

USE OF GEOMETRY

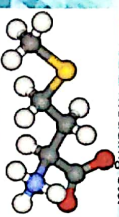
IN DAY TO DAY LIFE

MATHS PROJECT

MATHS IN MEDICINE

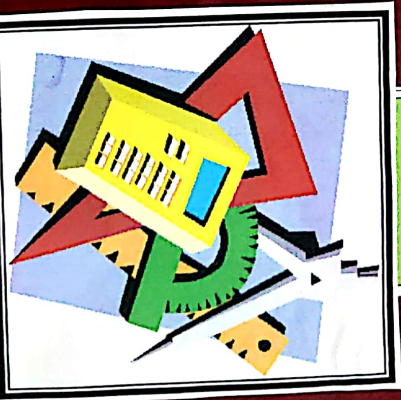
❖ Reconstruction of the shape of a tumor from CAT ('computerized axial tomography') scans and other medical measurements. A lot of Geometry is used in these.

❖ Protein modeling etc.

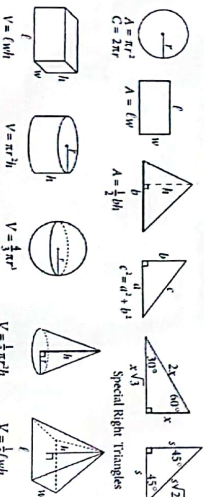


IX D

GROUP 4



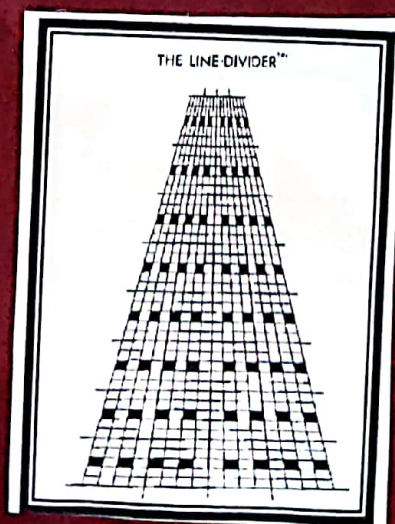
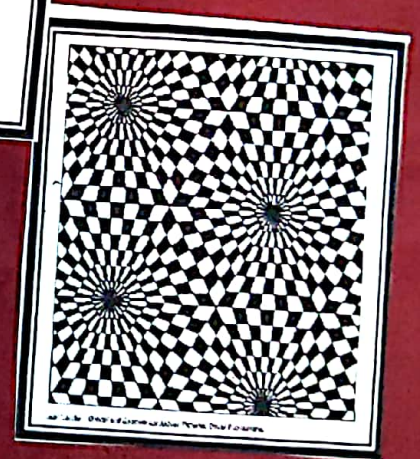
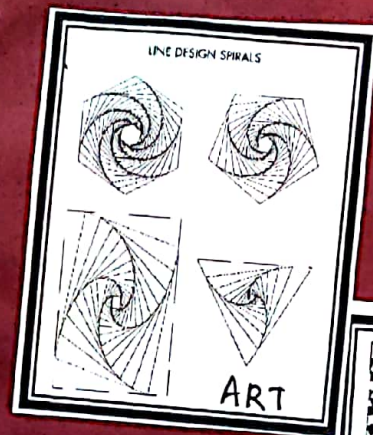
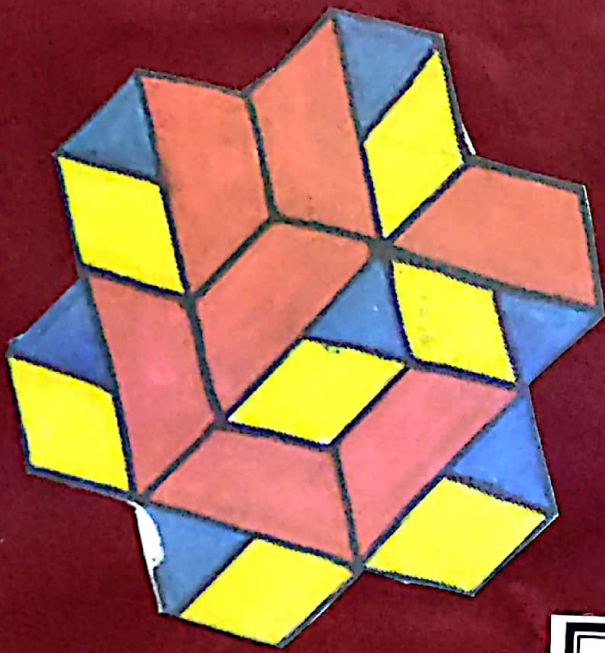
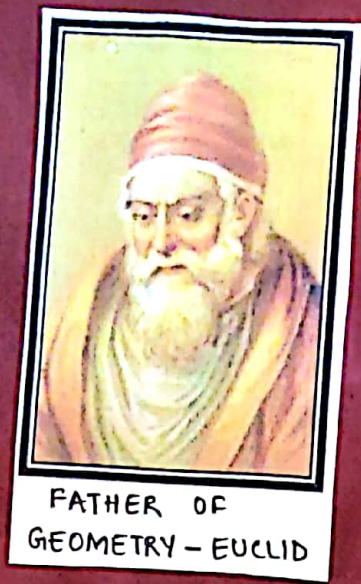
Reference Information



The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is 2π .

The sum of the measures in degrees of the angles of a triangle is 180.



INTRODUCTION

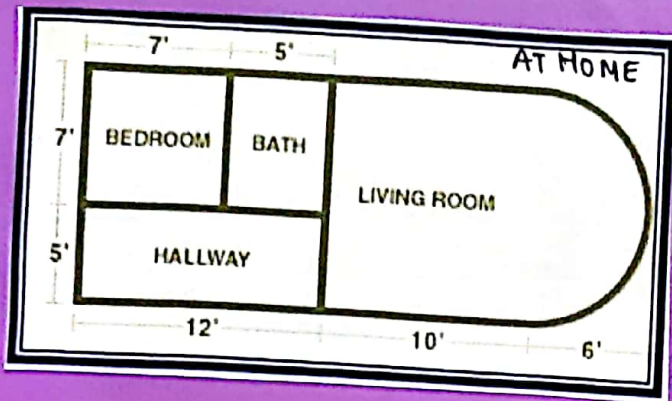
Geometry is most widely used application based mathematical concept used in our daily life. Geometry was evolved in 300 BC by Euclid known as the father of Geometry, a Greek mathematician. It is considered as one of the oldest concept and is concerned with shapes and sizes of the relative figures and with properties of space.

Geometry briefly is used in various daily life applications such as surveying, astronomy, navigation and building. Some of such applications of geometry in daily life in different fields are described below:-

ART

Mathematics and art are related in a variety of ways. For instance, the theory of perspective (a graphical representation of on a flat surface of an image as seen by eyes) shows that there is more to geometry than just the metric properties of figures and this perspective is the basis of origin of projective geometry. Figures of shapes a basic understanding of 2D & 3D, knowledge about spatial concepts, and contribution of estimation, patterns & measurements. From the before said, it is evident that there is a close relationship between art and geometry. The formation of shape is a result of the use of the use of geometrical forms like circle, triangle, square, mandala, or octagon. Moreover, the contents of paintings or sculptures are largely affected by the choice and shape of forms. Not to forget that.

AT HOME RELATED SUMS



SUM 1 : While constructing a house , the dimensions for each room :-

Bedroom $\rightarrow 7' \times 7'$ ($l \times b$)

Hallway $\rightarrow 5' \times 12'$ ($l \times b$)

Living room $\rightarrow 10' \times 12'$ ($l \times b$)

$\therefore$ Find the area of the house

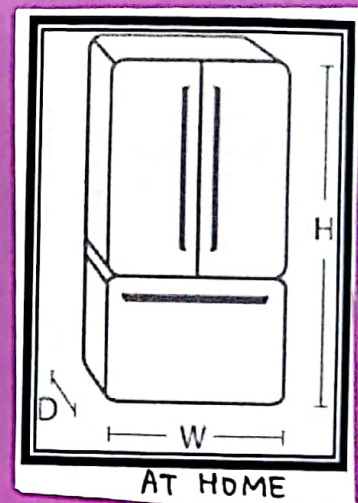
Ans- Area of bedroom = 49 sq. feet

Area of hallway = 60 sq. feet

Area of living room = 120 sq. feet

SUM 2 : While fitting a refrigerator in the house, the dimensions need to be measured and the space must be left accordingly :-

Area = length $\times$ width $\times$ height



Computer graphics is based on geometry - how images are transformed when viewed in various ways.

Robotics. Robotic vision, planning how to grasp a shape with a robot arm, or how to move a large shape without collision.

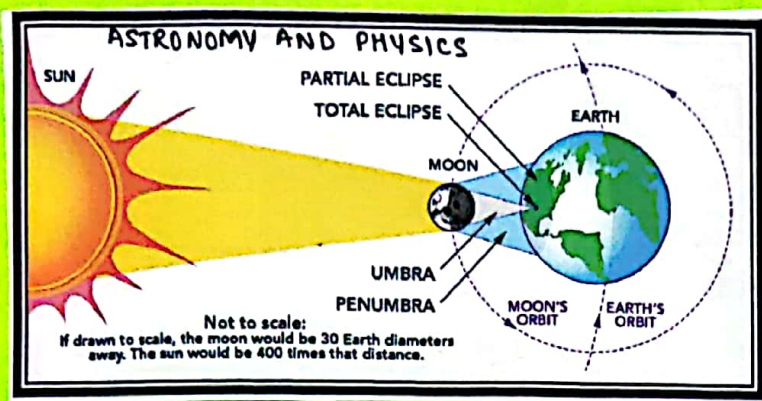
TECHNOLOGY

1 AT HOME

Geometry does not leave even a single chance to play a significant role in homes. TV, windows, doors, beds, chairs, tables also have different geometrical shapes. Bedsheets also have many geometric patterns on it. At home based applications such as finding the square footage at the home for placing a refrigerator or locating a space to fit in an air conditioner requires calculations of the space required and this is done by using area and volume concept. While whitewashing we need to make an estimate how much paint is required for the walls and roof and without geometrical calculations it would be nearly impossible for us to calculate the amount of paint required.

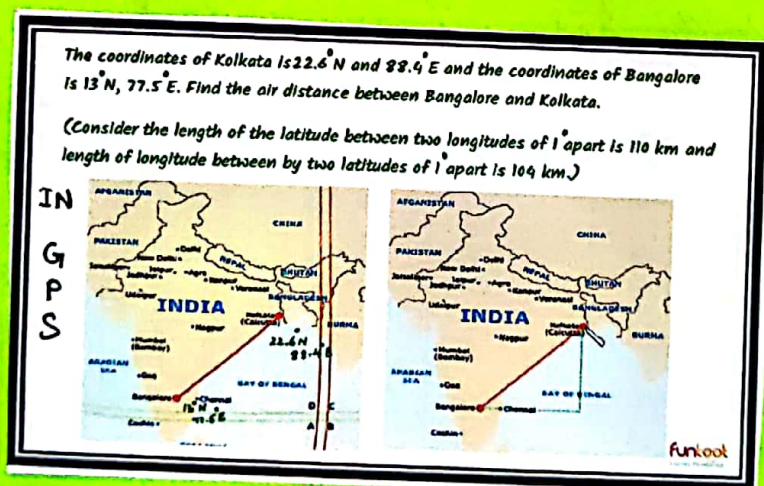
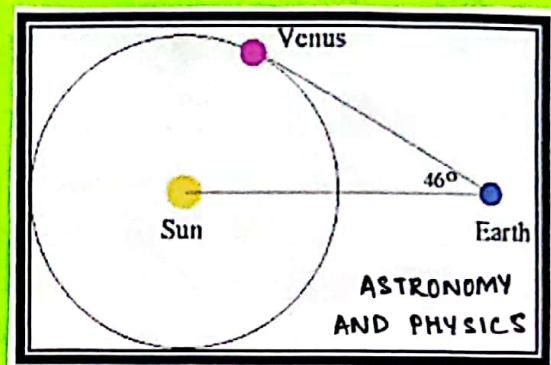
TECHNOLOGY

The concept of geometry is also applied in the fields of robotics, computer, and video games. For Example, the cars that we ride in are designed with the help of geometry. Geometry is used to improve the aerodynamics effects stability of the car at high speeds, safety, and wind noise that filters into the cabin. Geometry also is involved in engine designs. For example some engines are angled, like a straight 8. Geometry is present in transmissions too. The diameter and ratio of the gears must be correct to match the engine capabilities. The tires of the car also involve geometry. The treads form a continuous pattern that repeats over and over. In suspension geometry plays an important role in the cars handling characteristics. Geometry concepts are also applied in CAD where it helps the software to render visual images on the screen.



SUM:

The angle between Sun and Venus with reference to Earth is 46° .



415

ASTRONOMY & PHYSICS

The field of astronomy, especially as it relates to mapping the positions of stars and planets on the celestial sphere and describing the relationship between movement of celestial bodies have served as an important source of geometric problems throughout history. From simple angle measurements to the complex general theory of relativity, geometry can aid astronomers in the discovery, observation and exploration of other celestial bodies and hopefully grow our understanding of the universe as a whole. Other use of geometry includes measuring the speed and velocity of planets orbiting other stars.

EXAMPLE: If we form a triangle and we know one of the sides, the angle the telescope is looking at, then we can find the other side.

Modern geometry has many ties to physics as is exemplified by the links between pseudo-Riemannian geometry and general relativity. One of the youngest physical theories, string theory, is also very geometric in flavour. Differential geometry uses techniques of calculus and linear algebra to study problems in geometry.

GEOGRAPHICAL information SYSTEM

Geometry plays a significant role in global positioning system which require three co-ordinates to calculate location. A satellite equipped with a GPS system uses a form of geometry not unlike that used to calculate a right triangle. It involves the position of the satellite in the sky, the location of the GPS position on Earth - identified by longitude and latitude and the distance from that location to the place on Earth that equates to the satellite's position in the sky.

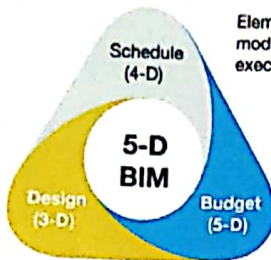
INDUSTRIAL UNIT

5-D functionality can integrate design, cost, and schedule in a 3-D output.

Building information modeling (BIM) is a digital representation of the physical and functional characteristics of a project, forming a reliable basis for decisions during the project's life cycle.

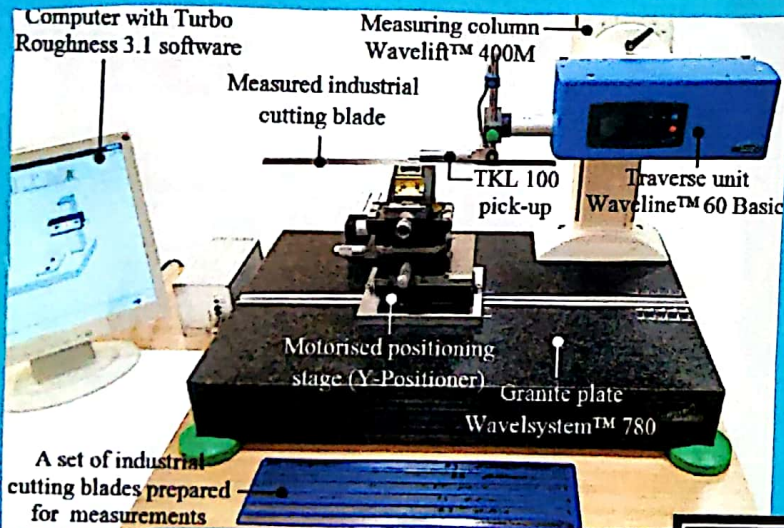
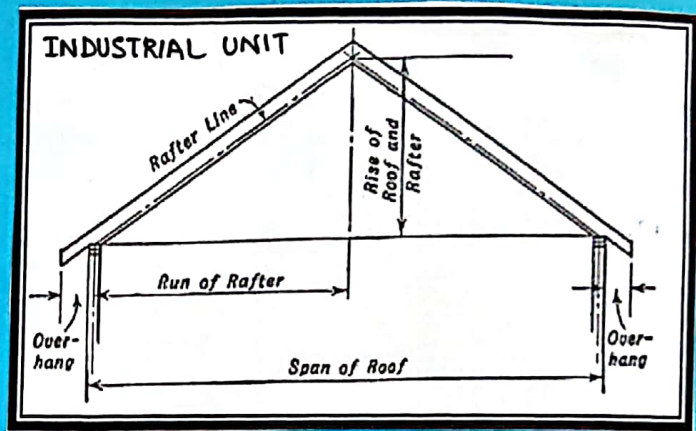
Information that can be embedded in 3-D model:

- Geometry
- Spatial data (from geographic information systems/lidar)
- Specifications
- Aesthetics (eg, color)
- Thermal properties
- Acoustic properties



Elements of a 3-D model are linked to the execution schedule

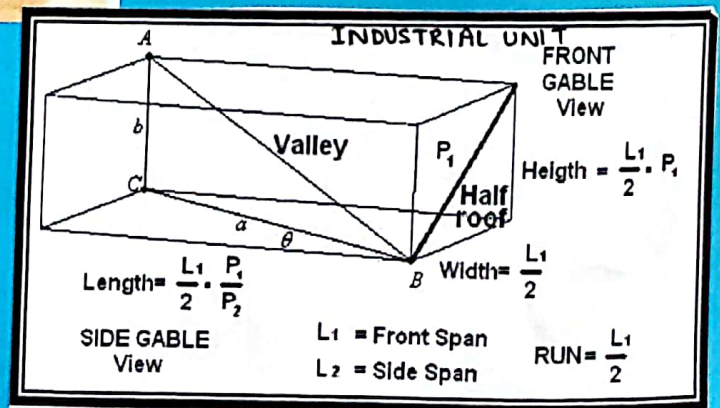
Elements of the 3-D model are used to develop budget and linked to cost heads



$$\text{length: } \frac{L_1}{2} \cdot \frac{P_1}{P_2}$$

$$\text{Height: } \frac{L_1}{2} \cdot P_1$$

$$\text{Width: } \frac{L_1}{2}$$



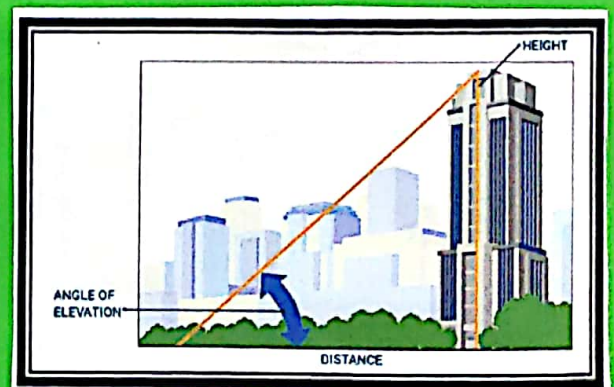
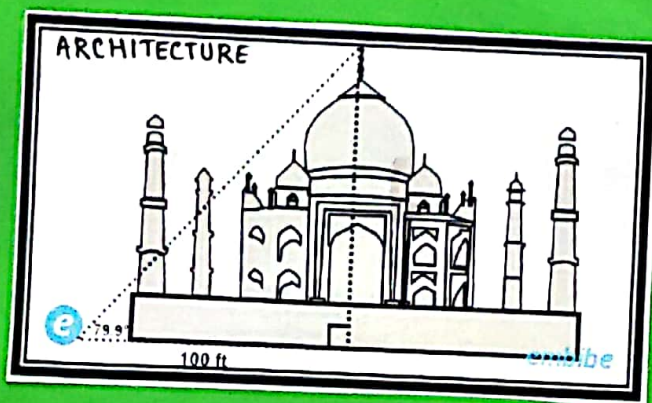
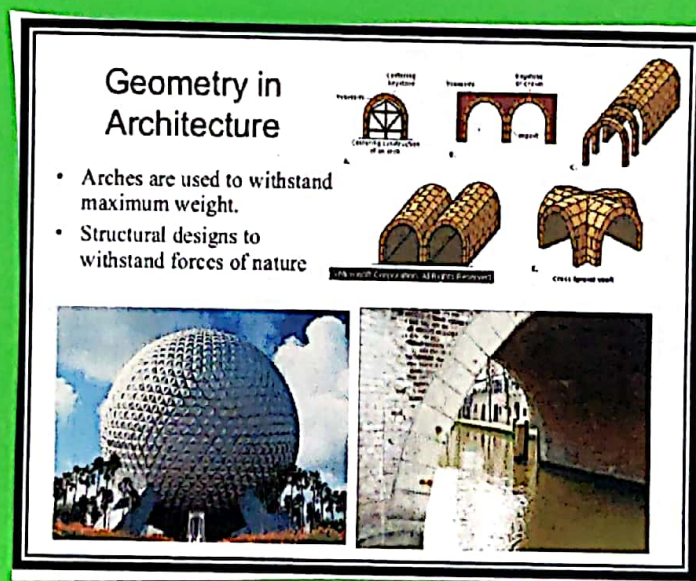
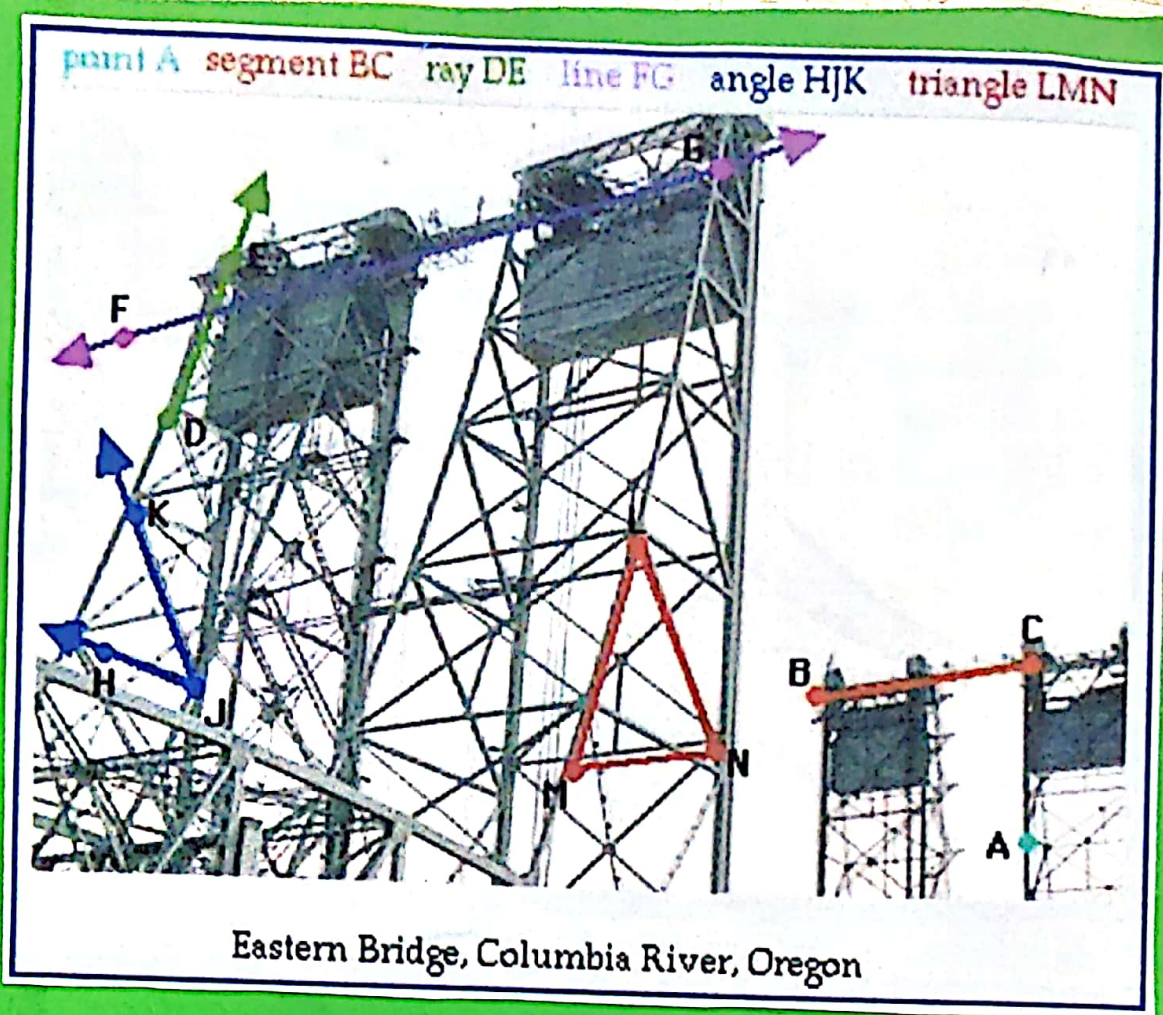
INDUSTRIAL UNIT

Industrial geometry is based on computational techniques which originated in various areas of applied geometry. To give a few examples the methods of computer aided geometric design from the mathematical foundations of the powerful CAD technologies available today. Computer vision provides methods for inspecting and analyzing image and videos. Image processing is used to reconstruct geometric features from digital image data such as X-ray or computer tomography images. Computational geometry provides efficient algorithms for solving fundamental geometric problems. Robot kinematics deals with geometric problems which occur in connection with robot mechanical systems.

Geometric methods have played an increasingly important role in a variety of areas dealing with computing for industrial applications; these include geometric modeling, computational geometry, Robotics, Computer vision, pattern, etc. The main branches of computational geometry are-

- Combinational computational geometry which deals with geometric objects as discrete entities.
- Numerical computational geometry deals primarily with representing real world objects in forms of suitable computer computations in CAD/CAM systems.

In any production and assembly line of an industrial unit there are important decision to make based on certain deduction. One of the most technologically used application that uses geometry is CAD.

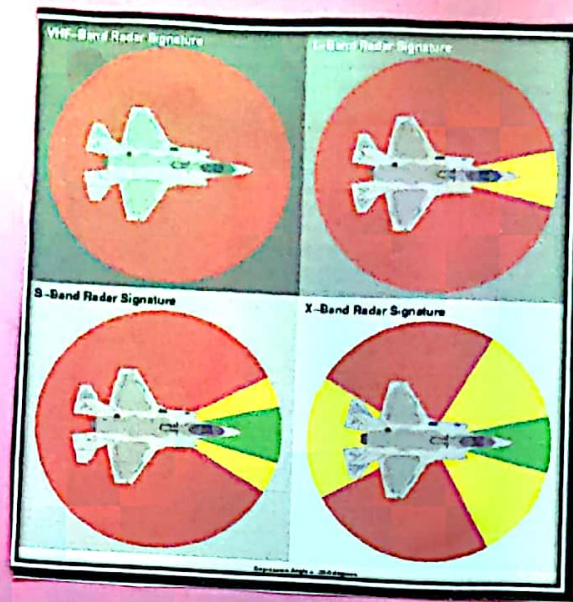


ARCHITECTURE

Mathematics and architecture are related since architecture uses mathematics for several reasons apart from the mathematics needed while engineering buildings, architects use geometry to define the spatial form of building from the pythagoreans of the 6th century BC onwards to create forms harmonious and thus to lay out buildings and their surroundings according to natural aesthetic and sometimes religious principles, to decorate buildings with mathematical objects such as tessellations and to meet environmental goals, such as to minimise speed around the base of tall buildings.

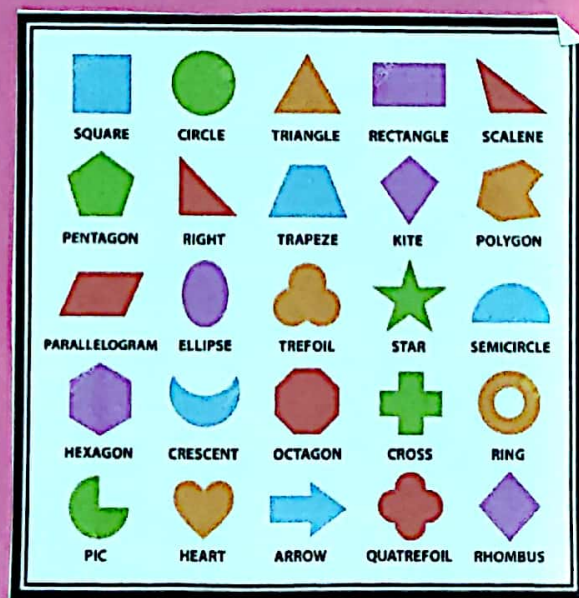
In ancient Egypt, ancient Greece India and the Islamic World, buildings including temples, buildings, mosque places and mausoleums, were laid out with specific proportions for religious reasons. In Islamic architecture, geometric shapes and geometric decorative patterns are used to decorate buildings both inside and outside. Some Hindu temples have a fractal like structure where parts resemble the whole, conveying about the infinite in Hindu cosmology. In Chinese architecture the towers of Fujian Province are circular, communal defensive structures. In 20th century mathematical ornaments are again being used to cover buildings.

In Renaissance architecture, symmetry and proportion were deliberately emphasised. Architecture such as Leon Battista Alberti, Sebastiano Serlio, influenced by Vitruvius and architecture from ancient Rome and the arithmetic of the pythagoreans from the 17th century. At the end of the 19th century, Vladimir Shukhov and Antoni in Russia pioneered the hyperbolic structures in the Sagrada Família, Gaudí also incorporated hyperbolic tessellations, catenary arches, catenoids and ruled surfaces. In the 20th century, modern architecture & Deconstructivism explored different geometries. Minimal surfaces have been exploited intensely like roof coverings at Schreyer International Airport while Buckminster Fuller pioneered the use of the strong thin shell structures known as geodesic domes.



Geometry in Daily Life

- Geometry is considered an important field of study because of its applications in daily life.
- For example, a sports car move in a circular path and it applies the concepts of geometry.
- Stairs are made in your homes inclined at 60° , with each stair designed at 90 degrees.
- A Simple cloth hanger has $2 \times 30^\circ$ angles + $1 \times 120^\circ$ angle = 180° angle.
- A ceiling fan has its 3 blades at 120° angles to make 360° while in motion.
- Any object when thrown at 45° angle, covers maximum distance.
- In addition, geometrical shapes are also used by the artists. The most interesting example is that nature speaks of geometry and you can see shapes in all things of nature.



DEFENCE

Defence applications are again one of the best examples of application of geometry in daily life. Daily operations of military consists much of real life. Geometrical applications such as loading of arms and piling of ammunition. Daily operations locating the co-ordinates and then launching the missiles.

CONCLUSION

In conclusion geometry is a part of daily life of human life. From our homes to the places of work designs rule of our life. Sports also dominated by geometrical concepts. In this regard, geometry is a real life daily part of the human existence.

LEARNING OUTCOME

- * We understood the different uses of geometry in defence, art,
- * We learnt how to apply the concepts of geometry in technology, architecture
- * We learnt the practical applications of geometry in at home and in astronomy and physics.
- * We learnt the usage of geometry in GIS and industrial units.

CONTRIBUTION:-

Use of Geometry in

- Art → Naman Sikchi
- Architecture → Divija Kothari
- At Home → Ishika Tania
- Astronomy and Physics → Meghal Jain.
GIS - Meghal Jain
- Technology - Saarth Jain
- Industrial Unit → Akshat Bhandari
- Defence : Pritam Sethi

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Swati
7/5/19