

# The mentors **Digest**



OCTOBER 2024

ISSUE NO:17



The mentors monthly magazine

Time to change the way.....



## Our Founder & his Vision

Knowledge is the prime wealth among all wealths. In other words, knowledge is the best and important wealth among all wealths. Start your journey to find or explore the knowledge. Our founder and renowned scholar late Padmashri Dr Vellayani Arjunan's vision is to spread quality education to entire community and make it affordable.



Shri. Vellayani Arjunan was born on 10 February 1933 at Vellayani in the erstwhile Kingdom of Travancore. After receiving a Master of Arts degree in Malayalam, he went on to teach Malayalam Language and Literature at

Sree Narayana College in Kollam. He later became the first Malayalam lecturer in Aligarh Muslim University, from which he gained his PhD degree in 1964. After leaving Aligarh Muslim University, he was appointed director of the State Institute of Encyclopaedic Publications in Kerala

He was honoured with the Padma Shri award by the nation in 2008. Dr Arjun, who was the first Professor of Malayalam at the Aligarh University and head of the Department of Modern Indian Languages. He supervised 20 research scholars and published more than 100 research papers and articles. He had authored 40 books in different genres including poetry, short story, essays and literary criticism, and his books were prescribed as textbooks in Kerala schools from 1959 onwards.

Degree	Topic	Awarding Institution
D.Litt.	Influence of Sree Narayana Guru on Malayalam Poetry.	Aligarh Muslim University
D.Litt.	A Comparative Study of the Mutual Relations and Uniformity of Hindi and Malayalam Languages.	Agra University
D.Litt.	The influence of Hindi Vocabularies on the South Indian Languages: A Linguistic study.	Jabalpur University
Ph.D.	A Comparative Linguistic Study of Common Vocables of Hindi and Malayalam Languages.	Aligarh Muslim University

### Other degrees

Degree	Subject
B.A. Hons	Malayalam Language and Literature
M.A.	Malayalam Language and Literature
M.A.	Hindi Language and Literature
M.A.	Hindi Special
P.G. Diploma	Tamil, Telugu, Kannada





## From the Editors Desk.....

Dear Students & future leaders,

**Sustainable development** is another name for economic growth that is environmentally friendly. The objective of which is to achieve an optimal balance between environmental, economic, and socio-political sustainability. Education is crucial in engaging students in the shaping and provision of essentials to future generations while preserving the environment. Ways students can contribute to sustainable development are

- Make wise use of recycling bins.
- Don't waste food.
- Resell and buy in a sustainable manner.
- Digital is also an option.
- Water Stations around the campus.
- Plant trees around you.
- Use cycles



Students acquire transversal competencies that can be applied in scenarios outside of their future professional world.

## WHAT IS SPECIAL ABOUT THE MONTH OF OCTOBER ?

**OCTOBER 04** :World Animal Welfare Day, observed on October 4th each year, serves as a global platform to highlight the importance of treating animals with respect, dignity, and compassion. The day emphasizes the need for raising awareness about the various challenges animals face—ranging from cruelty and exploitation to habitat destruction and illegal wildlife trade. It advocates for the ethical treatment of all animals, whether they are domestic pets, farm animals, or wildlife, encouraging individuals, communities, and governments to take active steps towards improving their welfare. Many organizations use this day to launch educational campaigns, host events, and promote pet adoption as an alternative to purchasing animals, all aimed at fostering a greater sense of empathy toward animals. Additionally, World Animal Welfare Day supports conservation efforts, particularly for endangered species. It serves as a reminder that animal welfare is interconnected with human well-being and the health of our planet's biodiversity. Through activities like fundraising, volunteering, and advocacy for stronger laws, people worldwide come together to celebrate the role animals play in our lives and ensure their future is safeguarded.





## RNA: THE TEXT MESSAGES OF LIFE

RNA, originally known for carrying genetic instructions within cells, is now recognized as a key communication tool between living organisms. While DNA is stable and can persist for millions of years, RNA is far more fragile and short-lived. However, RNA can survive when enclosed in protective bubbles called extracellular vesicles (EVs), which allow cells to send RNA messages to one another. These messages can travel between cells of the same organism or even across different species, making RNA a universal communicator.

The breakthrough came in the early 2000s when researchers discovered that these vesicles were not just cellular waste but actually carried functional RNA. Human cells were found to take in RNA from mouse cells and use it to produce proteins they otherwise couldn't. This showed that cells could package and send RNA as a way to share information, like warning neighboring cells about threats such as toxins or pathogens. Since then, scientists have found that this RNA-based communication happens in all forms of life—bacteria, plants, fungi, and even archaea. For example, plants and fungi use RNA to attack each other during infections, with each side sending RNA that damages the other. But RNA communication is not just about conflict. In some cases, it helps organisms cooperate, like bacteria using RNA to assist plant growth.

Scientists are still uncovering the many roles of RNA in cellular communication, and it's clear that RNA is much more than just a messenger inside cells—it's a powerful, dynamic molecule shaping interactions across the tree of life. Whether in health, disease, or evolution, RNA plays a central role in how living organisms interact and survive.

### The Versatility of RNA

Ribonucleic acid (RNA) is best known as a messenger molecule that copies protein recipes from DNA. However, its chemical structure lets it fold into complex shapes that perform assorted roles in the cell.

#### RNA'S BASIC STRUCTURE

Like DNA, RNA is built of nucleotide molecules. Unlike double-stranded DNA, RNA is a single molecular strand, which affords greater flexibility. Biologists are still discovering RNA's many forms and functions.



**mRNA**  
encodes protein sequences



**tRNA**  
decodes mRNA



**rRNA**  
forms the ribosome



**snRNA**  
assembles mRNA



**lncRNA**  
regulates gene expression



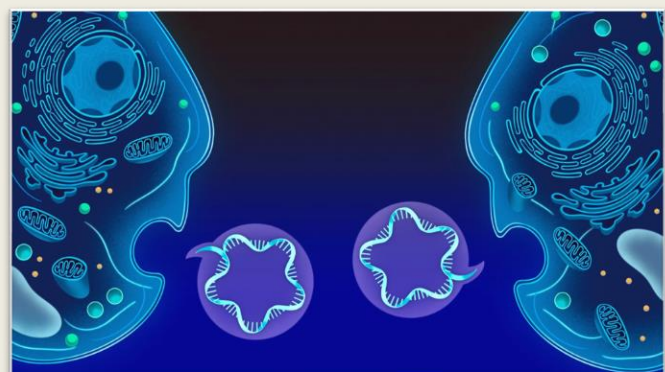
**miRNA**  
represses mRNA



**siRNA**  
degrades mRNA



**snoRNA**  
helps modify other RNAs



Did You Know ?  
Tardigrades can survive in space



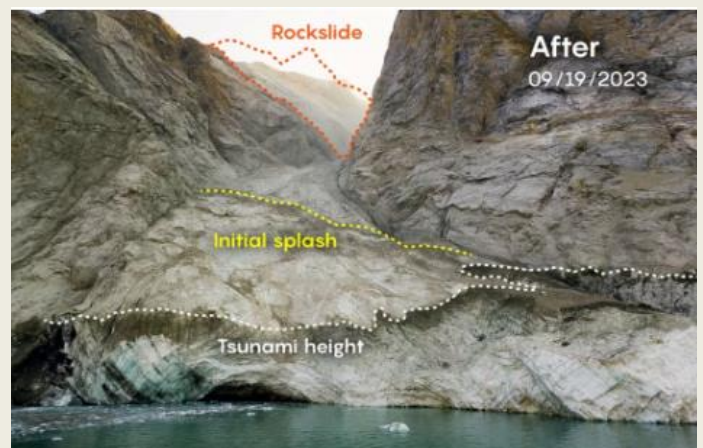
## THE NINE-DAY HUM: SOLVING THE MYSTERY OF GREENLAND'S SEISMIC SHOCK

The dramatic events of September 16, 2023, began with a massive rock-ice avalanche in eastern Greenland. A wedge of ice, thinned by climate change, gave way, sending 25 million cubic meters of rock careening into Dickson Fjord at speeds over 160 kilometers per hour. The avalanche struck the fjord with such force that it created a megatsunami, with waves initially reaching heights of 200 meters. These waves scoured the fjord, devastating archaeological sites and inundating a military outpost 72 kilometers away. Fortunately, no injuries or fatalities occurred.

What made the event even more baffling was the strange, deep hum that followed. Lasting for nine days, this mysterious hum was detected by seismometers across the globe. A team of 68 scientists from 15 countries collaborated to investigate the phenomenon, searching for answers. Initial theories ranged from glacial movements to volcanic activity, but none seemed to fit.

Eventually, the team landed on a plausible explanation: the avalanche triggered a "seiche," a standing wave sloshing back and forth in the fjord. Simulations revealed that the fjord's uneven topography caused this wave to stabilize and persist for days. Although the seiche's height diminished rapidly, its frequency was recorded at 10.88 millihertz, matching the hum detected worldwide. The study was a reminder of how climate change can catalyze unexpected natural events, with the landslide itself being a direct consequence of warming ice. The Greenland event highlights nature's unpredictability and the joy of scientific discovery. Though this hum didn't cause widespread destruction, it became a thrilling riddle for seismologists, reinforcing that curiosity-driven science can often yield the most surprising results.

**Did You Know ?**  
Our body has more bacterial cells than human cells.





## TERNARY COMPUTING: A MORE EFFICIENT AND SECURE ALTERNATIVE TO BINARY

For decades, binary has been the dominant system in computing, using just two digits—0 and 1—to perform all digital operations. However, base 3, or ternary, a system that uses three digits—0, 1, and 2—has long been recognized by mathematicians for its potential to be more efficient than binary. Despite its natural advantages, base 3 computing has rarely been embraced. But with recent advancements in cybersecurity and technology, ternary systems are making a comeback.

The main advantage of base 3 lies in its ruthless efficiency. For instance, two binary bits can represent four different numbers, but two "trits" in ternary can represent nine. This compression allows base 3 to represent large numbers with fewer digits, which makes it more space-efficient. A number that requires 42 bits in binary would only need 27 trits in ternary, offering a more compact way to store and process data.

This efficiency can be quantified through a metric called "radix economy." When comparing base 3 to base 2 and base 10 for storing large numbers, base 3 consistently comes out ahead, requiring fewer digits overall. It turns out that base 3 is the most economical integer base for computing, offering the best balance between the number of digits and space needed.

Base 3 also offers computational benefits. Unlike binary logic, which only allows for "yes" or "no" answers, ternary logic can

handle three possibilities in one go: "less than," "equal to," or "greater than." This reduces the number of queries needed for tasks like comparing numbers.

Historically, ternary computing hasn't been widely adopted due to the ease of implementing binary systems and established conventions. However, innovations in recent years have sparked new interest in ternary computing. Engineers have proposed ways to build ternary logic on binary-based hardware, and researchers like Bertrand Cambou are exploring base 3 for use in cybersecurity, where ternary systems could significantly reduce error rates and improve security protocols.

With these advances, base 3 computing could revolutionize fields like cybersecurity and data storage, providing faster, more secure solutions. Three might just be the magic number for the future of computing.

### How to Count in Threes

Ternary number systems have three digits, usually zero, 1 and 2. Whereas decimal digits tell you how many of each power of 10 you have, ternary digits label powers of 3.

#### DECIMAL

Each digit denotes powers of 10: 1, 10, 100 ...

0	1	6
×	×	×
$10^2$	$10^1$	$10^0$
=	=	=
0	+ 10	+ 6
16		

#### TERNARY

Each digit denotes powers of 3: 1, 3, 9 ...

1	2	1
×	×	×
$3^2$	$3^1$	$3^0$
=	=	=
9	+ 6	+ 1
16		



MATHEMATICS TOPIC OF THE MONTH:

## INDEFINITE INTEGRALS

### CONCEPT MAP

Class XII

Integration is the inverse process of differentiation  
 $\frac{d}{dx} F(x) = f(x)$ ,  $F(x)$  is an indefinite integral of  $f(x)$   
 or,  $\int f(x) dx = F(x) + c$ , where  $c$  is an arbitrary constant of integration

**Properties**

- $\int f'(x) dx = f(x) + c$
- $\int [f(x) \pm g(x)] dx = \int f(x) dx \pm \int g(x) dx$
- $\int k \cdot f(x) dx = k \int f(x) dx$ ,  $k$  being any real number.



**INDEFINITE INTEGRALS**

### Methods

#### Using Substitution

The given integral  $\int f(x) dx$  can be transformed into another form by changing the independent variable  $x$  to  $t$  by substituting  $x = g(t)$ .

#### Using by Parts

If  $u$  and  $v$  are two differentiable functions of  $x$ , then

$$\int (uv) dx = \left[ u \cdot \int v dx \right] - \int \left\{ \frac{du}{dx} \cdot \int v dx \right\} dx.$$

In order to choose 1<sup>st</sup> function, we take the letter which comes first in the word ILATE.

- I – Inverse Trigonometric Function
- L – Logarithmic Function, A – Algebraic Function
- T – Trigonometric Function, E – Exponential Function

#### Using Partial Fractions

- If  $f(x)$  and  $g(x)$  are two polynomials such that  $\deg f(x) \geq \deg g(x)$ , then we divide  $f(x)$  by  $g(x)$ .  
 $\therefore \frac{f(x)}{g(x)} = \text{Quotient} + \frac{\text{Remainder}}{g(x)}$
- If  $f(x)$  and  $g(x)$  are two polynomials such that the degree of  $f(x)$  is less than the degree of  $g(x)$ , then we can evaluate  $\int \frac{f(x)}{g(x)} dx$  by decomposing  $\frac{f(x)}{g(x)}$  into partial fraction.

- $\int dx = x + c$
  - $\int x^n dx = \frac{x^{n+1}}{n+1} + c$ , where  $n \neq -1$
  - $\int e^x dx = e^x + c$
  - $\int a^x dx = \frac{a^x}{\log_e a} + c$ , where  $a > 0, a \neq 1$
  - $\int \frac{1}{x} dx = \log_e |x| + c$ , where  $x \neq 0$
  - $\int \sin x dx = -\cos x + c$
  - $\int \cos x dx = \sin x + c$
  - $\int \tan x dx = \log |\sec x| + c$
  - $\int \cot x dx = \log |\sin x| + c$
  - $\int \sec x dx = \log |\sec x + \tan x| + c$
  - $\int \operatorname{cosec} x dx = \log |\operatorname{cosec} x - \cot x| + c$
- where 'c' is the constant of integration.

### Some Standard Integrals

### Integrals of Some Particular Functions

- $\int \frac{1}{\sqrt{x^2 - a^2}} dx = \log \left| x + \sqrt{x^2 - a^2} \right| + c$
- $\int \frac{1}{\sqrt{x^2 + a^2}} dx = \log \left| x + \sqrt{x^2 + a^2} \right| + c$
- $\int \frac{1}{x^2 - a^2} dx = \frac{1}{2a} \log \left| \frac{x-a}{x+a} \right| + c$
- $\int \frac{1}{a^2 - x^2} dx = \frac{1}{2a} \log \left| \frac{a+x}{a-x} \right| + c, a > x$
- $\int \frac{1}{x^2 + a^2} dx = \frac{1}{a} \tan^{-1} \frac{x}{a} + c$
- $\int \frac{1}{x\sqrt{x^2 - 1}} dx = \sec^{-1} x + c = -\operatorname{cosec}^{-1} x + c$ , where  $|x| > 1$
- $\int \sqrt{x^2 + a^2} dx = \frac{x}{2} \sqrt{x^2 + a^2} + \frac{a^2}{2} \log \left| x + \sqrt{x^2 + a^2} \right| + c$
- $\int \sqrt{x^2 - a^2} dx = \frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \log \left| x + \sqrt{x^2 - a^2} \right| + c$
- $\int \sqrt{a^2 - x^2} dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left( \frac{x}{a} \right) + c$
- $\int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1} \left( \frac{x}{a} \right) + c$
- $\int e^x (f(x) + f'(x)) dx = e^x f(x) + c$



## SCIENCE TOPIC OF THE MONTH:

(Open chain structures containing C and H only)

## CONCEPT MAP

**Class XI**

Although hydrocarbons are primarily consumed in fuels, non-fuel applications of hydrocarbons are of great importance to society and the economy. Certain hydrocarbons can be found in lubricating oils, greases, solvents, fuels, wax, asphalts, cosmetics and plastics.

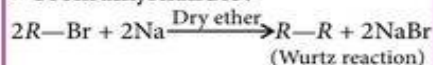
**Saturated**  
C—C single bonds present

### Alkanes

General formula,  $C_nH_{2n+2}$

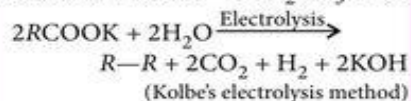
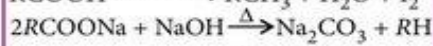
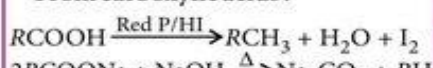
#### Preparation

##### From alkyl halides:

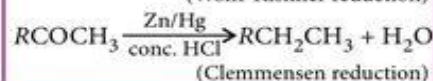
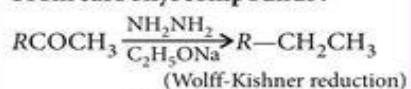


$R-X$  can be converted to alkane using  $Zn + CH_3COOH$ ,  $Zn + \text{dil. HCl}$ ,  $Zn-Cu + C_2H_5OH$ ,  $LiAlH_4$ ,  $Zn + NaOH$ ,  $NaBH_4$  and  $Ph_3SnH$  reducing agents.

##### From carboxylic acids:

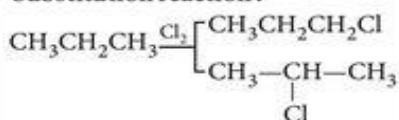


##### From carbonyl compounds:



#### Properties

##### Substitution reaction:

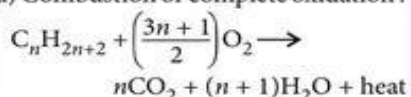


Order of reactivity:

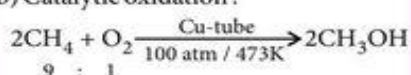
Alkanes:  $3^\circ > 2^\circ > 1^\circ > CH_4$   
Halogens:  $F_2 > Cl_2 > Br_2 > I_2$

##### Oxidation:

(a) Combustion or complete oxidation:



(b) Catalytic oxidation:



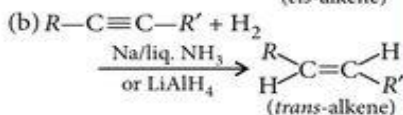
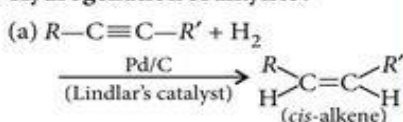
**Unsaturated**  
C—C multiple bonds present

### Alkenes ( $>C=C<$ )

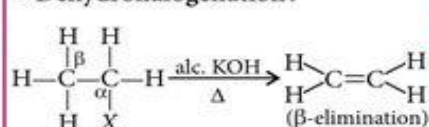
General formula,  $C_nH_{2n}$

#### Preparation

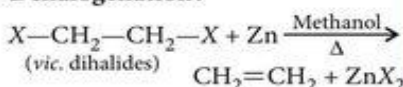
##### Hydrogenation of alkynes:



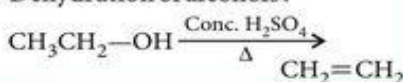
##### Dehydrohalogenation:



##### Dehalogenation:

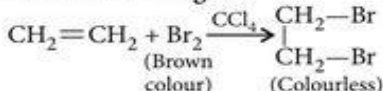


##### Dehydration of alcohols:

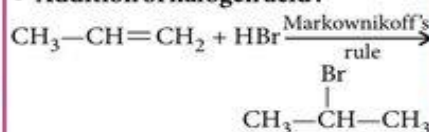


#### Properties

##### Addition of halogen:

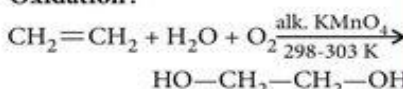


##### Addition of halogen acid:



HBr addition in presence of peroxide follows *anti-Markownikoff's rule*, known as *Kharasch effect* or *peroxide effect*.

##### Oxidation:

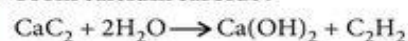


### Alkynes ( $-C\equiv C-$ )

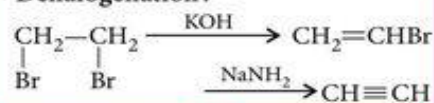
General formula,  $C_nH_{2n-2}$

#### Preparation

##### From calcium carbide:

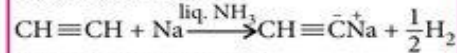


##### Dehalogenation:

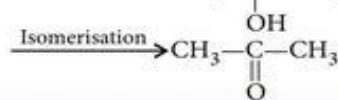
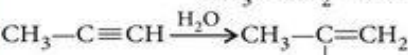
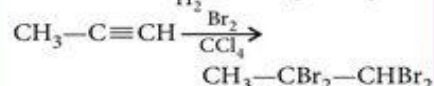
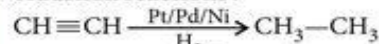


#### Properties

##### Acidic nature:



##### Addition reactions:



#### Commercial Uses

• **Alkanes:** Ethane is used for making hexachloroethane which is an *artificial camphor*. Higher alkanes in the form of gasoline, kerosene oil, diesel, lubricating oils and paraffin wax are widely used.

• **Alkenes:** Ethene is used as a general anaesthetic. It is a starting material for a large number of compounds such as glycol, ethyl halides, ethyl alcohol, ethylene oxide, etc.

• **Alkynes:** Acetylene is used as a general anaesthetic under the name *naracylene*. Acetylene is used as an illuminant.





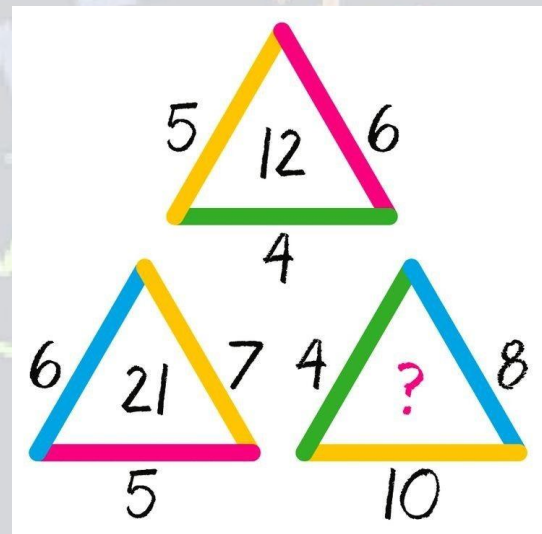
## TWIST YOUR MIND

(Answers will be given in the November 2024 digest)

### RIDDLES

1. I have a head like a cat and feet like a cat, but I am not a cat. What am I?
2. Paul's height is six feet, he's an assistant at a butcher's shop, and wears size 9 shoes. What does he weigh?

### PUZZLE



## Bright Spots: Positive Events from SEPTEMBER 2024

1. - India made history by winning double gold in both men's and women's categories at the 45th Chess Olympiad.
2. Venture capital funding for Indian startups remained strong, with over \$1 billion raised in September.
3. Scientists successfully taught a once-extinct bird species how to migrate by guiding them across Europe.
4. A blind Australian surfer became the first to conquer Nazare, the world's biggest wave.
5. India relaxed restrictions on rice exports, potentially easing global prices and benefiting farmers.

word  
of the  
month

**Selcouth** : Odd , unusual or extraordinary

### SEPTEMBER ANSWERS

RIDDLES : 1. Alphabet 2. A Feather 3. Ton

PUZZLE : 14

# The mentors Digest



The Mentors website launched , please log onto [www.thementors.co.in](http://www.thementors.co.in)

New Online Courses

## Welcome To The Mentors

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### Course Categories



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→ ENGINEERING

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SCHOOLS

→ CONSULTANCY

→ IAS BRIDGE  
PROGRAM

### CLASSES



#### CLASS 10

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#### CLASS 12

CBSE online tuitions with special emphasis on Board exams

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### MAGAZINES

JUNE 2023



JULY 2023



# The mentors Digest



## ABOUT US

**Affordable Quality education .....**

By understanding the need of aspiring students, India's renowned Industrial & Academic experts Mr. Manoj PL (Refining Specialist, Academician and founder Director Epinox Prompt Consulting Engineering Ltd), Ms. Chitra Jayasankar (Educational advisor, Tagore Educational trust) are there to bridge the gap of ensuring quality education for the students. We have formulated an online platform for providing significantly exceeding educational experience through online tuitions (classes 6-12), IAS bridge programs and finishing school for fresh engineers and other professionals. We will ensure excellent learning experience to students and 100% satisfaction level to parents.

Interested parents who are willing to associate with this concept are requested to contact



## Online TUTION

<b>GRADE - 6 &amp; 8</b>	<b>Mathematics &amp; Science</b>
<b>GRADE - 10</b>	<b>English ,Science, Social Science &amp; Maths</b>
<b>GRADE - 11</b>	<b>Physics ,Chemistry ,Biology &amp; Maths</b>
<b>GRADE - 12</b>	<b>Mathematics &amp; Physics</b>

CALL OR WHATSAPP ON **+918075999747** (Course Coordinator)



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