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# To what extent Euclid's geometrical proofs are usefulin real life?

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## Introduction

Euclidean geometry, the investigation of plane and strong figures based on axioms and theorems utilised by the Greek mathematician Euclid (c. 300 BCE). Euclidean geometry is the plane and strong geometry ordinarily instructed in high schools. To be sure, until the second half of the nineteenth century, when non-Euclidean geometries pulled in the consideration of mathematicians, geometry implied Euclidean geometry. It is the most commonplace articulation of general numerical reasoning. Instead of the retention of basic calculations to understand conditions through repetition, it requests genuine knowledge into the subject, cunning thoughts for applying hypotheses in extraordinary circumstances, a capacity to sum up from well-established realities, and an emphasis on the significance of proofs. In Euclid's incredible work, the Elements, the main devices utilised for geometrical developments were the ruler and the compass—a limitation held in rudimentary Euclidean geometry right up 'til today.

In its thorough deductive organisation, the Elements remained the model of scientific exposition till the end of the nineteenth century, when the German mathematician David Hilbert composed his well known Foundations of Geometry (1899). The cutting edge adaptation of Euclidean geometry is the theory of Euclidean (facilitate) spaces of various measurements, where distance is estimated by an appropriate speculation of the Pythagorean hypothesis.

## Foundation

Once Euclid realised that developing a detailed geometry must start with some.fundamentals.Therefore, initially he began the Elements with some unclear terms, for example, "a point is what has no part" and "a line is a length without breadth ." Proceeding from these terms, he characterised further thought such as edges, circles, triangles, and different polygons and figures. For instance, an edge was characterised as the tendency of two straight lines, and a circle was a plane figure comprising of all focuses that have a fixed separation (range) from a given community.

## Some of the important theories of Euclid that are taught at lower classes in schools

**Congruency of triangle**-Two triangles are said to be congruent if one triangle is same to the other regardless of the position.There are multiple theorems of proving the thraingles congruent, it includes :

- SSS (side-side-side)
- SAS (side-angle-side)
- ASA (angle-side-angle)

**Solid geometry**-The most significant distinction among plane and strong Euclidean geometry is that people can take a gander at the plane "from above," while three-dimensional space can't be taken a gander at "from outside." Consequently, natural experiences are more hard to get for strong geometry than for plane geometry. A few ideas, for example, extents and edges, stay unaltered from plane to strong geometry. For other recognizable ideas, there exist analogies—most perceptibly, volume for territory and three-dimensional shapes for two-dimensional shapes (circle for hover, tetrahedron for triangle, box for square shape). Be that as it may, the hypothesis of tetrahedra isn't close to as rich for what it's worth for triangles. Dynamic examination in higher-dimensional Euclidean geometry incorporates

convexity and circle packings and their applications in cryptology and crystallography (see precious stone: Structure).

**Volume**-As clarified above, in plane geometry the territory of any polygon can be determined by analysing it into triangles. A comparative strategy isn't feasible for solids. In 1901 the German mathematician Max Dehn demonstrated that there exist a solid shape and a tetrahedron of equivalent volume that can't be analysed and improved into one another. This implies math must be utilised to compute volumes for even numerous straightforward solids, for example, pyramids.

**convex geometry -**investigates convex shapes in the Euclidean space and it's increasingly dynamic analogs, it utilizes genuine analysis techniques. It is firmly associated with raised investigation, optimisation and useful examination and has significant applications in number theory.

## Real life applications of Euclid's theory

When anyone speaks about the geometrical part of the mathematics ,the first thing which comes to our mind is Architecture.Architects use the spatial form of a building for eg. to create the design of the building ,its shape, height, structure basically the construction blueprint.Each and every materialistic thing which we find in our surroundings are formed as a product of architecture ie. Skyscrapers(**figure1.1**), bridges formed in cartesian place structure(**figure1.2**) and etc.

Figure 1.1
(references of the image in bibliography)

After considering the architecture part of it ,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) showed that there is more to geometry than just the metric properties of figures: and this perspective is the basis of the origin of projective geometry.

The idea of geometry is additionally applied in the fields of robotics, PC, and computer games. Geometry gives convenient ideas both to PC and computer game software engineers. The way and the structure of the characters that travel through their virtual universes requires geometric calculations to make ways around the snags concentrating around the virtual world. Computer game motors ordinarily put to utiliseray-casting, which is a strategy that reproduces a 3-D world utilising a 2-D map. Utilising this type of geometry assists speed with increasing handling since counts are just accomplished for the vertical lines on the screen.

The GPS of the satellites utilise geometrical standards to compute the situation of the satellites. The utilisation of arrange geometry in the Global Positioning System (GPS) gives exact data about the area and time. GPS employee directions to compute the distance between any two spots. The coordinate geometry causes GPS to follow transportation mishaps and do safeguard activities. The coordinate geometry likewise helps in improving flight security weather anticipating, earthquake observing, and nature protection. In addition, different aspects of

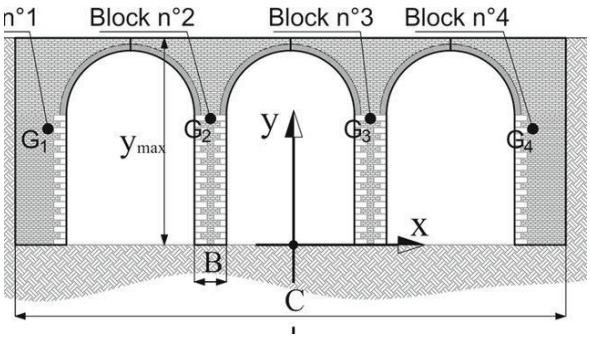


Figure 1.2

military operations of the particular countries are furnished with GPS.

The modern geometry has strong ties with physics. Also, it is a vital part of new physical concepts such as string theories and the theory of relativity. Moreover, the most basic form of geometry is Euclidean geometry that we use for all shapes and measurements.It is also have an impact on astronomy, assistance in the star positioning and planets on celestial sphere and the correlation between the celestial bodies.

Geometry doesn't leave even a solitary opportunity to play a huge in homes also. The windows, entryways, beds, seats, tables, TV, mats, floor coverings, pads, and so forth have various shapes. Also, bedsheets, quilts, covers, tangles, and covers have distinctive geometric examples on them. Geometry is likewise significant cooking. The gourmet expert needs to include all the fixings in precise extents and proportion to advance a flavourful dish. Likewise, while sorting out a room, every single space is used to make the room look all the more engaging. A house is made to look progressively satisfactory by utilising containers, artistic creations, and different beautiful pieces, which are of various geometric shapes and have various examples made on them.

Methods like x-rays, ultrasounds, MRIs, and nuclear imaging require the recreation of shapes of organs, bones, and tumors, which depends on geometry as it were. Physiotherapy additionally utilizes geometry. Geometric properties and highlights help in characterizing the picture in advanced networks. The geometrical ideas not just guide in perception, control, picture division, revision, and item portrayal yet in addition assume a significant job in expanding strength, loyalty, and proficiency. Bisecting edge methods and equal procedures are significant in radiology.

The most important example of geometry in everyday life is formed by the nature surrounding humans. If one looks closely, one might find different geometrical shapes and patterns in leaves, flowers, stems, roots, bark, and the list goes on. The organisation of the human digestive system as a tube within a tube also ascertains the role of geometry. The leaves on the trees are of varying shapes, sizes, and symmetries. Different fruits and vegetables have different geometrical shapes; take the example of orange, it is a sphere and after peeling it, one might notice how the individual slices form the perfect sphere.Looking closely at a honeycomb, one will see hexagonal patterns arranged tandemly. Similarly, examining a snowflake under a microscope will enable the examiner to be the guest of beautiful geometrical patterns.

## Conclusion

After analysing multiple examples in depth where the geometry is present we can say that without the Euclid and his presented geometry today's technological advancements would have been very less and even we would have not able to understand the theory behind such a vast and huge topic Today after researching on the topic for nearly 2 months on various aspects of geometry which includes GPS,Household things,Architecture, construction, nature, medicine and etc , I came to know lots of things regarding this topics and how it is useful to us..Therefore after analysing the Euclidean geometry ,i think that Euclid's geometrical proofs are useful in our real life to a very high extent.

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