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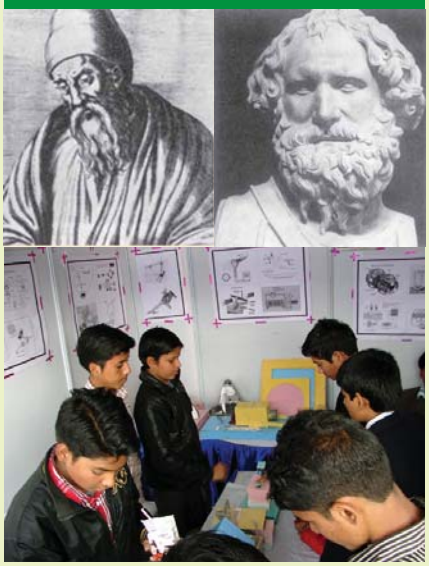
VIPNET NEWS

A monthly newsletter of Vigyan Prasar Network of Science Clubs - VIPNET

OCTOBER 2012 VOL. 10 NO. 10 PRICE: ₹2.00

National Mathematical Year 2012

Inside



International Year of Sustainable Energy for All 2012

Dear Vipnetian,

This year the focal theme of 'National Children Science Congress' is 'Energy: Explore Harness and Conserve'. The theme will continue next year as well. The theme Energy for NCSC has a very contemporary relevance as we know more than three billion people in developing countries rely on traditional biomass for cooking and other purposes. It is unfortunate that even one and half billion people are without electricity. Even if they have energy services, they do not have capacity to pay for them. It can be denied that there is an inextricable link between energy and sustainable development. We need to develop more modern, cleaner and efficient energy production systems. For this there is a need to search for never renewable and sustainable sources of energy.

Incidentally recognizing the importance of energy for sustainable development, the 'UN General Assembly' has also designated by its resolution 65/151, the year 2012 as the 'International year of Sustainable Energy for All'.

As all you know that VP is in the process of organising 5 regional meet of VIPNET Clubs. So far three such meets have been organised for the Western, Central and North-Eastern zone. In these meets, 12 issues have been identified for taking up programme and activities for next two years. Out of 12 issues, one issue is 'Energy'. After the completion of all meetings, VP would develop a manual and other resource material to take-up the programme and activities on theme Energy in more asystematic way.

We would also like to inform our VIPNET clubs that though the programme i.e. National Children Science Congress, children from the breath and length of the country have already started work on project relating to 'energy'. NCSTC-Network has also developed a detailed manual on the theme for the guidance of teachers and students. For more detail you may visit website *ncstc-network.org. (The contact details are given in the main article).*

If the members of your clubs are not participating in NCSC, even then, you can take up some programme or activities as suggested in the activity guide. For the benefit of our clubs, VP is presenting a brief account of the main theme and subthemes including suggestive activities that can be undertake by the clubs. We also invite VIPNET Clubs to contribute their ideas and views for developing a major programme on theme 'Energy'.

The year 2012, as International year of Sustainable Energy is providing us an opportunity to raise awareness about the importance of increasing sustainable access to energy, energy efficiency, and renewable energy at local, regional and national level. We hope, the programme, activities and project undertaken by the VIPNET members will go a long way not only in creating awareness among the people but also motivate them to reduce their carbon footprints.

Mathematical language is not only the simplest and most easily understood of any, but the shortest also. *... H.P. Brougham*

20th National Children Science Congress 2012
Focal Theme

Energy: Explore, Harness and Conserve

Energy is considered as crucial input parameter for our day to day work and for economical development of any country. Per capita energy consumption is one of the key deciding factors of the level of well-being of any society or for any country. It is also referred through the relationship between economic growths with energy consumption.

In reality economic development of every region or country largely depends on how its energy requirement is satisfied. Every production process has certain amount of energy requirement. Hence availability of quality energy sources is crucial for overall scientific and technological progress of any country.

Energy is central to sustainable development and poverty reduction efforts. It affects all aspects of development –social economic, and environmental— including livelihoods, access to water, agriculture productivity, health, population levels, education, and gender-related issues. None of the Millennium Development Goals (MDGs) can be met without major improvement in the quality and quantity of energy services in developing countries.

In this era when we are facing challenges due to climate change globally, efficient energy use and replacement of carbon based fuel with non-carbon based fuel are the key areas by which we can reduce our carbon foot print to a large extent and undertake some pragmatic measures for mitigation and adaptation of climate change. It is noteworthy that awareness and understanding in such areas in many cases encourage us for taking self initiatives for conservation , rational uses and strategies for enhancing efficiency. Therefore, "Energy: Explore, Harness and Conserve" has been proposed as the focal theme for the CSC 2012-2013, with an expectation that young mind will be able to realize the need, take different initiatives to explore and identify approaches to achieve optimum use through enhancing energy among the masses through their project work.

SUB-THEME:

I. Energy Reources

The growth and development of an area or locality or the country depends upon the availability, accessibility, potentiality, stock and present requirement of Energy Resources. This sub-theme deals with the different aspects of Energy Resources available as well as the potential sources available for the development of the area with emphasis on the ways and means to tap the different potential sources. The different sources of energy available can be divided into two major categories: Renewable Sources and Non-renewable Sources of Energy. The different Renewable sources of energy are Solar-Thermal and Photovoltaic, Hydro-Electricity, Wind Energy, Bio-mass (like firewood, agriculture waste, other Bio-Fuels, etc), and combination of Bio-energy sources Bio-ethanol and Bio-Diesel. The different sources of Non-Renewable Sources of Energy are Coal and Lignite, Oil, Natural Gas and Nuclear Energy.

Some project ideas :

- Explore and identify energy resources in and around you;
- Nature of availability of solar energy in your village or locality;
- Study on biomass resource potential in you village or locality;
- Assessment of potentiality of hydro power in a flowing stream;

II Energy System

The term energy system, here refers to the interrelated network of energy sources, conversion of energy sources, transmission and distribution of that energy to where it is needed to perform the work. The sub-theme here mainly focuses on developing devices to convert from one form of energy to another useable form, performance analysis and thus the feasibility and appropriateness.

Some project idea:

- Evaluate the energy efficiency of different chullahs used in a village;
- Comparison of Food web of two different natural ecosystems in an area;
- Maximum power output from a solar module at different solar radiation and at different inclination angle;
- Making various types concentrating type solar

Participants of 19th Children Science Congress at Jaipur

cooker and measurement of temperature at the focal point at different solar radiation throughout the day;

- Making of box type solar cooker by using various available materials like ply-board and measurement of cooking time for various kind of food;
- Measurement of amount of gas output from different kinds of organic waste materials (cow dung, vegetable waste, food waste, municipal solid waste etc.) during anaerobic digestion;
- Evaluation/estimation of human energy requirement and estimate the amount of other conventional energy sources required to substitute them; etc.

III. Energy and Society

Growth in any sector like agriculture, industry, housing, transportation, health care, education, tourism, entertainment, communication. etc. presupposes corresponding growth in energy sector. In other words, availability and accessibility to different energy resources many a time influences the societal pattern of an area. Societal make-up and structure also exerts impact on the energy consumption status and pattern. Both these processes determine many of the parameters which are linked with societal benefits, security/ well-being of human life. This sub-theme focuses on such societal dimension of energy use to cater to our needs of day to day life.

Some project idea:

- Gender-wise energy consumption pattern;
- Change in the pattern of energy consumption and impact on lifestyle and society;
- Energy spent to stay fit;
- Energy for basic needs and livelihood;
- Availability of bio-resources and efficient uses in the kitchen;
- Energy implication of dietary habits;
- Festival and change in pattern of energy consumption-impact on society;
- Change in energy flow due of shift in agriculture practices (crop, cattle, fertilizer use);
- Common facilities for reducing energy input in various sector, etc.

IV. Energy and Environment

The production or the use of energy especially the non-renewable sources had always laid a great impact on the environment. Whether it is at the time of production, processing, consumption or even transmission, it has great impact, whereas it is an

20th NATIONAL CHILDREN SCIENCE CONGRESS 2012

FOCAL THEME

Energy Explore, Harness and Conserve

Sub Theme

I- Energy Resources
II- Energy Systems
II- Energy and Society
IV- Energy and Environment
V- Energy Management and Conservation
VI- Energy Planning and Modeling'

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inseparable part of the growth and development. In this area one can assess the environmental impact of different processes of production, transmission/ transportation and uses of energy in and around us.

Some project ideas:

- The Impact of deposition of suspended particles on photosynthesis;
- Use of bio-resources as fuel in the kitchen and the impacts on health of women;
- Automobile pollution-impact on human health;
- Insects congregating around lights and probable impact on its population;
- Impact of wind generators on birds and other animals;
- Environmental Impact of mining and explorations activities for energy resources:
- Energy consumption in the brick industries;
- Fire wood collection and probable impact on forest and biodiversity; etc.

V. Energy Management and Conservation

The management energy deals with the different sources of Energy, assessing the present demand and optimal requirement with identification of the causes of misuse or wastage. It may be due to negligence, wrong practices and factors such as aging of the machinery, transmission loss, or any such cause which poses hindrance in delivering the maximum energy spent at the input. In order to meet the loss of energy, identifying steps such as Strategies for minimizing these losses, Strategies of techniques/set-up, change in management approach and practices are usually taken as conservation measure.

Some project ideas :

- Energy audit of school electricity usage;
- Understanding green building;
- Role of renewable energy in disaster management;
- School water audit to assess the impact of water uses on energy consumption.
- Assessing energy consumption pattern for preparation of food in the school.
- Recycling practices and its impact on energy consumption;
- Energy audit at a hospital;
- Energy conservation in a village household;
- Energy accounting for a solar green house;
- Energy accounting of village industries/micro-enterprises/market complex.

Child Scientist During the Inaugural Session at Jaipur on 27 December 2011

- Effectiveness of solar passive measures;
- Comparison of energy utilization of different crop;
- Energy accounting of a specific crop from tillage to harvesting; etc.

VI. Energy Planning and Modeling

The term planning of energy here refers to means for creating self sufficiency in energy with strategy for optimum use and achieving its security. This involves assessing the present demand and supply situation with reference to assessing the stock and identifying ways and means for optimizing the utilization. This is achieved through reviewing the consumption pattern, Projecting future demand and supply and Comparing situation with the help of models. The modeling shall help in identification of ways & means in attaining sufficiency and attain energy security.

Some project ideas:

- Micro-level energy planning and modeling-start from your school;
- Planning for energy-efficient building;
- Modeling grey water-recycling in a colony;
- Energy planning for transport sector;
- Modeling for water utilization of a particular society/area;
- Assessing present energy usage and projection for future requirement for your village or locality;
- Modeling of windows for optimal utilization of energy;
- Modeling of home/office interiors for efficient power consumption;
- Modeling of energy self-sufficient locality/village/ school;
- To plan and model the change in school timings for reducing the energy requirements; etc. ❑

Source:
20th National Children Science Congress-Brochure

Euclid

The Author of the Best Known Textbook

Euclid is one of the best known and most influential of classical Greek mathematicians but almost nothing is known about his life. He was a founder and member of the Academy in Alexandria, and may have been a pupil of Plato in Athens. Despite his great fame Euclid was not one of greatest of Greek mathematicians and not of the same calibre as Archimedes.

***A Dictionary of Scientists,* Oxford University Press, 1999**

Euclid offers strange contrasts: although his work dominated mathematics for over 2,000 years, almost nothing is known of his life and personality.

***The Cambridge Dictionary of Scientists,* Cambridge University Press, 2002**

His (Euclid's) *Elements* of geometry...is the earliest Greek mathematical treatise to have survived, and is probably better known than any other mathematical book, still being used as the basis of school textbooks in the early part of the 20th century. It was the first mathematical book to be printed and has stood as a model of rigorous mathematical exposition for centuries.

***Chambers Biographical Dictionary,* Chambers Harrap Publishers Ltd, 1997**

It is generally believed that Euclid, also known as Euclid of Alexandria, was a Greek mathematician. He lived in Alexandria, Hellenistic Egypt. He is regarded as the "father of geometry". His most popular work, *Elements*, is considered to be the most successful textbook of all time. He summarised the most of the Greek mathematics and geometry known during his time.

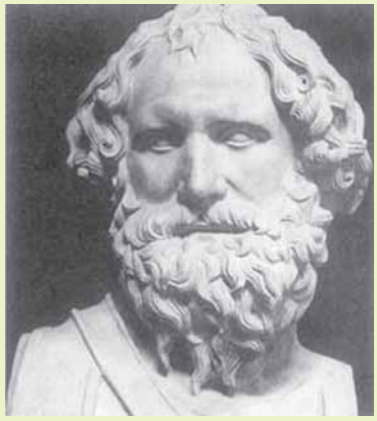
Euclid

We do not have any information about Euclid's life. According to some Arabian authors Euclid was the son of Naucrates and he was born in Tyre. However, historians of mathematics have not accepted this version and consider it fictitious. According to some others Euclid was born at Megara. This kind of belief perhaps arose from the fact that Euclid (or Eucleides) of Megara (which flourished around 390 BC), a philosopher, lived about 100 years before Euclid the mathematician. There are some stray remarks about Euclid. We do not know the veracity of these remarks. All accounts of Euclid describe him as a kind, fair, patient man who quickly helped and praised the works of others. The Greek mathematician Pappus of Alexandria (4th century AD) wrote: "...most fair and well disposed towards all who were able in any measure to advance mathematics, careful in no way to give offence, and although an exact scholar not vaunting himself." Stobaeus wrote: "... someone who had begun to learn geometry with Euclid, when he had learnt the first theorem, asked Euclid 'What shall I get by learning these things?' Euclid called his slave and said 'Give him three pence since he must make gain out of what he learns'.

We have almost no knowledge about Euclid's life, but unlike the works of other ancient Greek mathematicians his works survived. The most celebrated work attributed to Euclid is the *Elements*. It seems Euclid wrote other books, which no longer exist. However, we know about these books from the writings of later authors. Among the lost books of Euclid are: *Data* (on properties of figures), *Surface Loci* (two books), *Porisms* (a three-book work), *Conics* (four books), *Pseudaria* (Book of fallacies) *Phaenomena* (an elementary introduction to mathematical astronomy), *On Divisions of Figures* (on constructions), *Optics* (the first Greek work on perspective), and *Elements of Music*.

It is believed that Euclid lived in Alexandria around 300 BC. It should be noted here that after the death of Alexander the Great (356-323 BC), his generals divided up his kingdom. Egypt, the country in which Alexander the Great himself had founded the new city of Alexandria, came under the rule of Ptolemy I (c. 367-283 BC). In Alexandria, Ptolemy I, who was one of the greatest generals of Alexander the Great, established a library and a school and he invited Euclid to teach mathematics in his newly established school. Following Euclid many great

mathematicians came to Alexandria. The fact that Euclid lived in Alexandria is derived from a passage in Proclus's commentary on the first book of *Elements*. Proclus (c.410-485 AD), a Greek Neoplatonic philosopher, wrote: "All those who have written histories bring to this point their account of the development of this science. Not long after these men, came Euclid, who brought together the *Elements*, systematizing many of the theorems of Eudoxus, perfecting many of those of Theatetus, and putting in irrefutable demonstrable form propositions that had been rather loosely established by his predecessors. He lived in the time of Ptolemy the First, for Archimedes, who lived after the time of the first Ptolemy, mentions Euclid. It is also reported that Ptolemy once asked Euclid if there was not a shorter road to geometry than through the *Elements*, and Euclid replied that there was no royal road to geometry. He was therefore later than Plato's group but earlier than Eratosthenes and Archimedes, for these two men were contemporaries, as Eratosthenes somewhere says. Euclid belonged to the persuasion of Plato and was at home in this philosophy; and this is why he thought the goal of the *Elements* as a whole to be the construction of the so-called Platonic figures." Proclus lived in the fifth century AD; that is, 800 years after Euclid's death. The validity of Proclus' assertion that Archimedes referred to Euclid has been challenged on the ground that in those days such practices were not in vogue. This kind of counter argument cannot be proved or disproved with certainty. However, it is generally believed that Euclid wrote his works after Plato's pupils such as Eudoxus of Cnidus (408-353 BC) and before Archimedes.



Archimedes

Like in case of the Greek philosopher and mathematician Pythagoras (c. 580-c.500 BC) the existence of Euclid as a historical character has not been proved beyond doubt. It is true that it is generally assumed that there was a mathematician named Euclid who wrote the *Elements.* This is because for over 2,000 years no serious proof came forward to prove it otherwise. While it is true that there may be variation in style between some books of the *Elements*, but then it is not uncommon for an author to change his style. It has been argued that perhaps Euclid alone did not write all the works attributed to him. He was a leader of a group of mathematicians who together wrote the *Elements* and other works attributed to Euclid. We virtually do not know anything about Euclid. Even there is no preface to any of his works. And so it is not unexpected that even the very existence of Euclid has been doubted. It has been argued that the works attributed to Euclid were actually written by a group of Alexandrian mathematicians 'who took the name Euclid from the historical character of Euclid of Megara who lived about 100 years earlier.' In the distant past it was a common practice for the lesser-known authors to attribute their works to a known personality.

Eudoxus of Cnidus

The most famous work attributed to Euclid was his treatise on mathematics called the *Elements*. It remained the chief source for mathematical teaching for 2,000 years. Euclid's *Elements* were a compilation of Greek mathematics and geometry. Today there is no way of knowing how much of the work included in the *Elements* is Euclid's original work. Many of the theorems found in the *Elements* can be traced to previous thinkers including Euxodus of Cnidus, Thales (c.620-c.555 BC), and Pythagoras. However, the format of the *Elements* belongs to Euclid alone. Probably, there is no result in the *Elements* that was first proved by Euclid. He compiled the existing knowledge on the subject. There are definite proofs that while compiling the *Elements*, earlier works were used. The first printed copy of the *Elements* appeared in 1482. The *Elements* was translated into both Latin and Arabic and is the earliest similar work to survive, basically because it is far superior to anything previous.

There are 13 books in the *Elements*. The *Elements* begins with definitions and five postulates. Books one to six deal with plane geometry. Books one and two describe the basic properties of triangles, parallels, parallelograms, rectangles and squares. Book three discusses the properties of the circle. Book four deals with problems about circles. Book five lays out the work of Eudoxus of Cnidus on proportion applied to commensurable and incommensurable magnitudes. Book six looks at applications of the results of book five to plane geometry.

Books seven to nine are concerned with number theory. In particular, book seven is a self-contained introduction to number theory and contains the Euclidean algorithm for finding the greatest common divisor of two numbers. Book eight looks at numbers in geometrical progression.

Book ten, based on earlier work of the Greek mathematician Theaetetus (c.414-c.369 BC) deals with the theory of irrational numbers.

Books eleven to thirteen develop the subject of three-dimensional geometry. In book eleven the basic definitions needed for the three books together are given. The theorems then follow a fairly similar pattern to the two-dimensional analogues previously given in books one and four. The main results of book twelve are that circles are to one another as the squares of their diameters and that spheres are to each other as the cubes of their diameters. The last book of the *Elements* or book thirteen, which is mainly based on an earlier treatise *Theaetetus* by Plato, discusses the properties of the five regular polyhedra and gives a proof that there are precisely five.

Eratosthenes

The first printed version of the *Elements* appeared in 1482. Since its first publication, more than 1,000 editions were printed. Commenting on the importance of the *Elements*, B L van der Waerden, a mathematician and historian of mathematics wrote: "Almost from the time of its writing and lasting almost to the present, the *Elements* has exerted a continuous and major influence on human affairs. It was the primary source of geometric reasoning, theorems, and methods at least until the advent of non- Euclidean geometry in the 19th century. It is sometimes said that, next to the Bible, the "Elements" may be the most translated, published, and studied of all the books produced in the Western world." Further, Thomas L. Heath, the author of *A History of Greek Mathematics* (Dover Publications, New York, 1981) wrote: "This wonderful book, with all its imperfections, which are indeed slight enough when account is taken of the date it appeared, is and will doubtless remain the greatest mathematical textbook of all time. ... Even in Greek times the most accomplished mathematicians occupied themselves with it: Heron, Pappus, Porphyry, Proclus and Simplicius wrote commentaries; Theon of Alexandria reedited it, altering the language here and there, mostly with a view to greater clearness and consistency..." (both van der Waerden and Heath are quoted in *Euclid* by J J . O'Connor and E. F. Robertson, www-groups.dcs.stand. ac.uk/~history/Printonly/Euclid.html)

Euclidean geometry is based on a number of theorems and which in turn can be derived from five postulates (axioms) and five common notions. Jan Gulberg presents these postulates and notions as follows:

The Five Postulates

1. Exactly one straight line can be drawn between any two points.
2. A straight line can be continued infinitely.
3. With any point as centre, a circle with any radius may be described.
4. All right angles are equal.
5. Through a given point outside a given straight line, there passes only one line parallel to the given line; that is, such a line does not intersect the given line.

The Five Common Notions

1. Things equal to the same thing are equal.
2. If equals are added to equals, the wholes are equal.
3. If equals are subtracted from equals, the remainders are equal.
4. Things which coincide with one another are equal.
5. The whole is greater than a part.

The notions are not specific geometrical properties but rather general assumptions, which allow mathematics to proceed as a deductive science.

All the theorems of Euclidean geometry are based on these postulates and notions. In the 19th century mathematicians were able to demonstrate that other forms of geometries different from Euclidian geometry could be developed. While these forms of geometry are different from Euclidean geometry, they are as consistent and valid as Euclidean geometry. These geometries are called non-Euclidean geometries. Two prominent forms of non-Euclidean geometries that were developed in the 19th century were Hyperbolic Geometry and Elliptic Geometry. The concept of hyperbolic geometry was first proposed by the Russian mathematician Nikola Ivanovich Lobachevsky (1793-1856) in 1829. It was independently

Nikola Ivanovich Labachevsky

developed by the Hungarian mathematician Janos Bolyai (1802-1860). The great German mathematician Karl Friedrich Gauss (1777-1855) had developed the concept of hyperbolic geometry even before Lobachevsky and Bolyai but he did not want to publish his results in his lifetime. Gauss's results were finally published 30 years after the works of Lobachevsky and Bolyai were published. The mathematicians who had earlier not paid much attention to the new form of geometry proposed by Lobachevsky and Bolyai started taking note of it after the publication of Gauss's results because of his eminence. Thus the publication of Gauss' results on hyperbolic geometry not only made the mathematicians appreciate the works of Lobachevsky and Bolyai but also opened the door to its further development. Hyperbolic geometry substituted the Euclidean parallel postulate by another postulate, which states: "Through a given point outside a given straight line pass more than one line not intersecting the given line." There are many theorems in hyperbolic geometry, which contradict the theorems of Euclidean geometry. For example, in Euclidean geometry the sum of angles of a plane triangle is always 180°, but it is not so in hyperbolic geometry. In hyperbolic geometry the sum of angles of a triangle is less than 180° and it would vary with the size of the triangle.

Janos Bolyai

Geog Friedrich Bernhard Riemann

The concept of the elliptic geometry was first proposed by the German mathematician Georg Friedrich Bernhard Riemann (1826-1866) in 1854 in a paper entitled "Uber die Hypothesen, welche der Geometrie zu Grunde liegen" (On the Hypotheses which Form the Foundation of Geometry). The elliptic geometry rejected the Euclidean parallel postulate but on a different ground than adopted by hyperbolic geometry. In elliptic geometry, strictly speaking, there are no parallel lines; any two straight lines in a plane, if extended far enough, would eventually meet. Thus in elliptic geometry all lines perpendicular to a straight line meet at a point. Like in hyperbolic geometry, the sum of the angles is not equal to 180°, but unlike hyperbolic geometry the sum of angles in elliptic geometry is greater than 180°. The elliptic geometry is also known as Riemann geometry.

The development of non-Euclidean geometries has in no way reduced the importance of Euclidean geometry. As Jan Gullberg says, "Euclidean geometry is still the basis of most practical applications of geometry – it has taken human beings to the Moon and beyond."

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(The article is a popular compilation of the important points on life and work of Euclid available in the existing literature. The idea is to inspire the younger generation to know more about Euclid and his work. The author has given the sources consulted for writing the article. However, the sources on the Internet are numerous and so they have not been individually listed. The author is grateful to all those authors whose works have contributed to writing this article.) ❑

This is the abridged version of article by Dr. S. Mahanti appeared in the September, 2006 issue of 'Dream 2047'

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Romping Around Ramanujan Number

Srinivasa Ramanujan is perhaps the most famous mathematician India has produced. He was an autodidact and has done research work in mathematics though he lacked formal training in basic mathematics. He was born on 22 Dec 1887 in Tamil nadu. He had his elementary education in Erode. It is very fascinating to learn that though Ramanujan's family had no mathematician or mathematics oriented person, he had an innate and natural ability towards mathematics. He had an excellent memory also. When his colleagues at school knew tables up to 20 by heart, he knew up to 100. Once his higher secondary school teacher had remarked that he deserved more marks than maximum marks in mathematics examination. He would complete his mathematics paper in half of the allotted time in exams. He was so focused on mathematics that he failed in most of other subjects and eventually had to leave college without a degree and pursue independent research in mathematics. He did so when he was living in extreme poverty. Rumanian was introduced to mathematics by two college students who were paying guests in his house ,he was then a lad of 10years. By thirteen he had completed advanced trigonometry by Looney and had many theorems to his credit. The numbers from 1 to 1000 were like his friends and he would say their properties at ease. He himself had said that the theorems flashed before his eyes while he was solving problems. In his later life he was awarded FRS by Royal society of London.

Srinivasa Ramanujan

Ramanujan worked in many areas of number theory. Infinite series was a pet subject to him. One of the most popular Ramanujan's work is Ramanujan's number 1729. Probably it is more famous due to an incident between Ramanujan and British mathematician G.H.Hardy. The well known story goes like this-

Once G.H.Hardy went to see Ramanujan who was ill at that time at Putney, London and Hardy had traveled in a cab with 1729 on its number plate. Hardy told Ramanujan "I had ridden in taxicab with number plate 1729 and the number seems a rather dull one" "No" Ramanujan replied instantly and said "it is a very interesting number. It is the smallest number expressible as sum of two cubes in two different ways"

$1729 = 123 + 13 \qquad = 93 \quad + 103$

G.H.Hardy

The last sentence has to be modified as sum of two positive cubes because now we know that 91 would be smallest number if we allow negative cubes So 1729 became famous as Ramanujan number.

Now the smallest number which can be expressed as sum of two cubes in 'n' distinct ways are known as 'taxicab' numbers in reference to this incident indirectly in reverence to Ramanujan

Taxicab number is the smallest number that can be expressed as sum of two positive algebraic cubes in' n' different ways. Only 6 taxicab numbers are known till now,

Ta(1) = 2

Ta(2) = 1729

Ta(3) = 87,539,319

Ta(4) = 6,963,472,309,248

Ta(5) = 48,988,659,276,962,496

Ta(6) = 24,153,319,581,254,312,065,344

Where Ta = taxicabnumber.

1729 has many properties apart from being a taxicab number. It is also a Harshada number. We need to know more about Harshada number here. It was discovered by a Maharastrian school teacher Kaprekar. In Sanskrit 'Harshada' means joy giving. Harshada number is an integer that is divisible by sum of its digits in a given base system

For 1729, $1+7+2+9=19$, $1729/19=91$

Another interesting property of 1729 is that when its digits are added to get digit sum and on multiplication of this by its reversed digits yields 1729

That means 1729-- $1+7+2+9=19$

$19X91=1729$

This was discovered by Masahiko Fujiwara. He also showed that 1729 was one of four positive integers 81,1458,1729,1(trivial case) which has same property.

1729 is also Carmichael number, to be accurate third Carmichael number. To be a Carmichael number, the number (n) should be positive and composite. It should not be divisible by any perfect square except 1 and for all its prime divisors (p) it

should satisfy p-1/n-1 that is p-1 should get divided by n 1.

The smallest Carmichael number is 561

561 = 3x11x17, 561-1/3-1 = 560/2:

Similarly 560/10 and 560/16

For 1729 1729 = 7x13x19

1728/6 and 1728/12 and 1728/18

By this 1729 also becomes a Sphenic number, because it can be expressed as product of three primes (1729 = 7x13x19).

1729 is also average of greatest number in each of known Brown numbers. Brown numbers are a pair integers say (m,n) which satisfy the condition n! + 1 = m2. Till date only three such pairs are known (5,4) ,(11,5), (71,7) and it can be shown that (52 + 112 + 712)/3 = 1729

Another incident surrounding 1729 is that once Richard Feynman was challenged by a man with an abacus on a trip to Brazil, to find the square root 1729.03 within a time limit. Since Feynman knew 1729 = = 123 + 13 he was able to compute by hand accurately the square root of 1729.03 using interpolation method and won the challenge.

Though Ramanujan is famous as the discoverer of this number, he has extensively worked out other unique numbers as well. He is known for his mock theta functions, which he had described in his letter to G.H.Hardy. This was an open problem till 2002 .Because his notebook was lost and it needed proper definition, which was given by Sauder Zwegers. He is also known for Landau-Ramanujan constant, Ramanujan-Peterson conjecture, Ramanujan -Soldner constant. He also studied tau function better known as Ramanujan tau function. Much of his research work was recorded in loose leaf book and he wrote only final results, as paper was too expensive for him. He preferred to work on his slate. Ramanujan has received high recognition in India after his death. His birthday is celebrated as 'state IT day' in his native state Tamilnadu. SASTRA Ramanujan prize has been instituted for young mathematicians in his honor. Many films have been made around his life like 'The man who knew infinity: a life of srinivasa ramanujan', a play 'A disappearing number' is also one. The novel 'Indian clerk' deals with events following Ramanujan's letter to Hardy. ❑

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चित्र पहेली-74 / Photo Quiz-74

Brain Teaser / जुगत लगाओं

- वर्ष 2013 की शुरुआत के बाद किस समय, किस दिन तथा किस वर्ष निम्न समय घटित होगा।

a) 2000 सेकेंण्ड b) 2000 मिनट
c) 2000 घंटे d) 2000 दिन
e) 2000 सप्ताह

- **At what time and what day of yers will it be After the start of the year 2013. :-**

a) 2000 Second b) 2000 Minutes
c) 2000 Hour d) 2000 Day
e) 2000 Week

- उत्तर प्राप्त करने की अंतिम तिथि: 30, नवम्बर, 2012
- ड्रॉ द्वारा चयनित विजेताओं को पुरस्कार स्वरूप विज्ञान प्रसार के प्रकाशन भेजे जाएँगे।
- अपने जवाब इस पते पर भेजें :

विपनेट चित्र पहेली - 74, विज्ञान प्रसार, ए-50, सेक्टर 62, नोएडा-201 309 (उत्तर प्रदेश)

- Last date of receiving correct entries: 30 November., 2012
- Send Quiz Ans. to desk :

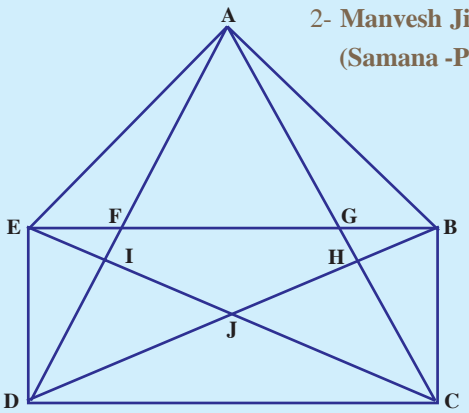
VIPNET Photo Quiz 74, VIGYAN PRASAR, A-50, Sec. 62, Noida-201 309 (U.P.)

Correct Answer of Photo Quiz 70

Ans.: 35 TRIANGLE

NAME OF THE WINNERS: -

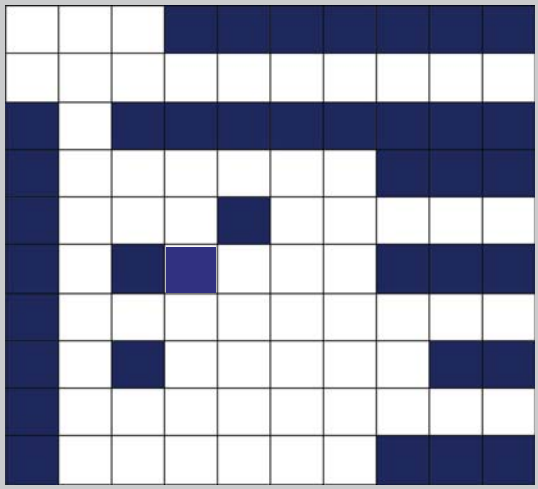
1- Grish (Hanuman Garh)
2- Manvesh Jindal (Samana -Punjab)



Mathematical Puzzle 28/ गणितीय पज़ल-28

- नीचे दिये गए खाली खाने में गणितीय गिनती को शब्दों में इस तरह भरिए, कि कोई खाली चौकोर खाना खाली न रहे।

- **Filling the blank square given below by using mathematical number in words in a way that no any blank square ramains found blank after filling the mathematical numbers in words form.**



R.K. Upadhyay
rkupadhyay@vigyanprasar.gov.in

- Last date of receiving correct entries: 30 Nov., 2012.
- Winners will get activity kit/ books as a prize.
- **Please send your entries to:-**

Mathematical Puzzle-28 , VIPNET News, Vigyan Prasar, A-50, Sector 62, Noida-201 309 (U.P.)

The puzzle has been Designed as part of National Mathematical Year-2012

Chemicals Terminology Puzzle- 25

Name of the winners:

1- Surajyamani Sarangi (Kandhamal)
2- Rajan Kumar (Madhubani)
3- Anurag Kumar (Meerut)
4- Chinmay A. Nawlakhe (M.S)

Club speak

जीव जन्तु संरक्षण सप्ताह

कल्पना चावला विज्ञान क्लब, पाली, राजस्थान द्वारा जनवरी-2012 में जीव

जन्तु संरक्षण सप्ताह का आयोजन किया गया। जिसके तहत गोष्ठी, चित्रकला, प्रश्नोत्तरी तथा व्याख्यान कार्यक्रम का आयोजन किया गया, जिसमे व्याख्याता, शिक्षक तथा गणमान्य व्यक्तियों ने जीव जन्तु के प्रति करुणा भाव रखने तथा जीवों से प्रेम करने का आव्हान किया। कार्यक्रम के दौरान छात्रों को 'राजस्थान में 'संकटग्रस्त वन्य जीवों' के बारे में तथा उनके विलुप्त होने के कारणों की जानकारी दी गयी। छात्रों को यह भी बताया गया कि हम इन संकटग्रस्त जीवों को कैसे संरक्षित कर सकते हैं। कार्यक्रम के अन्त में प्रतियोगिता का आयोजन किया गया तथा प्रथम, द्वितीय एवं तृतीय स्थान पाने वाले छात्रों को सम्मानित किया गया।

शुक्र पारगमनः 6 जून 2012

प्रगति विज्ञान संस्था, गाजियाबाद, द्वारा 6 जून, 2012 को शुक्र पारगमन को

देखने के लिए एक कार्यक्रम का आयोजन किया गया इस कार्यक्रम में लगभग 198 लोगों ने शुक्र पारगमन की घटना को सोलर फिल्टर के द्वारा देखा। कार्यक्रम के दौरान सभी लोगों में उत्साह भरा हुआ था और बहुत खुश थे। सभी लोगों की जुबान पर बस एक ही शब्द था कि 'वाह क्या नजारा है'! इस कार्यक्रम के दौरान लोगों को शुक्र पारगमन क्या है, कैसे होता है? तथा कितने अन्तराल पर होता है आदि के बारे में जानकारी दी गयी।

Computer Aided Learning Programme (CALP)

CRC Mirzapur VIPNET Science Club, Bhuj-Kutch, organized computer aided learning programme. In additions to this, also organised viewing of Transit

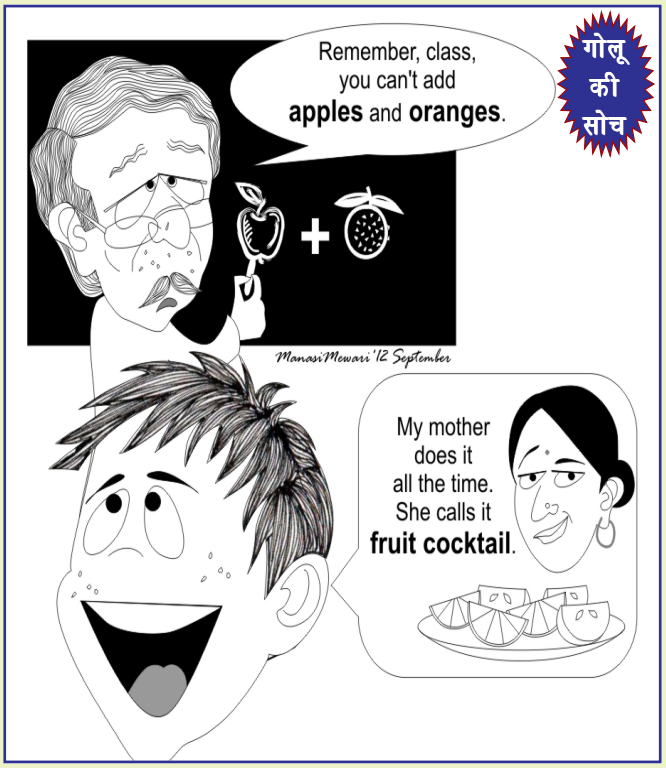
More than 1000 people watch TOV on 6 June at Indirabai Girl's High School BHUJ-KUCH

of Venus on 06 June, 2012. This programme aimed to provide general computer knowledge to the students. By CALP the students were learned/ know about different types of computer aided learning programme, viz what is CALP, types of CALP, role and importance of computer aided learning programme in future.

National Mathematical Year Celebration

Dr. C.V. Raman VIPNET Club, Jalgaon (MS.) celebrated National Mathematic Year programme on March 06, 2012.

About 55 students participated in the programme. During the programme a lecture on 'Mathematics in daily life' was delivered to inform the participant about what is mathematics, how it useful in our daily life & how it has been integral part of our day to day life. In addition to this a quiz programme was also organized for the students.



Published and Printed by Mrs. K. Dasgupta Misra on behalf of Vigyan Prasar, C-24, Qutab Institutional Area, New Delhi-110 016
Printed at Aravali Printers & Publishers Pvt. Ltd., Okhla Industrial Area, Ph-II, New Delhi-110 020

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Layout & design : *Ajeej Ahmed (Azad)*