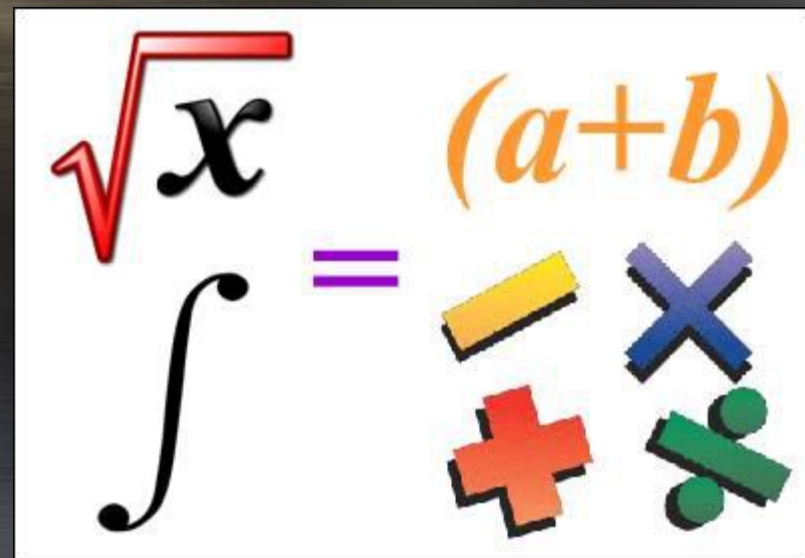


The Amazing World of Mathematics

S C Agarkar

DR VNBRIMS

Thane



My first day in the School



Questions on Globe

- There was a globe behind the teacher. Looking at it I started asking questions .
 - What would be its diameter?
 - What would be its perimeter?
 - How much is occupied by water?
 - How much land area is available for all of us to live, grow food, construct factories, etc.
- My habit of quantitative questioning not only continued but also grew over the years. Hence I am standing before you.

Many Changes in Gadgets

iPad vs Old Pad



No Change in Learning Process

- Learner has to interact with learning materials (books, computers, teaching aids, etc.)
- Learning is the responsibility of a learner. A teacher cannot teach an unwilling learner.
- Learning is a painful process, one has to struggle to achieve success.
- Knowledge is the best mode of wealth since it cannot be stolen, it cannot be divided among brothers, it is not heavy to carry. Moreover, it is the only wealth that grows by giving to others.

Mathematics around us

- Mathematics is being used in all walks of life.
 - Home management
 - Day to day activities
 - Sales and Service
 - Transport (surface, air and water)
 - Savings and investments
 - Politics
 - Communication
 - Entertainment

A Television Programme

- A Television Programme for students who disliked mathematics.
- It was decided that they will not use any mathematical concept that day.
- They found it difficult to manage even half an hour.
- Ultimately it was decided that mathematics is essential at every walk of the life.
- We must befriend the mathematics and make use of it for our own benefit.

Mathematical Literacy

- Mathematical literacy in general is poor even though literacy rate in India has grown significantly.
- My questions in History lesson on the invasion of Babar on Delhi.
- My experience as a college student (many of my friends did not get time to write)
- My experience in a journey from Vizag to Ramachandrapuram in Seemandhra
- My experience with a teacher of mathematics in Pune

Time Management

- Everyone gets 24 hours in a day. This time can be conveniently divided into three parts: Committed Time, Maintenance time and Discretionary time.
- Our progress depends on How we use the discretionary or leisure time.
- History gives many examples of successful utilization of leisure time for creativity and development: Albert Einstein, Michael Faraday, C V Raman and Lokmanya Tilak

In the opinion of Galileo

“Mathematics is the alphabet with which God has written the Universe.”

“In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual.”

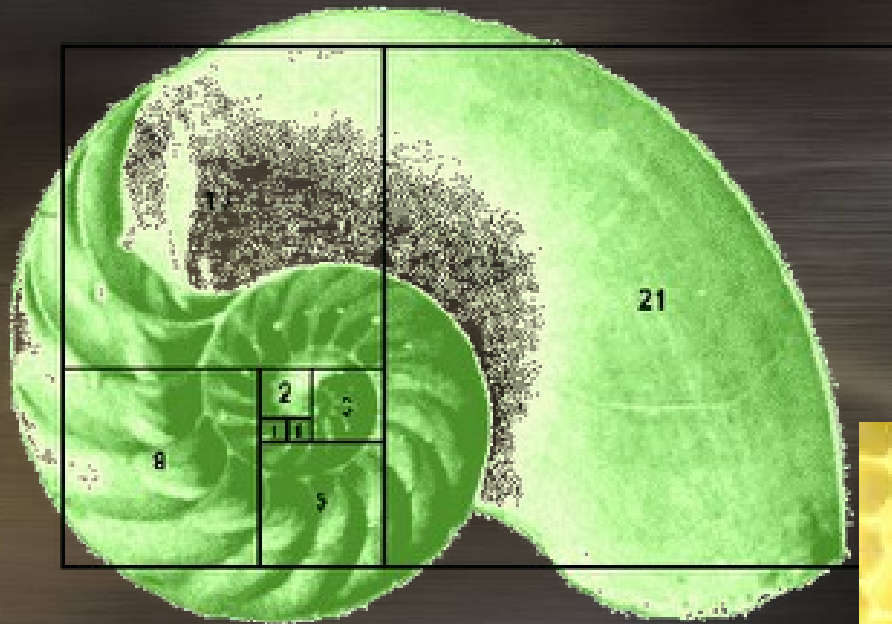
Galileo Galilei

www.planetapi.es

Symmetry in nature



Patterns in Nature



Quantification

- Quantification is an essential skill required in mathematics.
- A mere statement saying that literacy rate in India has grown significantly does not create much impact. But if I say the literacy rate was 17 percent in 1950 which has grown to 85 percent in 2010, the impact is visible.
- Look at the advertisements on television. They try to use quantification in their statements.
- Quantitative data is often misused, be careful while interpreting the information.

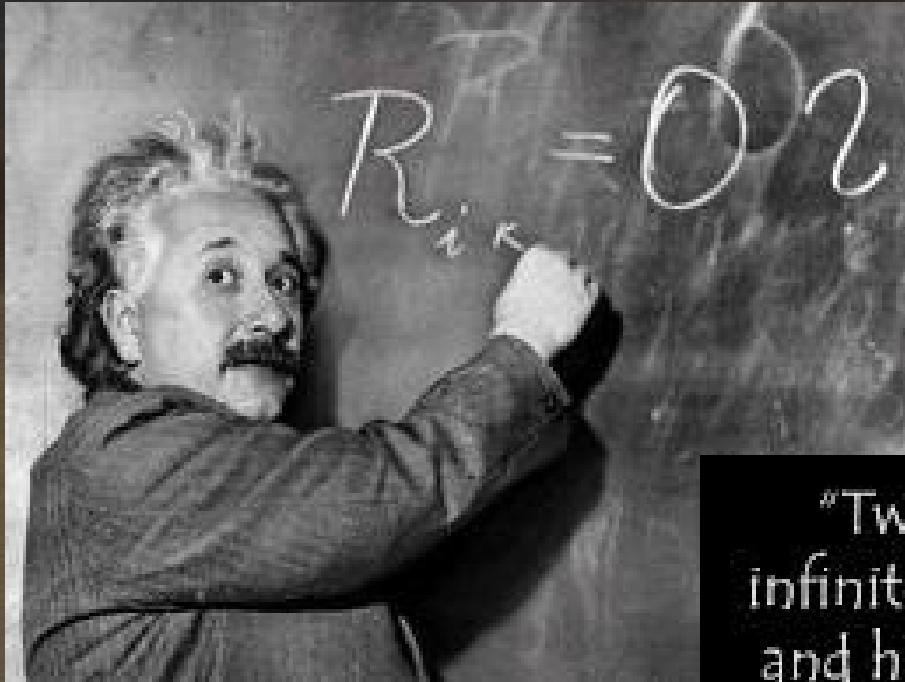
Physical phenomenon



**Newton's Third Law of
Emotion: "For every
male action**

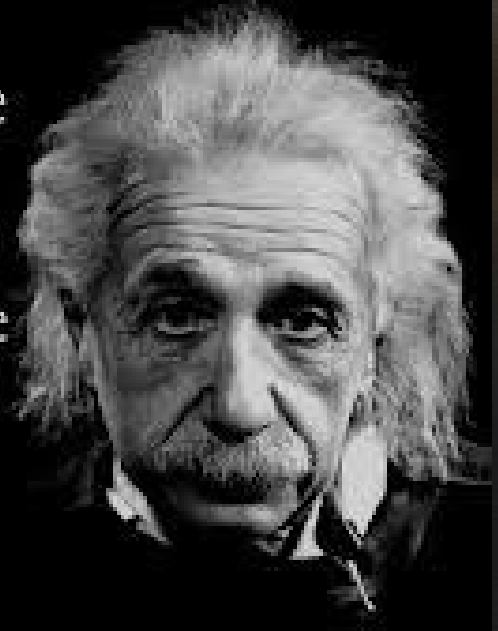
**there is a female
overreaction."**

Energy Equivalence

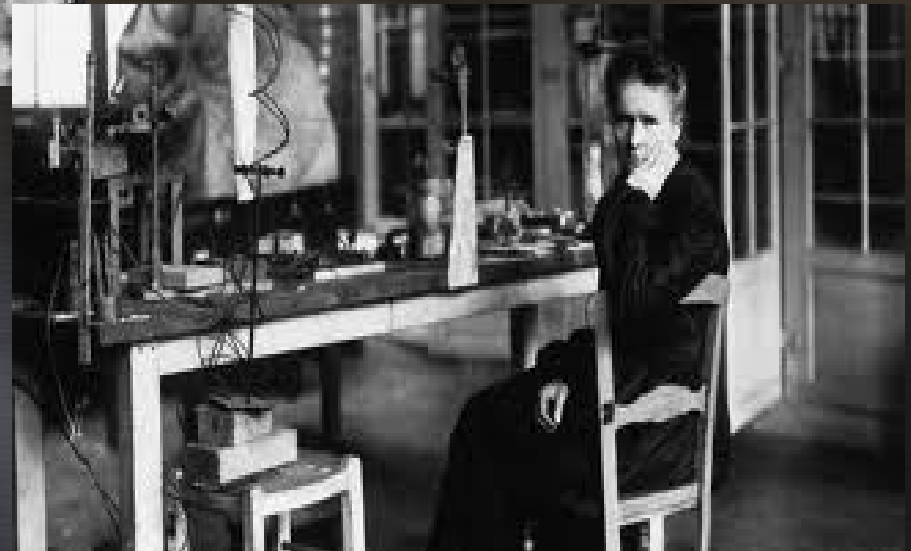


"Two things are infinite. The universe and human stupidity.

...and I'm not so sure about the universe."



Extraction of Radium



Estimation

- Estimation is yet another skill required in life. In the absence of that many problems would be created.
- Imagine you have estimated wrongly to cross the signal.
- Imagine you have estimated wrongly the salt required in the food item.
- Imagine you have estimated wrongly how many guests would come for marriage reception.
- Imagine you have estimated wrongly the time required to reach the nursing home.

A good estimator

JRD Tata was the chairman of Tata Institute of Fundamental Research until his death. He used to come in time for all the meetings. M.G.K. Menon, then the director asked him “How can you keep time for every meeting?”

The response was

“I estimate how much time is required to reach the institute from office/home taking into account the road traffic and traffic signals”.

Possibly the crux of JRD’s success lies in his ability to estimate.

Beauty of Mathematics

Components of beauty are

Elegance,

Grandness,

Regularity,

Symmetry,

Surprise,

Clarity.

All these components are seen in mathematics. Hence it can be said that mathematics is beautiful.

'Mathematics is the archetype of the beautiful' -Keplar

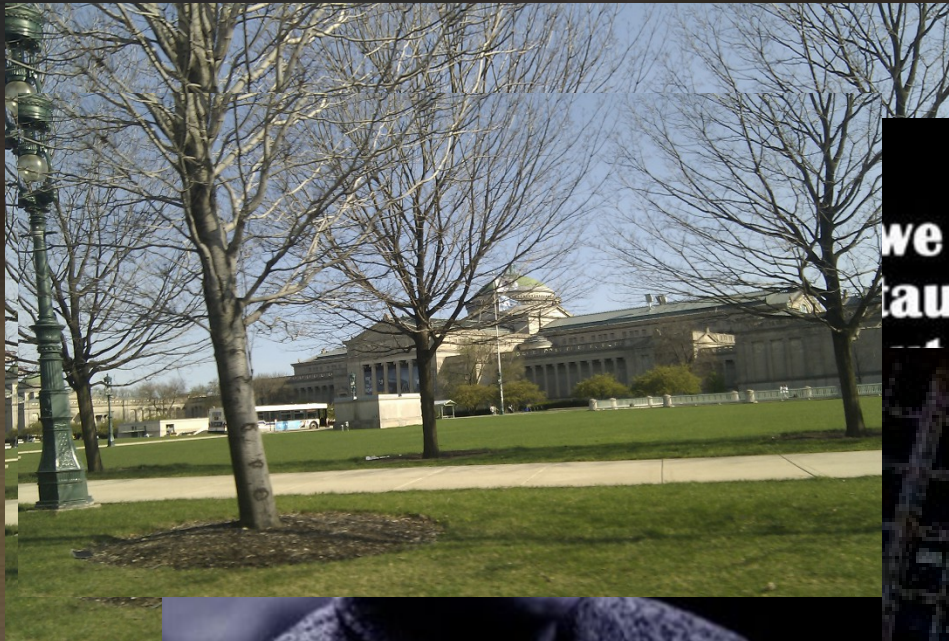
Expert opinion-1

- **Mathematics, rightly viewed, possesses not only truth, but supreme beauty -- a beauty cold and austere, like that of sculpture, without appeal to any part of our weaker nature, without the gorgeous trappings of painting or music, yet sublimely pure, and capable of a stern perfection such as only the greatest art can show. – Bertrand Russell (1872-1970), The Study of Mathematics.**

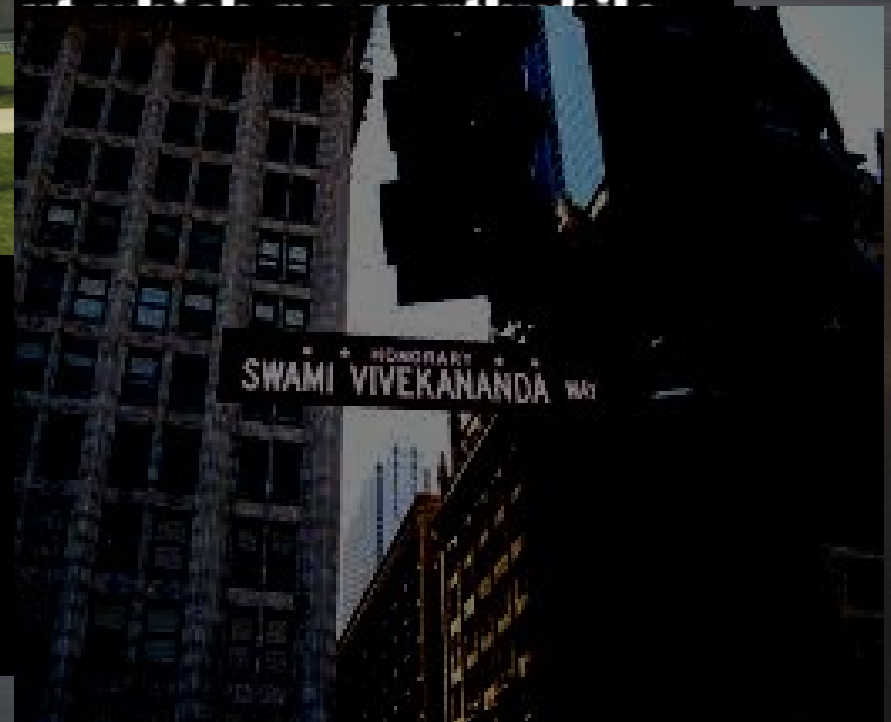
Expert opinion-3

- **The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas, like the colors or the words must fit together in a harmonious way. Beauty is the first test: there is no permanent place in this world for ugly mathematics. -- G. H. Hardy (1877 - 1947), A Mathematician's Apology, Cambridge University Press, 1994.**

Experience in Chicago



**we a lot to the Indians,
taught us how to count,**



Mathematics in India

यथा शिखा मयुराणां, नागानां मणयो यथा।
तद्वद वेदांगशास्त्राणां गणितं मूर्धनि स्थितम्॥

Aspeacock has its crest on top, as cobra has a jewel on the top, similarly mathematics is at the top among all the Vedic sciences.

Number system in India

- Indians has given the terms for numbers in multiples of ten and were coined for the sake of positional values. Indian terms for numbers are as follows:
- eka(1),dasha(10),
- shata(100),sahastra(1000),
- ayuta(10,000),laksha(10^5),
- prayuta(10^6 million),koti(10^7),
- arbuda(10^8),abja(10^9 billion),
- kharva(10^{10}),nikharva(10^{11}),
- mahapadma(10^{12} trillion),shanku(10^{13}),
- jaladhi(10^{14}),antya(10^{15} quadrillion),
- madhya(10^{16})andparardha(10^{17}).

Tradition of Mathematics

- Bodhayana(8th century BC) wrote *Shulbasutras* (Aphorism of chords), stated theorem for right angled triangle (The rope stretched along the length of a diagonal of the rectangle makes an area of which the vertical and horizontal side makes together) and also gave triplets (3,4,5; 5,12,13; 8,15,17; 7,24,25; 12,35,37).
- Pingala(300-200 BC) was a musical theorist, wrote *ChhandasShastra* and gave *meruprastara* (Pascal's triangle).
- Katyayana(3rd Century BC) wrote the *KatyayanaSulbaSutra*, which presented much geometry including the theorem of right angled triangle and a computation of the square root of 2 correct to five decimal places.

Tradition Continued

- Aryabhata (476-550 CE) wrote *Aryabhatiya* that describes quadratic equations, trigonometry and value of pi. He calculated the timings of occurrences of eclipses that are still valid.
- Varahmihir (505-587 CE) wrote *Panchasiddhant* related to astronomy and contributed to trigonometry.
- Brahmagupta (7th Century CE) wrote *Brahma Sphuta Siddhanta* that had basic mathematical operations and practical mathematics (e.g. stacking of bricks, sawing of a timber, piling of grains, etc.).
- Mahavira Acharya (9th century CE) wrote *Ganit Saar Sangraha*, Sridhara (10th century CE) wrote *Nav Shatika*, *Tri Shatika* and *Pati Ganita* and Sripati (11th Century CE) wrote *Siddhanta Shekhara* and *Ganit Tilaka*.

Bhaskaracharya

- **Bhaskar II that is Bhaskaracharya was born in Shalivahan Shaka 1036 (1114 AD) near Bijjala Bidain Maharashtra**
- **His father Maheswar was also a mathematician and astrologer. He learned mathematics from his father.**
- **He was heading the astronomical unit at Ujjain in Central India. Ujjain was the centre of knowledge creation in those days.**
- **We at Vidya Prasarak Mandal, Thane are celebrating his 900th birth anniversary. I have so far conducted 30 workshops on Bhaskaracharya's Lilavati. An international conference is scheduled in this campus from September 19 to 21, 2014.**

A big list of publications

Bhaskarachara 's Famous Books

- Lilavathi - Mathematics
- Bijaganita - Algebra
- Siddhantasiromani –
first part mathematical astronomy and
second part sphere
- Vasanabhasya
- Karanakutuhala
- Vivarana

Solution



Mathematics
may not teach us how to
add love or minus hate.
But it gives us every
reason to hope that
every problem has a
SOLUTION...

QUOTEDIARY.ME

Thank you



Any question?

