 2(1+0.01)$

$= 2\times 1.01$

$= 2.02$

HW Ques.

$\sqrt{4.16}$

Reward Yourself

Sitting X → 1 hour x distraction → 15 min. entertainment

1 hour x distraction → Choclate etc.

1.5 hr
2 hr
} → Reward

4. Sequence and Series

AP
Arithmetic Progression

GP
Geometric Progression

Arithmetic Progression (AP)

→ common difference (d) = gap = same

eg :- 1, 4, 7, 10, 13, 16, 19, 22, --- $d = 3$

3 3 3 3 3

$a, a+d, a+2d, a+3d, \ldots$

first term = a

n^{th} term ← $\boxed{a_n = a + (n-1)d}$

20^{th} term $\Rightarrow$ $a_{20} = 1 + (20-1)3$

$= 1 + 19 \times 3$

$= 1 + 57 = 58$

Sum of n-terms

$$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$S_n = \frac{n}{2}\left[a + a + (n-1)d\right]$$

$$S_n = \frac{n}{2}\left[a + a_n\right]$$

first, last term

Ques 1, 4, 7, 10 ------ 20 terms

Sum of 20 terms?

A) 490

B) 600

C) 590

D) None

$$S_n = \frac{20}{2}\left[1 + 58\right]$$

$$= 10 \times 59 = 590$$

QUESTION

3, 6, 9, 12,.....

1. Find 30th term
2. Sum of first 30 terms

$a = 3, d = 3$

$a_{30} = a + (n-1)d = 3 + (30-1)3$

$= 3 + 29 \times 3$

$= 3 + 87 = 90$

3 का Table $\longrightarrow$ $3 \times 30 = 90$

$S_{30} = \frac{30}{2}[3+90] = 15 \times 93$

$= 1395$

(HW) Ques 2, 6, 10, 14, - - -

A) 15^{th} term

B) Sum of 15 terms

Geometric Progression (GP)

→ common ratio(r) = same

eg :- 1, 2, 4, 8, 16, 32, 64, ----

$r = \frac{2}{1} = \frac{4}{2} = \frac{8}{4} = \frac{16}{8} = \text{-------} = 2$

first term

→ * $a, ar^1, ar^2, ar^3, ar^4, ar^5, \text{------} \Rightarrow \boxed{a_n = ar^{n-1}}$

2nd 3rd 4th

Ques $1, 2, 4, 8, 16, \ldots\ldots$

Find 10^{th} term.

$a = 1, r = 2$

$a_n = ar^{n-1}$

$= 1 \times 2^{10-1}$

$= 2^9 = 512$

* Sum of n terms

$$S_n = \frac{a(r^n - 1)}{r - 1} = \frac{a(1 - r^n)}{1 - r}$$

QUESTION

3, 6, 12, 24,.....

1. Find 10^{th} term
2. Sum of first 10 terms

A) 512
B) 1024
~~C)~~ 1536
D) None

$a = 3$

3, 6, 12, 24,

$r = \frac{6}{3} = \frac{12}{6} = \frac{24}{12} = 2$

$a_{10} = a r^{10-1} = a r^9$

$= 3 \times 2^9$

$= 3 \times 512 = 1536$

$S_n = \frac{a(r^n - 1)}{r - 1} = \frac{3(2^{10} - 1)}{2 - 1}$

$= \frac{3(1024 - 1)}{1} = 3 \times 1023 = 3069$

HW

Ques $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots\ldots$

Find 9^{th} term.

=

Ques $2, 6, 18, 54, \ldots$

Find 6^{th} term.

$$\sqrt{0.64} = \sqrt{\frac{64}{100}} = \frac{8}{10} = 0.8 = \frac{4}{5}$$

Doubts

$$ax^2 + bx + c = 0$$

$$x_1 + x_2 = -\frac{b}{a}$$

$$x_1 x_2 = \frac{c}{a}$$

* $y = k(\sin 2x)$ → $\max^m = 1$

$$\theta = 2x = 90^\circ$$

$$x = 45^\circ$$

शुक्रिया !

ज़िंदा रहे तो फिर मिलेंगे

DPP ✗

Assignment → Next Week

Sat, Sun

↓

No Phy Class

Sat → Bio ✓

HW

Full Week Revision

+ Short Notes

All classes → Notices

↓

Telegram Group Link

↓

PDF

↓

Link Join.