"History of Science & Technology"

INDEX

Topic Name:

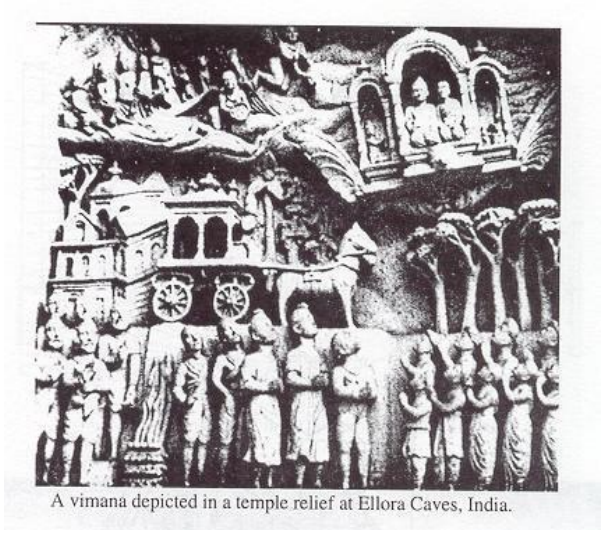
To prepare paper airplane

Objective:

To prepare paper airplane and demonstrate the functioning.

Activity:

The dream of flying is as old as mankind itself. However, the concept of the airplane has only been around for two centuries. Before that time, men and women tried to navigate the air by imitating the birds. They built wings to strap onto their arm or machines with flapping wings called ornithopters. On the surface, it seemed like a good plan. After all, there are plenty of birds in the air to show that the concept does work. Many stories from antiquity involve flight, such as the Greek legend of Icarus and Daedalus, and the Vimana in ancient Indian epics. The *Yujurveda* quite clearly tells of a flying machine, which was used by the *Asvins* (two heavenly twins). The *Vimana* is simply a synonym for flying machine. It occurs in the Yajurveda, the Ramayana, the Mahabharata, the Bhagavata Purana, as well as in classical Indian literature. At least 20 passages in the *Rig Veda* (1028 hymns to the gods) refer exclusively to the flying vehicle of the *Asvins*. This flying machine is represented as three-storied, triangular and three –wheeled. It could carry at least three passengers. According to tradition the machine was made of gold, silver and iron, and had two wings. With this flying machine the *Asvins* saved King Bhujyu who was in distress at sea.



A vimana depicted in a temple relief at Ellora Caves, India.

In the Yantra Sarvasva, sage Maharshi Bhardwaj describes vimana, or aerial aircrafts, as being of three classes:

1. Those that travel from place to place;
2. Those that travel from one country to another;
3. Those that travel between planets.

Before starting the activity watch this video:

Ancient Flying Vimana Recreated - Shivkar Bapuji Talpade [7]

Steps of Activity :

1. Take a sheet of paper and form a group of students.

2. Fold in Half: Fold a sheet of paper in half down the center and then open it up again so that it lays flat.

3. Fold the Cockpit: Fold the cockpit so that the flap corners meet at the center line.

4. Fold the Cockpit Down: Fold the cockpit down so that the point lines up with the center fold line.

5. Fold the 2nd Cockpit: Fold second cockpit by folding tow flaps down like the 3rd step.

6. Make the First Folds of the Wings: Fold another two flaps down to the center of the plane.

7. The Second Folds of the Wings: Flip the plane over and fold each side in to line up with the center fold of the plane.

8. Ready For Takeoff!: Flip the plane over one last time and open up the folds so that you have the 'body' of the plane to hold on to . Now ready for a test flight. To fly well, fly inside and throw as hard as you can.

9. Result: Measure the distance and time of flight for each group.

References:

[1]*https://en.wikipedia.org/wiki/Airplane*

[2]*http://www.wrightbrothers.org/History_Wing/History_of_the_Airplane/History_of_the_Airplane_Intro/History_of_the_Airplane_Intro.htm*

[3]*http://www.wikihow.com/Make-a-Paper-Airplane*

[4]*http://www.instructables.com/id/how-to-make-the-fastest-paper-airplane/*

[5]*http://www.foldnfly.com/index.html#/1-1-1-1-1-1-1-1-2*

[6]*http://www.bibliotecapleyades.net/vimanas/esp_vimanas_4.htm*

[7] *https://www.youtube.com/watch?v=UNt_Ye51WDk*

Outcome:

The students would be able to understand the basic principle of flying. The effect of force acting on it.

Topic Name:

Gyroscope

Objective:

To understand and demonstrate the working principle of gyroscope

Activity:

As mention in “The Vimanka Sastra”, the Rukma Vimana is self-propelled, its main energy source being a gyroscope mechanism within the main body of the Vimana itself. The gyroscope’s outer ring would be filled with mercury and have an electrical current run through it. Because the mercury is liquid, it can circulate around the body of the Vimana and would also act as a rotating electromagnet due to mercury’s conductive properties. This is theorized to cause anti-gravity-like effects as well as a “glowing light” [1]. In early times, people discovered the spinning top, a toy with a unique ability to balance upright while rotating rapidly. Ancient Greek, Chinese and Roman societies built tops for games and entertainment. The Maori in New Zealand have used humming tops, with specially-crafted holes, in mourning ceremonies. In 14th century England, some villages had a large top constructed for a warming-up exercise in cold weather. Tops were even used in place of dice, like the die in the contemporary fantasy game Dungeons & Dragons. It was not until the late 18th and early 19th centuries that scientists and sailors began attempting to use spinning tops as a scientific tool.

In the first several decades of the 20th century, other inventors attempted (unsuccessfully) to use gyroscopes as the basis for early black box navigational systems by creating a stable platform from which accurate acceleration measurements could be performed (in order to bypass the need for star sightings to calculate position). Similar principles were later employed in the development of inertial navigation systems for ballistic missiles.

Material requirements:

1. Wheel
2. Stand to mount the wheel
3. String

Procedure:

1. Prepare a group of students and provide material.
2. Guide the students to mount wheel first on stand. The wheel should be in position to rotate either clockwise or anticlockwise.
3. Use the provided the string to suspend the wheel after providing rotating motion.
4. Apply force to rotate the wheel.
5. Ask students to observe and note the difference in oscillation of wheel in both the case of rotation.

References:

[1] Shastry, Subbaraya; Josyer, G. R. (1973). *Vymaanika Shaastra* - Aeronautics by Maharshi Bharadwaaja. Mysore: Coronation Press.

[2] *http://solarsystem.nasa.gov/scitech/display.cfm?ST_ID=327*

[3] *https://en.wikipedia.org/wiki/Gyroscope#History*

[4] *https://www.youtube.com/watch?v=zbdrqpXb-fY*

[5] *https://www.youtube.com/watch?v=cquvA_IpEsA*

Outcome:

The students would be able to understand the basic principle of gyroscope. The effect of force acting on it.

Topic Name:

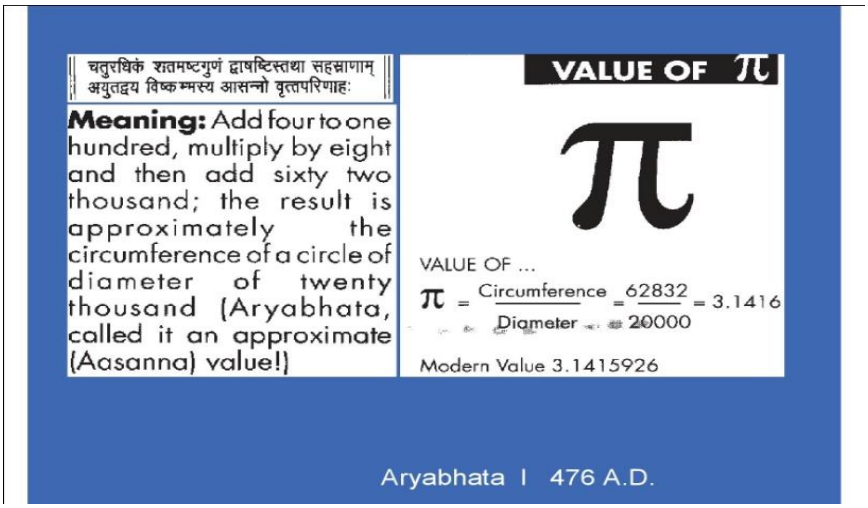
Finding the value of π (Pi)

Objective:

To understand the important of $\boldsymbol{\pi}$, with a brief history of its finding

Activity:

There is one Hidden truth of value of π.More than 4700 years ago, the famous Indian mathematician and astronomer Aryabhatta (476 A.D.) gave 62832/20000 = 31416/10000 = 3.1416 as an approximation of π(written in second part of the Aryabhatiyam).

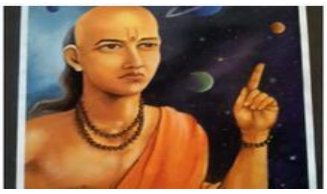


Aryabhata worked on the approximation for **pi** and have come to the conclusion that Pi is **irrational**.

In the second part of the Aryabhatiyam (gaṇitapāda 10), he writes:
|| caturadhikam śatamaṣṭaguṇam dvāṣaṣṭistathā sahasrāṇām
ayutadvayaviṣkambhasyāsanno vṛttapariṇāhaḥ.||

"Add four to 100, multiply by eight, and then add 62,000. By this rule the circumference of a circle with a diameter of 20,000 can be approached."

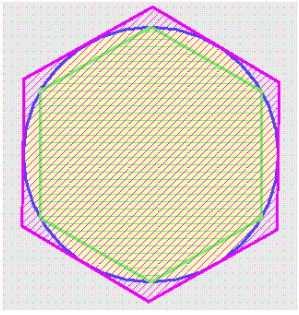
This implies that the ratio of the circumference to the diameter is ((4 + 100) × 8 + 62000)/20000 = 62832/20000 = **3.1416**, which is accurate to five significant figures.



The ancient Babylonians generally calculated the area of a circle by taking 3 times the square of its radius (π=3), but one Old Babylonian tablet (from ca. 1900-1680 BCE) indicates a value of π is 3.125.Ancient Egyptians calculated the area of a circle by the following formula (where d is the diameter of the circle):

$[(8d)/9]^2$ This way an approximate value of π is 3.1605.

But, The first theoretical calculation of a value of π was proved by Archimedes of Syracuse (287-212 BCE), one of the most brilliant mathematicians of the ancient world. Archimedes worked out that $223/71 < \pi < 22/7$. Archimedes's results rested upon approximating the area of a circle based on the area of a regular polygon inscribed within the circle and the area of a regular polygon within which the circle was circumscribed.



Beginning with a hexagon, he worked all the way up to a polygon with 96 sides!

Materials:

- Thread
- Unit Scale [Students have to define their own unit scale]
- Scissors
- Marker pen

Producer:

1. First of all take a long thread.
2. Cut thread into number of pieces with help of scissors (cutter).
3. Now draw the circle on the floor with help of marker pen and put thread pieces onto the circle marked line in a proper way.
4. Now you calculate the circumference of circle with help of formula of
5. Circumference = 2πr
6. Where D is longest chord of circle, r is radius of circle
7. Repeat this for different circle.

References:

[1] Website :*https://en.wikipedia.org/?title=Pi*

[2] Website :*http://www.math.com/tables/constants/pi.htm*

[3] Website :*http://www.projectmathematics.com/storypi.htm*

[4] Video: *https://www.youtube.com/watch?v=_IOcWcatWFY*

[5] Video: *https://www.youtube.com/watch?v=LLuAhTcZLpU*

Outcome:

We know that **π** is closely related to the circle, it is used in many formulas from the fields of geometry and trigonometry, particularly those concerning circles, spheres, or ellipses. And Formula from other branches of science & engineering include **π** in some of their important formulae, including sciences such as statistics, fractals, thermodynamics, mechanics, cosmology, number theory, and electromagnetism etc.

Topic Name:

Pythagoras theorem

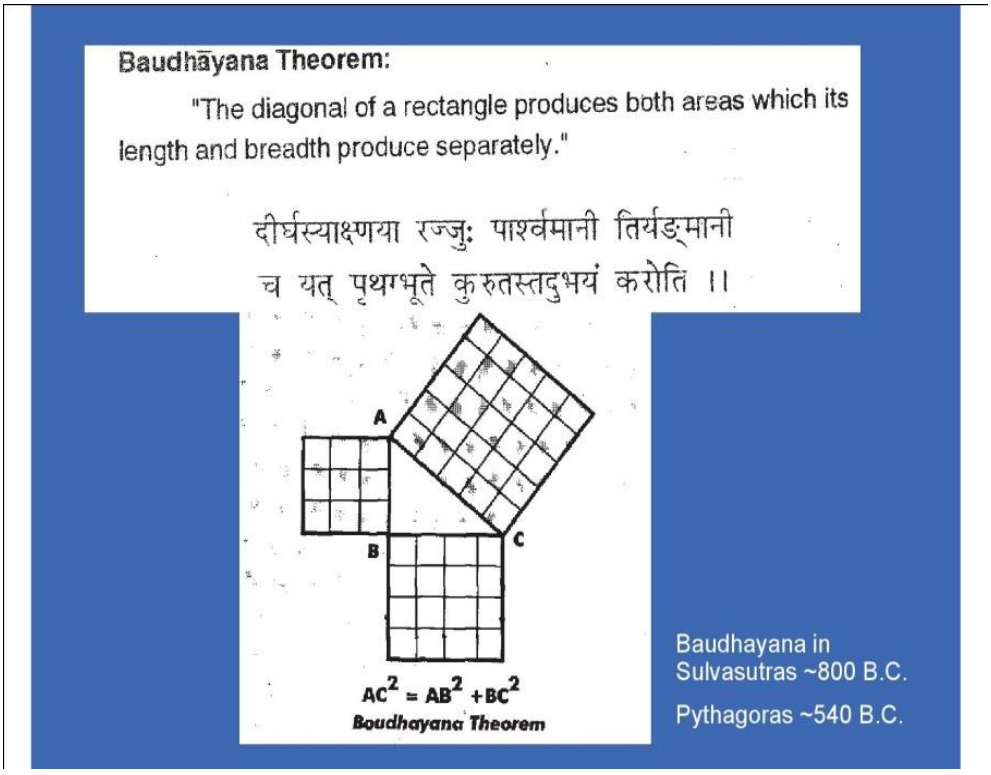
Objective:

Students will understand the importance of Pythagoras theorem in Engineering and Science.

Activity:

History of Pythagoras Theorem:

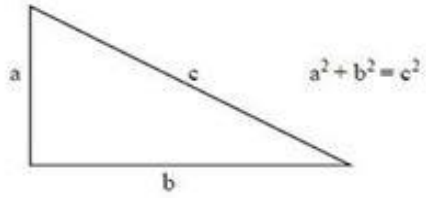
Indian Mathematician Baudhayana, had given a precise geometric expression of "Pythagorean theorem" mentioned in his book Shulbasutra, which is considered to be the first book on advanced mathematics.



It was Baudhāyana who discovered the Pythagoras theorem. Baudhāyana listed Pythagoras theorem in his book called Baudhāyana Śulbasûtra (800 BCE). Incidentally, Baudhāyana Śulbasûtra is also one of the oldest books on advanced Mathematics. The actual shloka (verse) in Baudhāyana Śulbasûtra that describes Pythagoras theorem is given below:

दीर्घचतुरश्रस्याक्ष्णया रज्जुः पार्श्वमानी तिर्यग् मानी च यत् पृथग् भूते
कुरुतस्तदुभयं करोति ॥

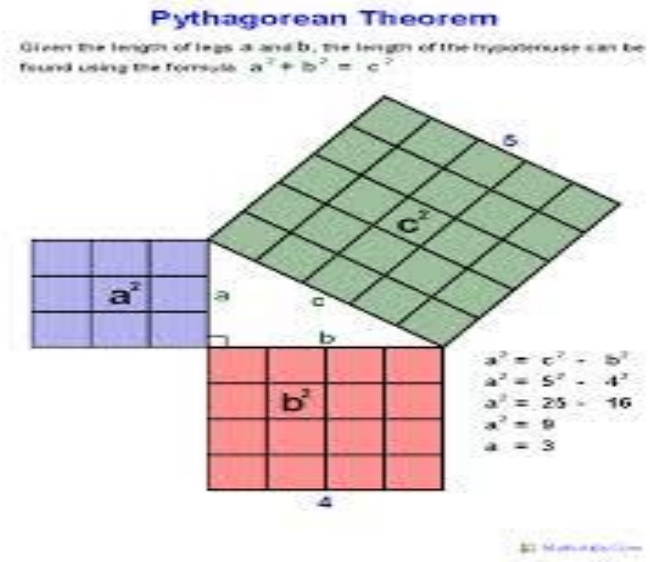
Interestingly, Baudhāyana used a rope as an example in the above shloka which can be translated as – **"A rope stretched along the length of the diagonal produces an area which the vertical and horizontal sides make together"**



Baudhāyana also provides a non-axiomatic demonstration using a rope measure of the reduced form of the Pythagorean theorem for an isosceles right triangle:

> *The cord which is stretched across a square produces an area double the size of the original square.*

Pythagoras was a Greek mathematician and a philosopher, but he was best known for his Pythagorean Theorem.



Materials:

- Paper sheet
- Unit Scale [Students have to define their own unit scale]

- Scissors
- Marker pen

Producer:

- First of all take a paper sheet.
- Cut into a right-angled triangle with help of scissors.
- Now measure the two sides, which makes 90° angle.
- Similarly, we will measure the remaining 3rd – side.
- Here, we can realize that sum of square of first two sides equal to the square of 3rd – side (AB2 + BC2 = AC2).

References:

[1] Website : *http://www.geom.uiuc.edu/~demo5337/Group3/hist.html*

[2]Website : *https://en.wikipedia.org/?title=Pythagorean_theorem*

[3]Website : *http://www-history.mcs.st-and.ac.uk/Biographies/Pythagoras.html*

[4]Video: *https://www.youtube.com/watch?v=PrjTkWGLk2Q*

[5] Video: *https://www.youtube.com/watch?v=FdMXjJunb1o*

Outcome:

After the complication of activity students are realize the use of Pythagoras theorem in various field, they can imagine the practical approach of mathematical formula.

Topic Name:

Newton’s motion laws

Objective:

Understand the Newton’s motions law with help of Bhagavad Gita’s chapter 4 (18th Sloka)

Activity:

You will be surprised to know that the Physics Laws you learn today has its roots in Ancient India. They were mentioned by Indian Rishis (scientists) in Vedas. You will definitely take pride in Indian History. Vaishesika sutras proposed 1800 years before Newton’s Three Laws of Motion. Actually Newton’s laws were explained by VAISHESHIKA SUTRA [1].

Vaishesika Sutras proposed 1800 years before Newton’s Three Laws of Motion

वेग: निमित्तविशेषात कर्मणो जायते |
Translation : Change of motion is due to impressed force.
(The law stated that an object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force.)

वेग: निमितापेक्षात कर्मणो जायते नियतदिक क्रियाप्रबन्धहेतु |
Translation : Change of motion is proportional to the impressed force and is in the direction of the force.

वेग: संयोगविशेषविरोधी |
Translation : Action and reaction are equal and opposite.

Materials:

- To jars (Plastic or glass)
- Flour of sand
- Iron filings or small lead pellets
- Meter scale

Producer:

- Fill one jar with flour or sand. Pack it tightly.
- Fill the other jar with iron filings or small lead pellets. Again, fill it tightly.

- Put lids on both of the jars. Lids should be on tight.
- Place both three-ring binders next to each other on a wooden or tile floor. Place each jar on its side and release both from the top of the "ramps" at exactly the same time.
- In the Table below, record how far each jar rolled. Do not measure the binder itself, just the distance from the end of the binder to where each jar actually stopped.
- Repeat Steps 3-4 for each of the surfaces listed on the Table. 7.
- Fill in the Table with your results for each race.
- After complete this activity tries to find activities related to newton's second and third law.

Table:

Sr. No.	Surface	How far did the empty jar travel?	How far did the filled jar travel?
1.			
2.			
3.			
4.			

References:

[1] *"The vaisesika sutras of Kanada"*, by Nandalal Sinha, PIBN 100701606 (1923)

Outcome:

- Students able to correlate the Bhagavad Dita's 18th Sloka in chapter 4 with Newton's motion law
- Also understand the Newton's law (2nd & 3rd) with help of activity design by them.

Topic Name:

Gravitation Force

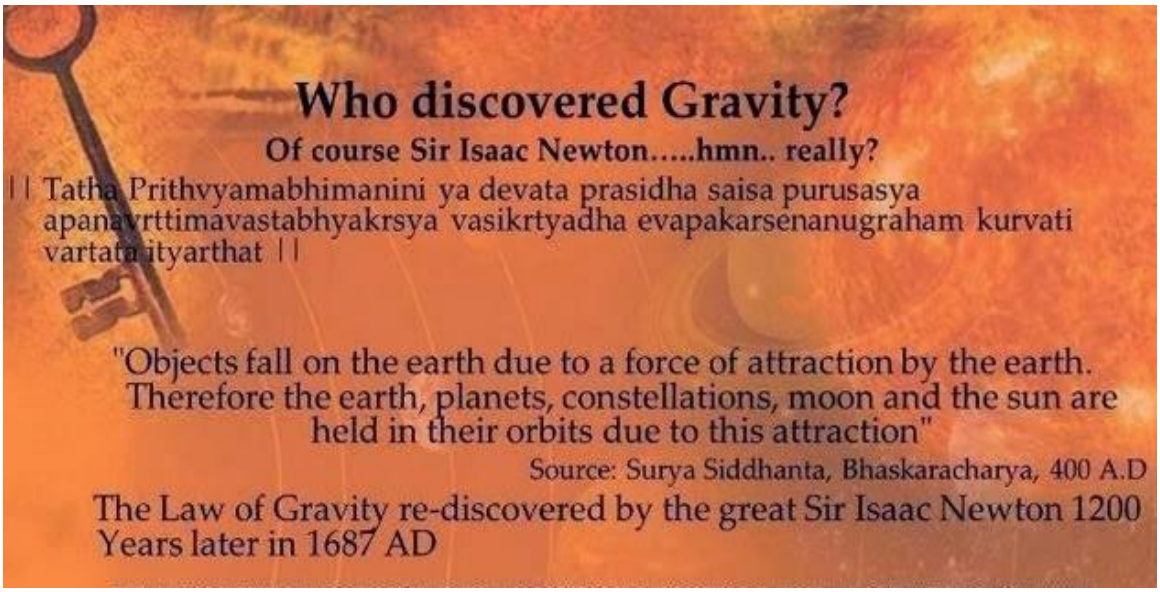
Objective:

To know the how all object fall down to the earth with help of universal law.

Activity:

"Objects fall on the earth due to a force of attraction by the earth. Therefore, the earth, planets, constellations, moon and sun are held in orbit due to this attraction."

You guessed which law of above is? Obviously you give answer to that of Newton's law of Gravity. This law is not given by the European scientist Newton first time before him the Bhaskaracharya states these lines [1]. Approximately 1200 years later (1687 AD), Sir Isaac Newton rediscovered this law of Gravity.



Materials:

- Piece of paper
- Stone
- Meter scale

Producer :

1. Take piece of paper and a stone.
2. Now take a piece of paper in one hand and a stone on another hand.
3. Also you think which is heavier and which fall faster?
4. First roll the piece of paper up into a tight ball.
5. In one of height drop the stone and paper approximately the same time.
6. Note you do this activity where there is no air.
7. Note that which landed on the ground first? And why?
8. You people repeat this activity with any similar containers

References:

[1] E. Burgess, Surya-Siddhanta, A text book Hindu Astronomy, American Oriental Society, 1856-60

Outcome:

- Students understand the Universal law.
- After complete this activity they are able to design more activities for gravitational law.
- Students will conclude the activity (one or two group of students can present what they have learnt during activity)

Topic Name:

Earth Magnetic Field

Objective:

To know the direction of N- pole and S- pole and magnetic field lines.

Activity:

History:

Ancient history of electromagnetic theory was first observed by “Thales of Miletus” in 6th century BC (624BC - 546BC) [1], while observing the rubbing fur on amber. He observed that there was attraction between two; which is known as static electricity [2].

Apparatus:

- Iron filings
- Piece of paper
- Bar magnet

Observation:

- Place a stiff piece of paper over a bar magnet that is resting on a flat surface.
- Sprinkle some iron filings on the piece of paper.
- Students observe what happens.
- The interesting pattern that results is due to the magnetic field surrounding the magnet.
- Now draw the magnetic field pattern, it is important to include arrow to show the direction of field.
- The arrows always point away from the magnet’s North Pole and towards the magnet’s South Pole.

Theory:

However, with electric charges you can have just a positive charge, like a proton, or just a negative charge, like an electron. You can't do that with magnets, north will always be attached to a south and south will always attach to a north. Even if you break a permanent magnet in half both of the pieces will again have a north and a south. You can keep splitting the magnet, but it will always be a magnet with a north and a south. With electrical charges, like charges repel and opposite charges attract. It is the same with the magnetic poles. The north end of one magnet will be attracted to the south end of another.

References:

[1] *https://en.wikipedia.org/wiki/History_of_geomagnetism#Early_ideas_on_magnetism*

[2] *https://en.wikipedia.org/wiki/Timeline_of_electromagnetic_theory*

Outcome:

After completing this activity students able find the direction of magnetic field.

Topic Name:

Magnetic Levitation

Objective:

To understand the magnetic levitation phenomena

Activity:

History:

Magnetic levitation has been around for years [1] According to ancient Indian mythology Gods had a very special ability to fly in air. Behind this only levitation concept is there. Yogis, Brahmans & hermits could rise above the ground up to 90 cm and float in air [2] Different religious have various examples of levitation amongst their religion followers & it was generally used for showing the power of their religion [3].

The main advantage of magnetic levitation is for transportation. Magnetically levitated vehicles are called maglev vehicles. In this vehicle absence of contact between moving system and stationary system. Can you imagine a train that actually floats in air 4 to 6 inches in the air and travel up to 300 mph. With such an arrangement great speeds could be achieved with very low energy consumption.

Apparatus:

- Dowel rod
- Ceramic disk magnets
- Wooden block

Procedure:

- Place the end of the dowel rod into the hole in the block of wood to create a stand with the dowel mounted vertically.

- Place two disc magnets on the dowel rod (with the rod through the holes in the middle of the magnets). Do the magnets stick together, or does the top one "levitate" above the bottom one?
- What can you say about which poles of your magnets are towards each other? If your magnets are stuck together, slide the top one off, flip it over, and put it back on. It should now "levitate" above the other magnet.
- Predict what will happen if you press the top magnet down onto the bottom magnet, and then quickly release it. Then do it and describe what happens.
- Closely observe how far apart the two magnets are.
- Like this you will more magnetic disk and see what happen?

Theory:

The poles on the disk magnets are on the flat sides. Image one of the disk magnets is a coin (with a hole in the middle!). Heads is North, tails is South (or vice versa - but the point is that the flat sides are the poles). Two like poles are facing each other, so the magnets repel each other. The magnetic force between the two magnets pushes the top magnet upward, preventing it from sliding down on top of the bottom magnet. The force of gravity pulls down on the top magnet, preventing it from flying up off the top of the post. So two forces at play are gravity (pulling down) and magnetism (pushing up). The two forces are at equilibrium (they "balance out" each other), causing the top magnet to levitate a few centimeters above the bottom magnet

References:

[1] *http://www.faculty.rsu.edu/users/c/clayton/www/presson/paper.htm*

[2] *http://english.pravda.ru/society/anomal/09-11-2005/9197-levitation-0/*

[3] *https://en.wikipedia.org/wiki/Levitation_%28paranormal%29*

Outcome:

After completing this activity students will able to identify the difference between repulsion & attraction.

Topic Name:

Archimedes Principle

Objective:

The basic understanding of floating or sinking of an object in water must be inculcated within the students, to bridge the gap between laws of physics and its application with real time engineering.

Activity:

The history of Archimedes principle reveals a sheer worry of a king who thought he is tricked, for having an impure crown of gold mixed with silver. This worry, led to the invention of a great idea, on which many huge objects like ships, submarine, hot air balloons are operating. As the king approached his friend Archimedes, known to be the son of an astrologer, he started to work on this idea. One fine day, in deep thought, while bathing he noticed that when he climbed in to a soaking bath the water level went up. This led him to the idea that "Archimedes' states that a body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid." He went naked shouting "Eureka Eureka" to the king when he found this. Hence, without destroying the crown, just by measuring the weight of crown and water it had displaced, it was found that the crown was adulterated. This led to a new start of forensic application too.

Today all the huge transportation vehicles like Ship, submarine, hot air balloons work on this principle of buoyancy.

Principle : *"an immersed body is buoyed up by a force that is equal to the weight of the fluid that it displaces"*

1. Take a large bowl and inside it take a small bowl.
2. Fill in the small bowl with water to some level.
3. Float the paper boat in it.
4. Now pour some salt in paper boat, it will sink a bit.
5. After that put a marble in paper boat, it will sink completely.

Reasoning:

- If the weight of the body is lesser than the force of buoyancy the body floats. Hence, paper boat floats.
- If the weight of the body is equal to force of buoyancy the body submerges, hence the paper boat with salt submerges.
- If the weight of the body is greater than the force of buoyancy the body sinks. Hence the boat with marble sinks.

References:

[1] Website : *www.wikipedia.com/search*

[2] Website : *www.wikihow.com*

[3] Website: *www.youtube .com*

Outcome:

Based on above activities, the following outcomes are expected:

- The basics of buoyancy and its application in real world are understood.
- As activity is done on practical basis, a deep insight on practical knowledge is gained.
- An application in real time is expected, in which Archimedes Principle can be applied.

Topic Name:

Cryptography

Objective:

Understanding the mechanism of encrypting and decrypting, to produce strong ciphers, that can have use in various fields of engineering.

Activity:

Throughout the history of Indian civilization, cryptography and the hiding of secrets advanced rapidly with the growth of their civilization. Many Indian rulers used cryptography to encode messages and directives to the vast network of spies they operated over the Indian subcontinent, as well as to covertly transmit and protect basic operational and financial information from subterfuge. Indian ciphers did not normally consist of direct character substitutions, but rather phonetic changes that allowed secret messages to be communicated through sign language and specialized spoken languages. Cryptography is the mechanism of encrypting data, to protect it from being read or edited by some external party. Cryptography today has expanded its wings in every part of technology right from cellular mobile communication, OTP, satellite communication up to military uses in wars. Cryptography plays a very important part in the designing of these applications. But, its birth had long been done in Indian history of Mahabharata. The two chakras – Chakravyuha and Padmavyuha whose appearance is like a blooming lotus, is actually, a multi-tire defensive information. Also, in World War II, cryptography had a great deal of input in providing secretive information safely. Charles Babbage's Crimean War was one of the earliest inventions in this field. Thus, cryptography has always been an important factor in understanding traditional as well as modern encryption and decryption schemes.

कटपयादि संख्या - kaTapayAdi for Melakarta Ragam Names & Numbers									
1	2	3	4	5	6	7	8	9	0
क	ख	ग	घ	ङ	च	छ	ज	झ	ञ
ट	ठ	ड	ढ	ण	त	थ	द	ध	न
प	फ	ब	भ	म					
य	र	ल	व	श	ष	स	ह		
ka	kha	ga	gha	nga	cha	Cha	ja	Jha	nya
Ta	Tha	Da	Dha	Na	ta	tha	da	dha	na
pa	pha	ba	bha	ma					
ya	ra	la	va	sha	Sha	sa	ha		

Principle: *"Encrypting a plain text by adding some thumb rule on it and transferring it to a cipher text. Decrypting the same text by reversely applying the rule, to obtain the plain text back."*

1. Take 3 students in a group.
2. Two will communicate through encryption process, by deciding upon a code.
3. Let the code be: Adding 3 to every letter. e.g. HI becomes KL, as 3 is added to H and 3 is also added to I.
4. The 3rd person has to try to decrypt or guess the increments for 2 minutes and then it will be handed over to the receiver.
5. Here if the 3rd person is able to successfully decrypt the code, it is a weak cipher.

But, if it's tough to decrypt it is a strong cipher.

References:

[1] Website : *www.wikipedia.com/search*

[2] Website : *www.wikihow.com*

[3] Website: *www.youtube .com*

[4] *http://www.conservapedia.com/Cryptography*

Outcome:

Based on above activities, the following outcomes are expected:

- The basic understanding of cipher will be embedded.
- Flaws of a weak cipher and that of a strong cipher will be understood.

Topic Name:

Town planning

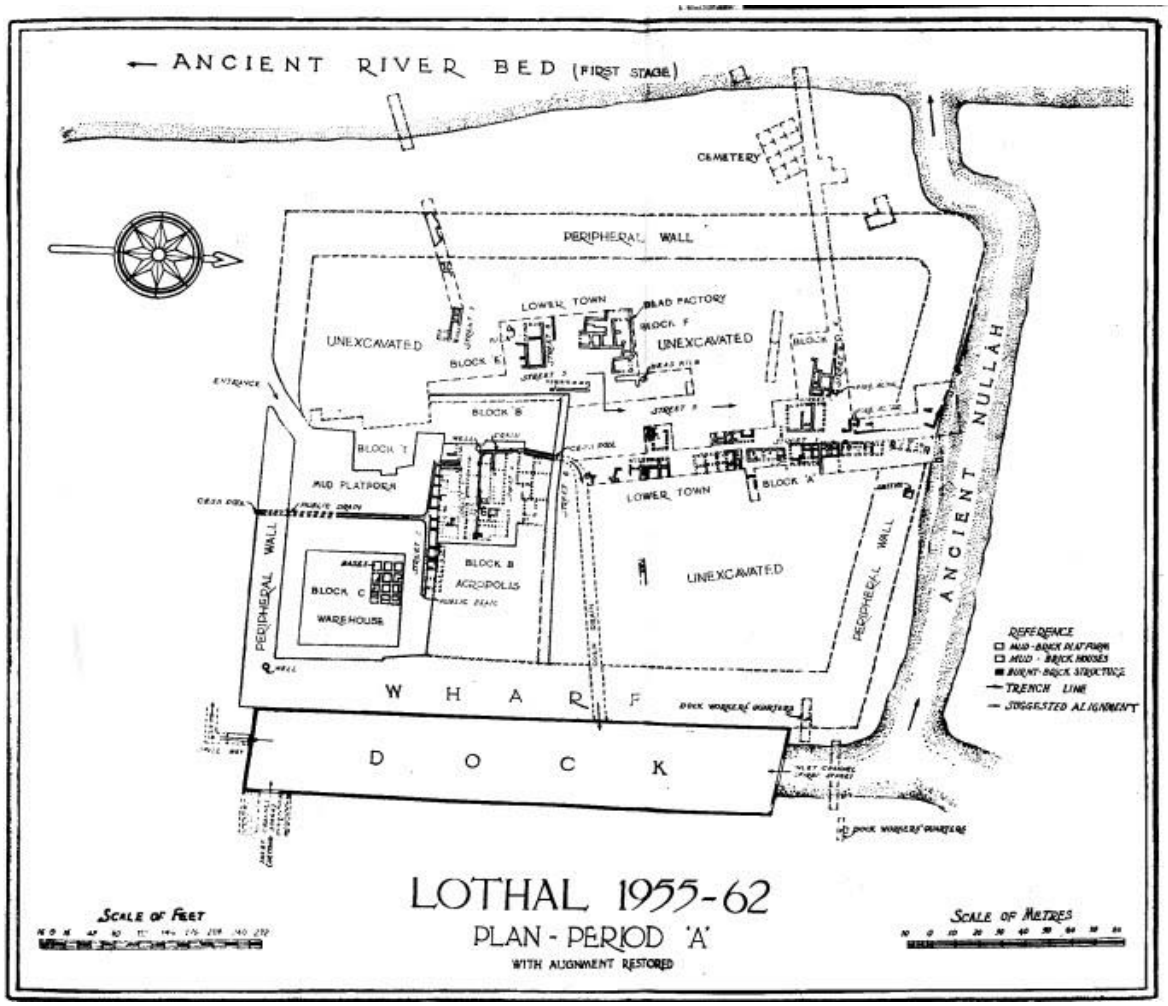
Objective:

- To contribute to a balanced town by ensuring that new and existing facilities are complimentary and well connected.
- To provide sustainable buildings that in environmental, social and economic terms can continue to flourish
- To offer attractive transport alternatives for people living, working and visiting the area and minimize car parking provision on site

Activity:

Lothal is one of the most prominent cities of the ancient Indus valley civilization. Located in the modern state of Gujarat and dating from 2400 BCE, it is one of India's most important archaeological site that dates from that era.

The first thing that strikes us with regard to Harappan culture is the town planning and urbanization. Mohenjo-Daro, Harappa, Lothal or Sutkagendor were built on similar plan. To the west of each a citadel built on a high platform suggest division in society or some upper class existence. It was defended by wall and on it were constructed the public buildings. Below this citadel was the town proper. Everywhere, the main streets ran from north to south and other streets ran at right angles to the main streets. Houses, residential or others stood on both sides of the streets. Both at Harappa and Mohenjo-Daro, houses were built of kiln-burnt bricks. At Lothal and Kalibangan, residential houses were made of sun-dried bricks. An average house had, besides kitchen and bath, four to six living rooms. Large houses with thirty rooms and staircases suggest that there were large two or three storied buildings. Most of the houses had wells within them and a drainage system carried the waste water to the main underground drain of the street. The city was surrounded by a wall to protect it from invaders and to mark the city limits. Areas outside city limits were left open as farmland. At the end of each main road was a large gateway with watchtowers.



Activity:

Things needed – A1 size sheet, pencil, eraser & ruler per group

1. Define the components like school, residential area, industry zone, park etc to be mapped on paper and mention their base area with dimensions.
2. Include 1 component with greater height (like 100 feet structure) whose base area students will decide.
3. Brief the students with basic DOs of town planning
4. Students will arrange the defined blocks on paper within given time

References:

[1] Hindu Net : *http://www.hindunet.org/hindu_history/sarasvati/html/settlement_plans_and_architectur.htm*

[2] Wikipedia : *https://en.wikipedia.org/wiki/Lothal*

Outcome:

- Students will come to know what type of town planning will lead to development and satisfy the needs of diversity.
- Modern methods for master plan can be formed.
- Easy grasping and understanding of knowledge.
- Students are cultivated habit of promoting our culture at international level and enchant our mantras / principles of planning

Topic Name:

Finding North using Astrological Knowledge

Objective:

- To introduce the basics of Astrological Knowledge.
- To understand the Move and Rotation of Astrological Object in sky like Sun, Earth, Stars

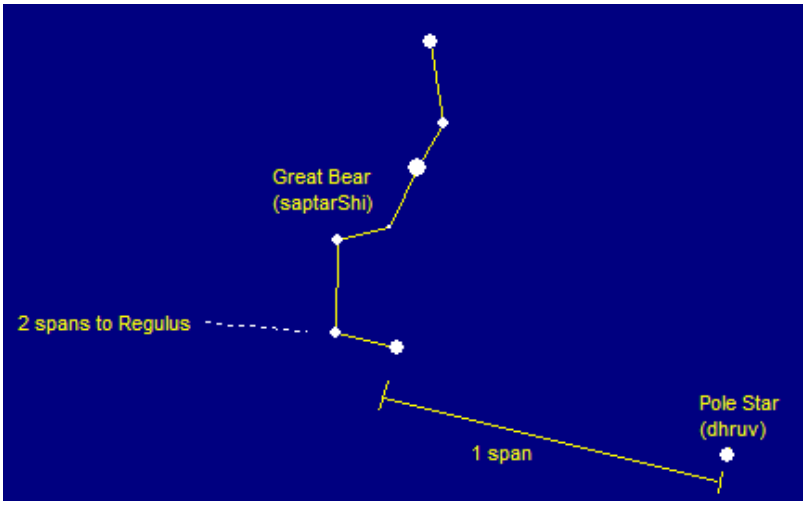
Activity:

Since thousands years stars and astrological objects are used to find direction. Especially We Indians are well known for our astrological knowledge.

In past Indian people used stars to identify their perfect direction of traveling on earth and sea. There are so many references found where Indians were traveling to Andaman island which required in-depth knowledge of direction because Andaman island is a group of very small islands far from Indian coast. In sea travel with this much precision is almost impossible without compass or other modern devices.

The top two stars of Saptarshi are well known as a pointer to the Pole star (Dhruv).[1]

Our activity will give you basic idea of finding direction towards north in night as it is difficult in comparison with day.



Step-1: Find Great Bear (Saptarshi) as shown in figure. It is easy to find due to its large size and distinct shape

Step-2: Find two stars that form the outer edge of the Great Bear (Saptarshi) as shown in figure.

Step-3: Draw an imaginary line straight through the two stars of the bear edge about 1 span (the outstretched measure from the thumb tip to little finger)

Step-4: This Pole(Dhruv) Star locate the North direction.[1]

References:

[1] *http://www.cse.iitk.ac.in/users/amit/story/10_cassini.html*

Outcome:

At the end of this activity, students should be able to:

- Find North direction in night.
- Understand basic astrological concept.