

# The mentors Digest



AUGUST 2024

ISSUE NO:15



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.....

### Paris Olympics 2024: What to Expect

**A Historic Event:** The Paris Olympics 2024 will be a historic event for several reasons. First, it will mark the 100th anniversary of the last time Paris hosted the Games in 1924. Second, it will be the first time that the Olympics and the Paralympics will share the same venues and facilities. Third, it will showcase the city's cultural diversity and innovation, as well as its commitment to sustainability and social inclusion.

**A Spectacular Venue:** The Paris Olympics 2024 will take place in various iconic locations across the city and its surroundings. Some of the venues include the Eiffel Tower, the Champs-Élysées, the Louvre Museum, the Palace of Versailles, and the Stade de France. The Olympic Village will be located in the Seine-Saint-Denis area, which is home to many immigrants and low-income families. The organizers aim to transform the area into a model of urban development and social integration.

**A Sustainable Vision:** The Paris Olympics 2024 will also be a showcase of environmental responsibility and innovation. The organizers have pledged to make the Games carbon-neutral, by using renewable energy sources, reducing waste, and promoting green transportation. They have also set ambitious goals for gender equality, accessibility, and diversity, by ensuring equal representation of women and men, providing facilities for people with disabilities, and celebrating the cultural heritage of the participants and the host city.



## WHAT IS SPECIAL ABOUT THE MONTH OF AUGUST ?

**AUGUST 10** :World Biofuel Day also serves as a platform for governments, industry leaders, researchers, and the general public to engage in discussions and share knowledge about the advancements and challenges in biofuel technology. Various events, such as seminars, workshops, and exhibitions, are organized to showcase the latest developments and innovations in biofuel production and utilization. The use of biofuels offers numerous environmental and economic benefits

Biofuels help reduce greenhouse gas emissions, improve air quality, and decrease the reliance on finite fossil fuel resources. They also provide an opportunity for rural development and job creation, particularly in agricultural sectors, as the production of biofuels often involves the use of crops and agricultural residues.

The primary goal of World Biofuel Day is to promote the use of biofuels to reduce dependency on fossil fuels, mitigate climate change, and promote sustainable development. By raising awareness about the benefits of biofuels, World Biofuel Day aims to encourage innovation and research in the field of bioenergy and support policies that foster the adoption of biofuels globally.

**WORLD  
BIOFUEL  
DAY** August 10





## USING MATH TO WIN GOLD: THE STORY OF KEN ONO AND OLYMPIC SWIMMERS

### Introduction

Ken Ono, a number theorist, has revolutionized Olympic swimming by applying mathematical principles to enhance performance. His collaboration with swimmer Andrew Wilson at Emory University in 2014 sparked a unique project that has led to significant successes, including Olympic medals.

### Applying Mathematics to Swimming

Ono utilized his expertise in abstract number patterns and modular forms to analyze swimmers' acceleration data, identifying inefficiencies. This approach allowed him to refine athletes' techniques, often without direct observation.

### Innovative Techniques

Ono's team began with basic tools like Saran Wrap and accelerometers, eventually employing high-definition video and force sensors. They meticulously analyzed every aspect of a swimmer's stroke, focusing on optimizing force generation and reducing deceleration. This detailed analysis revealed subtle but crucial technique adjustments.

### Success and Challenges

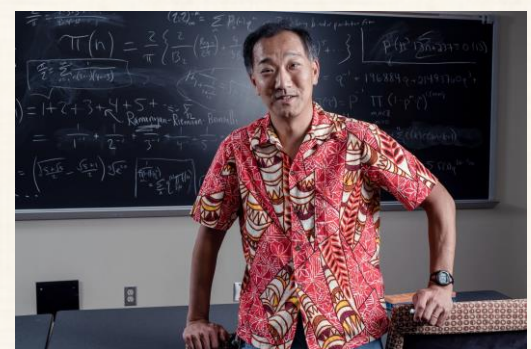
The results speak for themselves: Andrew Wilson won a national collegiate championship and a gold medal at the Tokyo Olympics. Other swimmers, like Kate Douglass and Gretchen Walsh, also achieved remarkable success, breaking records and qualifying for multiple Olympics. Ono faced challenges, such as managing noisy data, but his analytical approach proved crucial in refining swimming techniques.

### Conclusion

Ken Ono's work exemplifies the powerful synergy between mathematics and sports. By applying mathematical insights, he has helped swimmers reach their peak performance, showcasing the importance of analytical thinking and precision in achieving athletic excellence.

### Did You Know ?

Bananas are slightly radioactive because they contain potassium-40, a naturally occurring isotope of potassium.





## WHAT IS MACHINE LEARNING?

Machine learning is a branch of artificial intelligence (AI) that focuses on teaching computers to learn and improve from experience without being explicitly programmed. It involves feeding computers large amounts of data, known as training data, and using algorithms to improve the performance of other algorithms. The process is akin to trial and error, where the system continually adjusts itself to achieve better results.

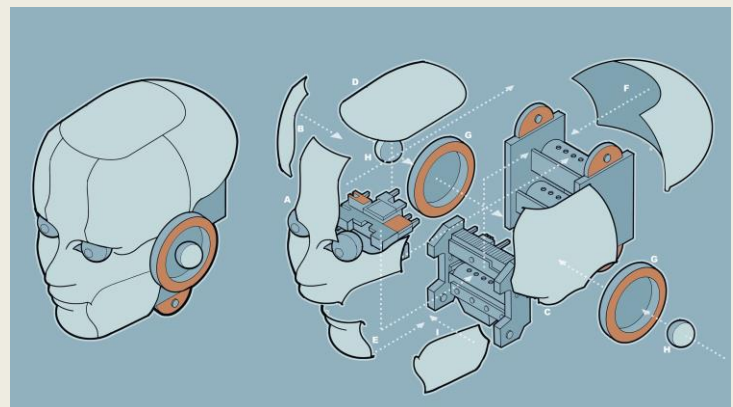
In **supervised learning**, a common type of machine learning, the system is trained on labeled data. For example, to teach a model to recognize cats in photos, it is given a dataset of images labeled as "cat" or "not cat." The model uses this information to learn to classify new images. This is done through a mathematical function called a model, which transforms the input data (photos) into output labels (cat/not cat). The model is refined using an objective function that measures how well it performs, adjusting the model's parameters to minimize errors.

**Unsupervised learning**, on the other hand, deals with unlabeled data. It aims to find patterns or structures within the data without predefined categories. This approach is used in applications like content recommendation systems and some computer vision tasks.

**Reinforcement learning** is another approach where the model learns by receiving rewards or penalties based on its actions. This method is used for dynamic tasks, such as game playing or controlling autonomous vehicles.

Since the 2010s, artificial neural networks, particularly deep learning models, have been at the forefront of machine learning. These models are inspired by the human brain's structure and can handle complex tasks by processing large amounts of data through multiple layers of neurons. They are particularly effective in areas like language processing and image recognition. However, machine learning models are not without challenges. They can overfit, meaning they perform well on training data but fail to generalize to new data. Biases in the training data can also lead to biased outcomes. Furthermore, understanding how and why these models make decisions, known as the interpretability problem, remains a significant issue.

Overall, machine learning is about setting up a system that can learn and improve over time, handling tasks and making decisions that humans might find complex or time-consuming to program explicitly.





## INSECTS AND OTHER ANIMALS HAVE CONSCIOUSNESS, EXPERTS DECLARE

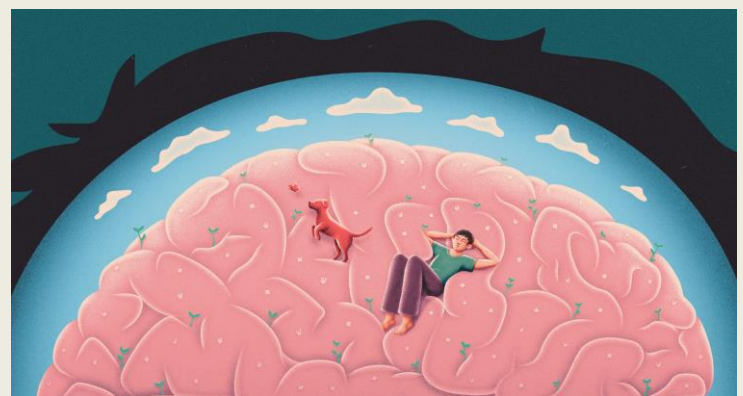
Have you ever wondered what your brain is up to when you're just lounging on the couch, not engaged in any specific task? Surprisingly, even in these moments of inactivity, your brain is quite busy, thanks to what scientists call the "default mode network" (DMN). Discovered about 20 years ago, the DMN consists of interconnected brain regions that become active when we're not focused on the external world.

In the late 20th century, neuroscientists noticed that while certain brain areas became more active during specific tasks, others seemed to dial down their activity. These "task-negative" areas were later found to be active during rest or mind-wandering, leading to the concept of the DMN. This network includes regions like the medial prefrontal cortex and posterior cingulate cortex, which are involved in functions such as memory, self-reflection, and imagining the future.

The discovery of the DMN has spurred extensive research into how brain networks, rather than isolated brain regions, contribute to our mental processes. The DMN, for example, is thought to play a role in daydreaming, recalling past experiences, and even thinking about others' thoughts and feelings. It's like a backstage crew, silently working to shape our internal narratives and maintain a sense of self. Researchers are also exploring the DMN's links to mental health conditions. Some

studies suggest that disruptions in this network may be associated with disorders like depression and schizophrenia. The "triple network theory" even proposes that interactions between the DMN and other networks, such as the salience network (which helps us focus on important stimuli), could be key to understanding these conditions.

While the exact functions and implications of the DMN are still being explored, its discovery has revolutionized our understanding of the brain's inner workings. It shows that even when we're resting, our brains are far from idle, busy making sense of our experiences and thoughts. So next time you catch yourself daydreaming, remember: your brain is hard at work behind the scenes!



The longest living cells in the human body are neurons, which can last an entire lifetime.

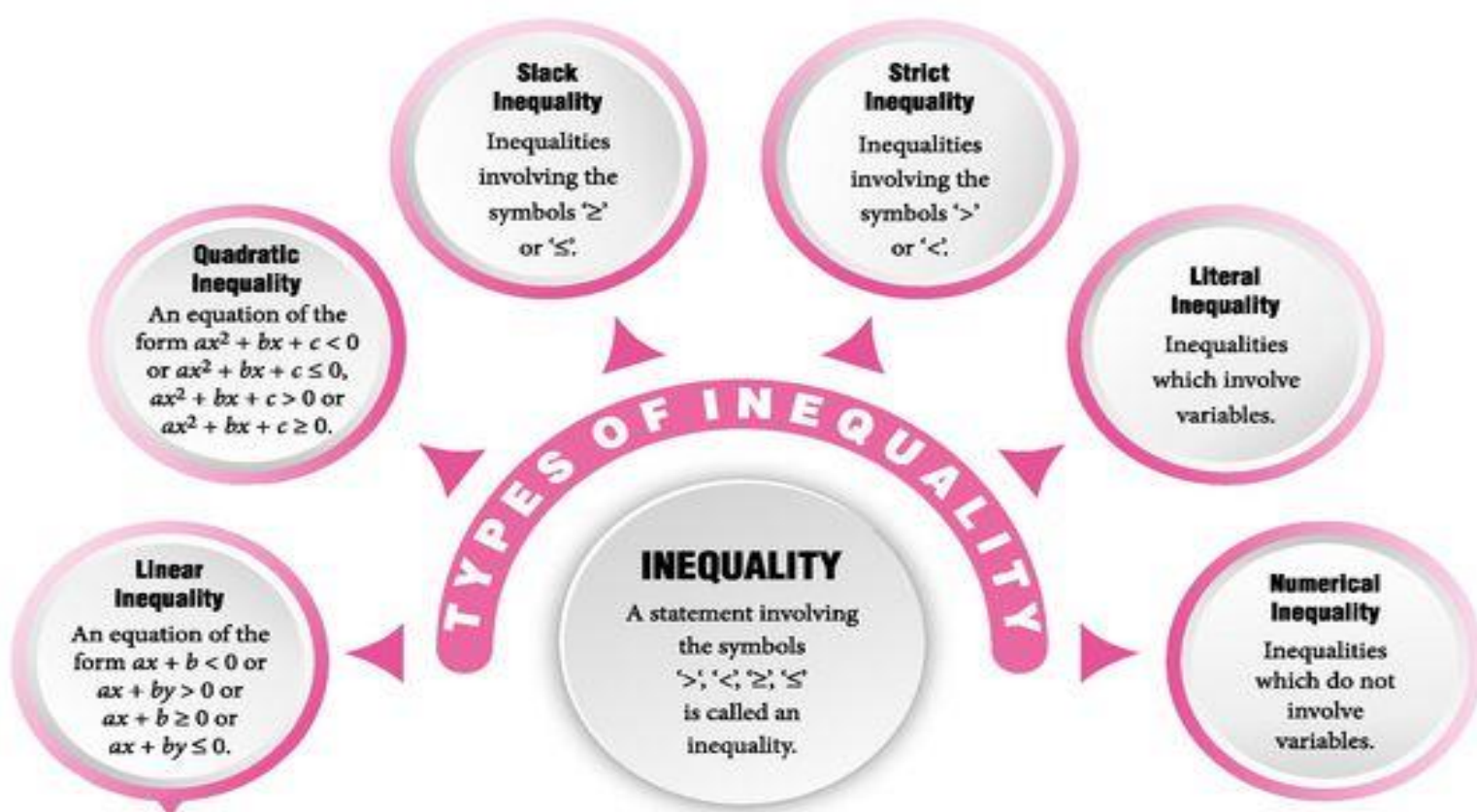


MATHEMATICS TOPIC OF THE MONTH:

CONCEPT  
MAP

## LINEAR INEQUALITIES

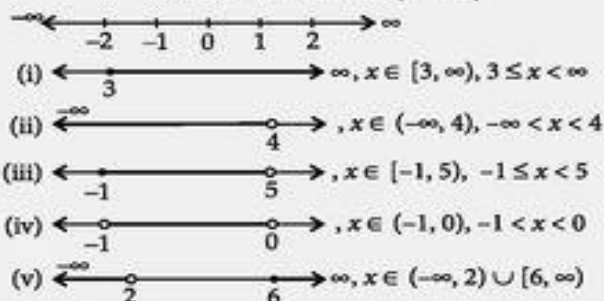
Class XI



### Linear Inequality in One Variable

- A linear inequality which has only one variable, is called linear inequality in one variable.
- Solution of Linear Inequality in One Variable**: Any solution of an inequality in one variable is a value of variable which makes it a true statement. The set of all solutions of an inequality, is called the solution set of the inequality.

### Graphical Representation of Intervals on the Real Number Line (x-axis)



### Linear Inequality in Two Variable

- An inequality of the form  $ax + by + c > 0$ ,  $ax + by + c < 0$ ,  $ax + by + c ≥ 0$  or  $ax + by + c ≤ 0$ , where  $a ≠ 0$  and  $b ≠ 0$ , is called a linear inequality in two variables  $x$  and  $y$ .
- The region containing all the solutions of an inequality, is called the **solution region**.

### Algorithm

- Convert the inequality  $ax + by + c ≤ 0$ , into equation  $ax + by + c = 0$
  - Draw the straight line  $ax + by + c = 0$  which divides the plane into two half planes as  $ax + by + c < 0$  (or)  $ax + by + c > 0$
  - Choose a point not on the line if possible (0, 0) and substitute in the inequation.
  - If the point satisfies the inequation  $ax + by + c < 0$ , then the half plane containing the origin represents the inequation and the other plane represents  $ax + by + c > 0$
- Note**: In case of strict inequality, draw the dotted straight line, otherwise draw thick line.



## BRAIN MAP

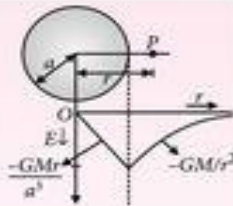
### CLASS XI

SCIENCE TOPIC OF THE MONTH:

## GRAVITATIONAL FIELD AND POTENTIAL

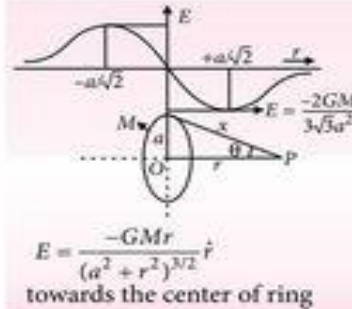
### Gravitational Field

The space surrounding the body within which its gravitation force of attraction is experienced by other bodies is called gravitational field.



- Inside  $r < a$   
 $E = -\frac{GMr}{a^3}$
- Outside  $r \geq a$   
 $E = -\frac{GM}{r^2}$

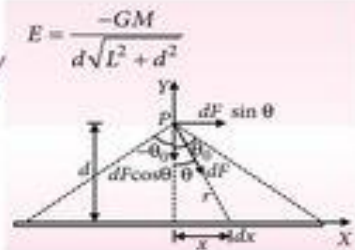
Due to uniform solid sphere at point P



Due to a uniform ring at a distance  $r$  on the axis from centre

Due to a uniform ring at a distance  $r$  on the axis from centre

Due to a linear mass of finite length on its axis



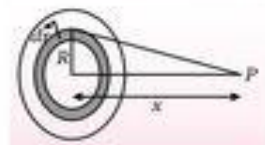
Here  $\theta_0 = \pi/2$   
linear mass density  $\lambda$   
Field intensity,  $E = \frac{2G\lambda}{d}$

Due to infinite uniform linear mass distribution

Due to a uniform disc of mass M

At a distance  $x$  on the axis from centre

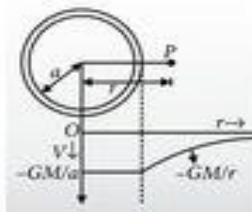
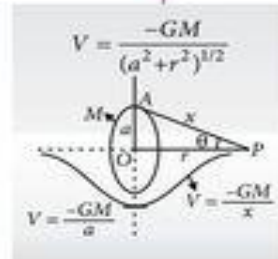
$$E = -\frac{2GMx}{R^2} \left[ \frac{1}{x} - \frac{1}{\sqrt{x^2 + R^2}} \right]$$



Due to uniform thin spherical shell

- Inside  $r \leq a$   
 $V = -\frac{GM}{a}$
- Outside  $r > a$   
 $V = -\frac{GM}{r}$

Due to a uniform ring at a distance  $r$  on the axis from centre



Uniform Thick Spherical Shell

- Outside  $V = -\frac{GM}{r}$
- Inside  $V = -\frac{3}{2}GM \left( \frac{R_2 + R_1}{R_2^2 + R_1R_2 + R_1^2} \right)$

### Gravitational Field Intensity (E)

Relation between gravitational field and potential

$$E = -\frac{dV}{dr}$$

### Gravitational Potential (V)

$$\vec{E} = \frac{\vec{F}}{m} \text{ SI unit: } N \text{ kg}^{-1}, [E] = [M^0L^2T^{-2}]$$

The gravitational force experienced by a unit mass placed at a point.

The amount of work done by an external agent in bringing a body of unit mass from infinity to that point in the gravitational field.

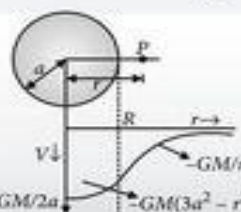
$$V = -\frac{GM}{r} \text{ SI unit is } J \text{ kg}^{-1}, [V] = [M^0L^2T^{-2}]$$

Due to infinite uniform linear mass distribution ( $\lambda$ )

Due to a linear mass of finite length on its axis

Due to uniform solid sphere at point P

- Inside  $r \leq a$ ,  
 $V = -\frac{GM}{2a^3}(3a^2 - r^2)$
- Outside  $r \geq a$   
 $V = -\frac{GM}{r}$



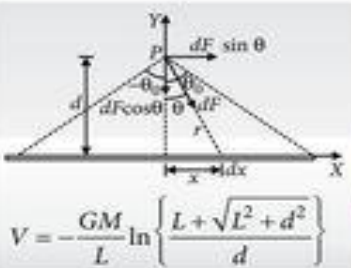
### Relation between E and R

For two planets A and B of masses  $m_A, m_B$  and radius  $R_A$  and  $R_B$  having

- equal mass  $\frac{E_A}{E_B} = \frac{R_B^2}{R_A^2}$
- equal density  $\frac{E_A}{E_B} = \frac{R_A}{R_B}$

Potential difference between two points at distance  $d_1$  and  $d_2$

$$V_{12} = 2G\lambda \ln \frac{d_2}{d_1}$$



$$V = -\frac{GM}{L} \ln \left\{ \frac{L + \sqrt{L^2 + d^2}}{d} \right\}$$





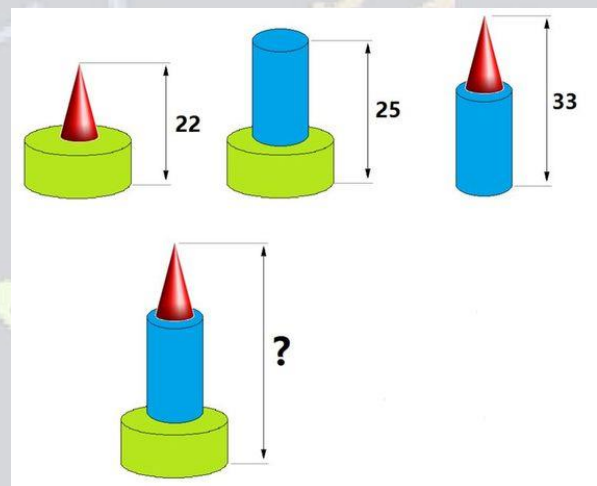
## TWIST YOUR MIND

(Answers will be given in the September 2024 digest)

### RIDDLES

1. What comes once in a minute, twice in a moment, but never in a thousand years?
2. I have a neck, but no head. I have two arms, but no hands. What am I?

### PUZZLE



## Bright Spots: Positive Events from JULY 2024

- The EU passed a law criminalizing severe environmental destruction.
- Seven countries are now fully powered by renewable energy.
- Six African nations are among the top ten fastest-growing economies.
- Ghana progresses towards eliminating malaria.
- Amazon deforestation hits a five-year low, with a new \$204M reforestation fund.
- India inaugurated its first all-electric ferry in Kochi, boosting sustainable transport initiatives.
- Paris Olympics 2024 are on track, promising a sustainable and innovative event.

**word  
of the  
month**

**Iridescent:** Showing luminous colors that seem to change when seen from different angles.

### JULY ANSWERS

RIDDLES : 1. CLOUD 2. FIRE

PUZZLE : 14

# The mentors Digest



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

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### MAGAZINES

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# 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.

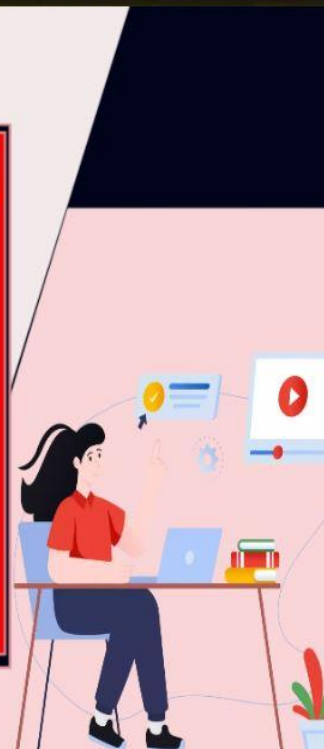
Interested parents who are willing to associate with this concept are requested to contact



## 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>

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