Geometry is all about shapes and their properties. If you like playing with objects, or like drawing, then geometry is for you! Geometry can be divided into: Plane Geometry is about flat shapes like lines, circles and triangles ... shapes that can be drawn on a piece of paper Solid Geometry is about three dimensional objects like cubes, prisms, cylinders and spheres. Hint: Try drawing some of the shapes and angles as you learn ... it helps. A Point has no dimensions, only position A Line is one-dimensional A Plane is two dimensional (2D) A Solid is three-dimensional (3D) Why do we do Geometry? To discover patterns, find areas, volumes, lengths and angles, and better understand the world around us. Plane Geometry Plane Geometry is all about shapes on a flat surface (like on an endless piece of paper). General Drawing Tool Square Calculator and Rectangle Calculator Polygons A Polygon is a 2-dimensional shape made of straight lines. Triangles and Rectangles are polygons. Here are some more: Pentagon Pentagram Hexagon Properties of Regular Polygons Diagonals of Polygons Interactive Polygons The Circle Circle Theorems (Advanced Topic) There are many special symbols used in Geometry. Here is a short reference for you: Geometric Symbols Congruent Shapes Similar Shapes Types of Angles Using Drafting Tools Transformations: Rotation Reflection Translation Resizing Symmetry: Tessellations Tessellation Artist Pythagoras' Theorem Pythagorean Triples Circle Theorems Triangle Centers Trigonometry Trigonometry is a special subject of its own, so you might like to visit: Introduction to Trigonometry Trigonometry Index Solid Geometry is the geometry of three-dimensional space - the kind of space we live in ... ... let us start with some of the simplest shapes: Common 3D Shapes Polyhedra and Non-Polyhedra There are two main types of solids, "Polyhedra", and "Non-Polyhedra": Polyhedra (they must have flat faces): Cubes and Cuboids (Volume of a Cuboid) Platonic Solids Prisms Pyramids Investigating Solids Activity Non-Polyhedra (when any surface is not flat): Sphere Torus Cylinder Cone geometry, the branch of mathematics concerned with the shape of individual objects, spatial relationships among various objects, and the properties of surrounding space. It is one of the oldest branches of mathematics, having arisen in response to such practical problems as those found in surveying, and its name is derived from Greek words meaning "Earth measurement." Eventually it was realized that geometry need not be limited to the study of flat surfaces (plane geometry) and rigid three-dimensional objects (solid geometry) but that even the most abstract thoughts and images might be represented and developed in geometric terms.This article begins with a brief guidepost to the major branches of geometry and then proceeds to an extensive historical treatment. For information on specific branches of geometry, see Euclidean geometry, analytic geometry, projective geometry, differential geometry, non-Euclidean geometries, and topology. In several ancient cultures there developed a form of geometry suited to the relationships between lengths, areas, and volumes of physical objects. This geometry was codified in Euclid's Elements about 300 bce on the basis of 10 axioms, or postulates, from which several hundred theorems were proved by deductive logic. The Elements epitomized the axiomatic-deductive method for many centuries. Analytic geometry was initiated by the French mathematician René Descartes (1596–1650), who introduced rectangular coordinates to locate points and to enable lines and curves to be represented with algebraic equations. Algebraic geometry is a modern extension of the subject to multidimensional and non-Euclidean spaces. Projective geometry originated with the French mathematician Girard Desargues (1591–1661) to deal with those properties of geometric figures that are not altered by projecting their image, or "shadow," onto another surface. The German mathematician Carl Friedrich Gauss (1777–1855), in connection with practical problems of surveying and geodesy, initiated the field of differential geometry. Using differential calculus, he characterized the intrinsic properties of curves and surfaces. For instance, he showed that the intrinsic curvature of a cylinder is the same as that of a plane, as can be seen by cutting a cylinder along its axis and flattening, but not the same as that of a sphere, which cannot be flattened without distortion. Beginning in the 19th century, various mathematicians substituted alternatives to Euclid's parallel postulate, which, in its modern form, reads, "given a line and a point not on the line, it is possible to draw exactly one line through the given point parallel to the line." They hoped to show that the alternatives were logically impossible. Instead, they discovered that consistent non-Euclidean geometries exist. Topology, the youngest and most sophisticated branch of geometry, focuses on the properties of geometric objects that remain unchanged upon continuous deformation—shrinking, stretching, and folding, but not tearing. The continuous development of topology dates from 1911, when the Dutch mathematician L.E.J. Brouwer (1881–1966) introduced methods generally applicable to the topic. The earliest known unambiguous examples of written records—dating from Egypt and Mesopotamia about 3100 bce—demonstrate that ancient peoples had already begun to devise mathematical rules and techniques useful for surveying land areas, constructing buildings, and measuring storage containers. Beginning about the 6th century bce, the Greeks gathered and extended this practical knowledge and from it generalized the abstract subject now known as geometry, from the combination of the Greek words geo ("Earth") and metron ("measure") for the measurement of the Earth. In addition to describing some of the achievements of the ancient Greeks, notably Euclid's logical development of geometry in the Elements, this article examines some applications of geometry to astronomy, cartography, and painting from classical Greece through medieval Islam and Renaissance Europe. It concludes with a brief discussion of extensions to non-Euclidean and multidimensional geometries in the modern age. The origin of geometry lies in the concerns of everyday life. The traditional account, preserved in Herodotus's History (5th century bce), credits the Egyptians with inventing surveying in order to reestablish property values after the annual flood of the Nile. Similarly, eagerness to know the volumes of solid figures derived from the need to evaluate tribute, store oil and grain, and build dams and pyramids. Even the three abstruse geometrical problems of ancient times—to double a cube, trisect an angle, and square a circle, all of which will be discussed later—probably arose from practical matters, from religious ritual, timekeeping, and construction, respectively, in pre-Greek societies of the Mediterranean. And the main subject of later Greek geometry, the theory of conic sections, owed its general importance, and perhaps also its origin, to its application to optics and astronomy. While many ancient individuals, known and unknown, contributed to the subject, none equaled the impact of Euclid and his Elements of geometry, a book now 2,300 years old and the object of as much painful and painstaking study as the Bible. Much less is known about Euclid, however, than about Moses. In fact, the only thing known with a fair degree of confidence is that Euclid taught at the Library of Alexandria during the reign of Ptolemy I (323–285/283 bce). Euclid wrote not only on geometry but also on astronomy and optics and perhaps also on mechanics and music. Only the Elements, which was extensively copied and translated, has survived intact. Euclid's Elements was so complete and clearly written that it literally obliterated the work of his predecessors. What is known about Greek geometry before him comes primarily from bits quoted by Plato and Aristotle and by later mathematicians and commentators. Among other precious items they preserved are some results and the general approach of Pythagoras (c. 580–c. 500 bce) and his followers. The Pythagoreans convinced themselves that all things are, or owe their relationships to, numbers. The doctrine gave mathematics supreme importance in the investigation and understanding of the world. Plato developed a similar view, and philosophers influenced by Pythagoras or Plato often wrote ecstatically about geometry as the key to the interpretation of the universe. Thus ancient geometry gained an association with the sublime to complement its earthy origins and its reputation as the exemplar of precise reasoning. Ancient builders and surveyors needed to be able to construct right angles in the field on demand. The method employed by the Egyptians earned them the name "rope pullers" in Greece, apparently because they employed a rope for laying out their construction guidelines. One way that they could have employed a rope to construct right triangles was to mark a looped rope with knots so that, when held at the knots and pulled tight, the rope must form a right triangle. The simplest way to perform the trick is to take a rope that is 12 units long, make a knot 3 units from one end and another 5 units from the other end, and then knot the ends together to form a loop. However, the Egyptian scribes have not left us instructions about these procedures, much less any hint that they knew how to generalize them to obtain the Pythagorean theorem: the square on the line opposite the right angle equals the sum of the squares on the other two sides. Similarly, the Vedic scriptures of ancient India contain sections called sulvasutras, or "rules of the rope," for the exact positioning of sacrificial altars. The required right angles were made by ropes marked to give the triads (3, 4, 5) and (5, 12, 13). In Babylonian clay tablets (c. 1700–1500 bce) modern historians have discovered problems whose solutions indicate that the Pythagorean theorem and some special triads were known more than a thousand years before Euclid. A right triangle made at random, however, is very unlikely to have all its sides measurable by the same unit—that is, every side a whole-number multiple of some common unit of measurement. This fact, which came as a shock when discovered by the Pythagoreans, gave rise to the concept and theory of incommensurability. Chinese and Greek geometric theoremsA comparison of a Chinese and a Greek geometric theoremThe figure illustrates the equivalence of the Chinese complementary rectangles theorem and the Greek similar triangles theorem.By ancient tradition, Thales of Miletus, who lived before Pythagoras in the 6th century bce, invented a way to measure inaccessible heights, such as the Egyptian pyramids. Although none of his writings survives, Thales may well have known about a Babylonian observation that for similar triangles (triangles having the same shape but not necessarily the same size) the length of each corresponding side is increased (or decreased) by the same multiple. The ancient Chinese arrived at measures of inaccessible heights and distances by another route, using "complementary" rectangles, as seen in the next figure, which can be shown to give results equivalent to those of the Greek method involving triangles. A Babylonian cuneiform tablet written some 3,500 years ago treats problems about dams, wells, water clocks, and excavations. It also has an exercise on circular enclosures with an implied value of π = 3. The contractor for King Solomon's swimming pool, who made a pond 10 cubits across and 30 cubits around (1 Kings 7:23), used the same value. However, the Hebrews should have taken their π from the Egyptians before crossing the Red Sea, for the Rhind papyrus (c. 2000 bce; our principal source for ancient Egyptian mathematics) implies π = 3.1605. Knowledge of the area of a circle was of practical value to the officials who kept track of the pharaoh's tribute as well as to the builders of altars and swimming pools. Ahmes, the scribe who copied and annotated the Rhind papyrus (c. 1650 bce), has much to say about cylindrical granaries and pyramids, whole and truncated. He could calculate their volumes, and, as appears from his taking the Egyptian seked, the horizontal distance associated with a vertical rise of one cubit, as the defining quantity for the pyramid's slope, he knew something about similar triangles. Geometry is a branch of mathematics that deals with the study of shapes, sizes, and the properties of space. It focuses on the relationships between points, lines, surfaces, and solids in a way that reveals their nature and interactions. TypeDescriptionApplicationsEuclidean GeometryStudies flat, 2D spaces, where the basic elements are points, lines, and planes, and follows Euclid's postulates.Architecture, engineering, and map designNon-Euclidean GeometryExplores curved spaces, including hyperbolic (negative curvature) and elliptic (positive curvature) geometries.Cosmology, GPS systems, and general relativity theoryAnalytic GeometryUses coordinates and algebraic equations to describe geometric properties and relationships between points, lines, etc.Computer graphics, robotics, and data visualizationDifferential GeometryStudies geometric properties using calculus, focusing on curves and surfaces and their curvature.Physics, particularly in relativity and mechanicsProjective GeometryDeals with properties of figures that remain invariant under projection, studying relationships between points and lines.Art, perspective drawing, and optical systemsDiscrete GeometryExamines geometric structures in discrete sets, such as points, graphs, and networks.Computer science, combinatorics, and network designFractal GeometryStudies irregular shapes that display self-similarity at different scales.Computer graphics, modeling natural phenomena, and artTopologyExplores properties of spaces that remain invariant under continuous transformations, like stretching or twisting.Theoretical physics, knot theory, and complex systems Euclidean Geometry forms the foundation of the study of geometry. This branch focuses on the properties of plane and solid figures, deriving insights from axioms and theorems. Here are the key aspects of Euclidean Geometry: Fundamental Concepts: Points and Lines: The simplest elements in geometry, representing positions and linear connections between points. Axioms and Postulates: Euclidean Geometry is built on basic, self-evident statements known as axioms and postulates, which underpin more complex theorems and proofs. Geometrical Proof: Logical steps used to demonstrate or verify relationships between geometric figures. Euclid's Fifth Postulate: A specific foundational statement that deals with parallel lines and has led to significant developments in geometry. Five Basic Postulates: These postulates define and shape Euclidean Geometry: Connecting Points: A straight line segment can be drawn connecting any two points. Infinite Extension: Any straight line can be extended indefinitely in both directions. Drawing Circles: A circle can be drawn with any point as its center and any length as its radius. Right Angles: All right angles are congruent (i.e., equal). Parallel Lines: Any two straight lines are parallel if they are equidistant from each other at two points. Axioms or postulates form the foundational assumptions in geometry, which are universally accepted without requiring proof. Below are several of Euclid's axioms in geometry, which serve as key building blocks: Equality Transitivity:Things equal to the same things are equal to each other.Example: If $A=C$and $B=C$, then A=B. Addition of Equals:If equals are added to equals, the wholes are equal.Example: If A=B and C=D, then $A+C=B+D$ Subtraction of Equals:If equals are subtracted from equals, the remainders are equal.Example: If $A=B$ and $C=D$, then $A-C=B-D$. Coinciding Equals:Things that coincide or overlap are equal to one another. Part-Whole Relationship:The whole is greater than its part.Example: If $A>B$, there exists a CC such that $A=B+C$. Doubles of the Same:Things that are double the same thing are equal to one another.Example: If $A=B$, then $2A=2B$. Halves of the Same:Things that are halves of the same thing are equal to each other.Example: If $A=B$, then $A2=B2$. Non-Euclidean geometry encompasses geometries that differ from Euclidean geometry, particularly in their treatment of parallel lines and angles within planar spaces. Here's a look at the two main types: Spherical Geometry:This is the study of geometry on a spherical surface. In this geometry:Lines: Are defined as the shortest distance between two points and take the form of arcs known as great circles.Triangles: The sum of the angles in a triangle on a sphere is greater than 180º.Spherical geometry is particularly relevant in navigation, astronomy, and earth sciences, as it reflects the nature of our world. Hyperbolic Geometry:This type of geometry deals with surfaces that curve inward. In this geometry: Triangles: The sum of the angles in a planar triangle is less than 180º. Applications: Hyperbolic geometry has applications in topology, where it helps describe and understand various curved surfaces and their properties. Euclidean Geometry primarily deals with the study of geometry on a plane, a two-dimensional surface that extends infinitely in all directions. Here are some key aspects: The Plane:The plane serves as a foundational concept in geometry, acting as a 2D surface that supports various geometric entities and is crucial in fields like graph theory. Basic Components:The fundamental components of a plane in Euclidean geometry include: Points: Zero-dimensional units representing locations. Points that lie on the same line are collinear. Lines: One-dimensional entities formed by a set of points extending infinitely in both directions. Lines can intersect or run parallel and are often the intersection of two planes. Angles: Formed by two intersecting lines, angles are a key feature in describing the relationships between lines. Differentiating Between Lines:It's essential to distinguish between different types of lines: Line: Extends infinitely in both directions and has no endpoints. Line Segment: Has a defined start and end point. Ray: Has a start point and extends infinitely in one direction. Relationships Between Lines:Lines can have various relationships: Parallel: They never intersect and remain equidistant. Perpendicular: They intersect at a right angle. Intersecting: Lines that cross each other at any angle. When two straight lines or rays intersect at a point, they form an angle. Angles are measured in degrees and can take on various forms, including acute, right, obtuse, straight, or reflex angles. In terms of relationships, pairs of angles can be complementary, summing to 90º, or supplementary, summing to 180º. The construction and study of angles and lines are integral to the field of geometry, serving as foundational elements. Additionally, exploring angles within a unit circle or a triangle lays the groundwork for trigonometry, bridging geometry and trigonometric functions. Furthermore, the concept of transversals and related angles provides insights into the properties and theorems associated with parallel lines, enhancing the understanding of geometric relationships. Plane shapes are two-dimensional or flat geometric figures that are essential for classifying and understanding the properties of various geometric forms. Polygons are closed curves composed of more than two lines, and one key example is the triangle, a closed figure with three sides and three vertices. Numerous theorems have been developed around triangles to explore their properties in depth, including: Heron's Formula the Exterior Angle Theorem The Angle Sum Property The Basic Proportionality Theorem The Similarity and Congruence in Triangles The Pythagorean Theorem These theorems clarify relationships between angles and sides within triangles. Another key plane shape is the quadrilateral, which is a polygon with four sides and four vertices. Solid shapes in geometry are three-dimensional figures characterized by length, width, and height. Various types of solids exist, including cylinders, cubes, spheres, cones, cuboids, prisms, and pyramids, each of which occupies space and has distinct features: Characteristics: Solids are defined by their vertices (corner points), faces (flat surfaces), and edges (lines connecting vertices). Platonic Solids and Polyhedrons: In Euclidean space, the five Platonic solids and various polyhedrons exhibit unique and interesting properties, contributing to the study of solid geometry. Nets and Solid Construction: Nets of plane shapes can be folded to form solids, providing a bridge between two-dimensional and three-dimensional geometry. Measurement in geometry plays a crucial role in understanding and quantifying the properties of various geometric figures. Here are the key aspects: Length and Distance:Measurement of length and distance is fundamental to geometry, helping to define the size of line segments, the distance between points, and the perimeters of shapes. Area:Area measures the 2D space enclosed by a figure, such as squares, rectangles, circles, and polygons. Formulas like $A=l\times w$ for a rectangle or $A=1/2\times b\times h$ for a triangle simplify these calculations. Volume:Volume measures the three-dimensional space occupied by a solid shape, such as cubes, spheres, or cylinders. For instance, the volume of a cube is $V=s^3$ (where ss is the length of a side), while the volume of a cylinder is $V=\pi r^2h$ (where rr is the radius of its base and h its height). Angles:Angles are another key measurement in geometry, defined in degrees or radians. Angles help characterize the relationships between intersecting lines or the internal angles of polygons. Coordinate Systems:In analytic geometry, measurements are often facilitated by coordinate systems, which provide a way to quantify positions and distances between points using numerical coordinates. Geometry formulas are essential tools that help quantify the properties of various geometric figures. Here are key formulas for different shapes: Area: Rectangle: $A=l\times w$ Triangle: $A=1/2\times b\times h$ Circle: $A=\pi r^2$ Parallelogram: $A=b\times h$ Perimeter: Rectangle: $P=2(l+w)$ Triangle: $P=a+b+c$ (where a,b, and c are the lengths of the sides) Circle: $C=2\pi r$ (Circumference) Volume: Cube: $V=s^3$ Rectangular Prism: $V=l\times w\times h$ Cylinder: $V=\pi r^2h$ Sphere: $V=4/3\pi r^3$ Cone: $V=13\pi r^2h$ Surface Area: Cube: $SA=6s^2$ Rectangular Prism: $SA=2lw+2lh+2wh$ Sphere: $SA=4\pi r^2$ Cylinder: $SA=2\pi r(h+r)$ Pythagorean Theorem: In a right triangle with legs a and b, and hypotenuse c: $a^2+b^2=c^2$ ShapeFormulaRight TrianglePythagorean Theorem: $b^2+h^2=c^2$ (where b is base, h is height, c is hypotenuse) Area: $A=1/2b\times h$ Perimeter: $P=b+h+c$TrianglePerimeter: $P=a+b+c$ Area: $A=1/2b\times h$ (where a,b,ca are sides)RectanglePerimeter: $P=2(l+w)$ Area: $A=lw$ Diagonal: $d=\sqrt{l^2+w^2}$(where ll is length, ww is width)ParallelogramPerimeter: $P=2(a+b)$ (where a,b are sides) Area: $A=b\times h$ Height: $h=A/b$Base: $b=A/h$TrapeziumArea: $A=12(a+b)h$ (where a,b are parallel sides, h is the distance between them)CircleCircumference: $C=2\pi r$ Area: $A=\pi r^2$ Diameter: $d=2r$ (where r is radius)SquarePerimeter: $P=4a$ Area: $A=a^2$ Diagonal: $d=a\sqrt{2}$ Side: $a=\sqrt{A}$ArcArc Length: $L=r\theta$(where is the central angle in radians, r is radius)CubeArea: $A=6a^2$ Volume: $V=a^3$ Edge: $a=\sqrt[3]{V}$ Space Diagonal: $d=a\sqrt{3}$CuboidSurface Area: $A=2(lb+bh+hl)$ Volume: $V=lbh$ Space Diagonal: $d=\sqrt{l^2+b^2+h^2}$ (where l is length, b is breadth, h is height)CylinderTotal Surface Area: $A=2\pi rh+2\pi r^2$ Curved Surface Area: $Ac=2\pi rh$ Volume: $V=\pi r^2h$ Base Area: $Ab=\pi r^2$Radius: $r=\sqrt{V/\pi h}$ConeTotal Surface Area: $A=\pi r(r+l)=\pi r(r+\sqrt{h^2+r^2})$ Curved Surface Area: $Ac=\pi rl$Volume: $V=13\pi r^2h$Slant Height: $l=\sqrt{h^2+r^2}$Base Area: $Ab=\pi r^2$SphereSurface Area: $AA=4\pi r^2$ Volume: $V=43\pi r^3$Diameter: $d=2r$ A triangle has a base of 6 units and a height of 8 units. Calculate its area, perimeter, and the length of the hypotenuse. Solution: Area: $A=1/2\times 6\times 8=24$ square units Hypotenuse:$h=\sqrt{6^2+8^2}=\sqrt{36+64}=\sqrt{100}=10$ units Perimeter:$P=6+8+10=24$ units A rectangle has a length of 10 units and a width of 4 units. Find its area, perimeter, and the length of its diagonal. Solution: Area:$A=10\times 4=40$ square units Perimeter:$P=2(10+4)=2\times 14=28$ units Diagonal:$d=\sqrt{10^2+4^2}=\sqrt{100+16}=\sqrt{116}\approx 10.77$ units A circle has a radius of 7 units. Calculate its area and circumference. Solution: Area:$A=\pi\times 7^2=\pi\times 49\approx 153.94$ square units Circumference:$C=2\pi\times 7=14\pi\approx 43.98$units A trapezium has two parallel sides of length 8 units and 4 units, with a distance of 5 units between them. Find its area. Solution: Area:$A=1/2(8+4)\times 5=1/2\times 12\times 5=30$ square units A cylinder has a radius of 3 units and a height of 7 units. Find its volume and total surface area. Solution: Volume:$V=\pi r^2h=\pi\times 3^2\times 7=\pi\times 9\times 7=63\pi\approx 197.92$ cubic units Geometry and algebra differ in approach. While algebra deals with abstract symbols and equations, geometry focuses on shapes, sizes, and spatial relationships. Which is harder depends on individual preferences: those comfortable with visual and spatial reasoning may find geometry easier, while algebra may suit others better. Basic math geometry involves the study of shapes, sizes, and spatial relationships in two-dimensional and three-dimensional spaces. This includes foundational concepts like points, lines, and planes, as well as formulas for calculating areas, perimeters, and volumes of various figures like triangles, rectangles, and circles. Geometry is typically introduced around 8th to 10th grade, depending on the educational curriculum. In these grades, students learn about plane and solid geometry, exploring the properties of various shapes, theorems, and formulas, which provide a foundation for more advanced studies. In many educational systems, geometry is often taught in 10th grade. This course covers a range of topics, including geometric principles, properties of shapes, and proofs, along with formulas for calculating area, volume, and other measurements, providing students with foundational geometric knowledge. The hardest math class varies by individual and curriculum. For many, advanced classes like calculus, linear algebra, or differential equations can pose significant challenges due to abstract concepts and complex calculations. However, difficulty depends on the student's background, skills, and comfort with different types of math. Add Tone Friendly Formal Casual Instructive Professional Empathetic Humorous Serious Optimistic Neutral 10 Examples of Public speaking 20 Examples of Gas lighting What is the sum of the interior angles of a triangle? Choose the correct answer How many sides does a regular hexagon have? Choose the correct answer In a right-angled triangle, what is the relationship between the lengths of the sides? Choose the correct answer What is the area of a rectangle with a length of 8 cm and a width of 5 cm? Choose the correct answer How many degrees are in each interior angle of a regular octagon? Choose the correct answer What is the circumference of a circle with a radius of 7 cm? Choose the correct answer What is the volume of a cube with a side length of 4 cm? Choose the correct answer In a circle, if the diameter is 10 cm, what is the radius? Choose the correct answer How many degrees are in the sum of the interior angles of a pentagon? Choose the correct answer What is the surface area of a sphere with a radius of 3 cm? Choose the correct answer Geometry is a branch of mathematics that studies the shape, sizes, positions, angles, and dimensions of things. Flat shapes like squares, circles, and triangles are a part of flat geometry and are called 2D shapes. These shapes have only 2 dimensions, the length and the width. Examples of 2D shapes in flat geometry are as shown below. 2D shapes can be further classified as open shapes and closed shapes. Open shapes can be defined as a shape or figure whose line segments and/or curves do not meet. They do not start and end at the same point. Closed shapes are the exact opposite of open shapes. They start and end at the same point. In geometry, a three-dimensional shape can be defined as a solid figure or an object or shape that has three dimensions – length, width, and height. Unlike two-dimensional shapes, three-dimensional shapes have thickness or depth. The attributes of a three-dimensional figure are faces, edges, and vertices. The three dimensions compose the edges of a 3D geometric shape. A cube, rectangular prism, sphere, cone and cylinder are the basic 3-dimensional shapes we see around us. In geometry, an angle can be defined as the figure formed by two rays meeting at a common endpoint. An angle is represented by the symbol ∠. Angles are measured in degrees (°) using a protractor. For example, 45 degrees is represented as 45°. The angles are classified based on their measurements as: An acute angle measures less than 90°. An obtuse angle is between 90° and 180°. A right angle precisely measures 90°. An angle measuring exactly 180° is a straight angle. A reflex angle measures between 180°- 360°. A complete angle measures 360°. The vertex of a shape where two edges meet form an angle. Different shapes in geometry have different angle measures. For example: A triangle is a 3 sided shape, and the sum of its 3 interior angles is 180° A square, rectangle or quadrilateral are 4 sided shapes, and the sum of their 4 interior angles is 360° Other polygons like the pentagon, hexagon, heptagon, octagon have 5, 6, 7, 8 sides respectively and varying angles. Examples of different Polygons with their angles and sides are as shown below. We learn various aspects of shapes, like the measurement of angles, length of sides, area, volume, etc in geometry. Similarity and congruence are two important aspects of geometry. Similarity: Similarity is when two shapes are the same but their sizes may vary. Congruence: Congruence is when two shapes are exactly the same in shape and size. A coordinate plane is a 2D surface formed by using two number lines that intersect each other at the right angle. The horizontal number line is the x-axis, and the vertical number line is the y-axis. The intersection of the two axes is the (0,0) coordinate. Using the coordinate plane, we plot points, lines, etc. By joining various points on the coordinate plane, we can create shapes. We use Formula and Theorems to solve the geometry problems. A formula is a mathematical equation to solve a geometry problem while a theorem is a statement that is proved using previously known facts. For example, the "Pythagoras Theorem" proved that a2 + b2 = c2 for a right-angled triangle, where a and b are the sides of the right-angled triangle, and c is the hypotenuse. However, a2 + b2 = c2 is the formula for finding the hypotenuse of a right-angled triangle. – The word geometry is made from the Greek words "Geo" meaning "earth" and "metry" meaning "measurement". Is the given shape an example of a simple closed curve that is also a polygon? Solution: A closed shape that does not cross itself is a simple closed curve. Polygons are closed shapes formed of only straight lines like triangles, rectangles, pentagons and so on. The given figure is curved and is not made of only straight lines, this is not a polygon. In a triangle ABC, right angled at B, if ∠C=45° what is the measure of ∠A? Solution: △ ABC is the given right triangle with ∠B=90°. Sum of the angles of a triangle = 180° ∠A+∠B+∠C=180° ∠A+∠C=180°-90°=90° But, ∠C=45° hence ∠A=90°-45°=45° Identify the flat surfaces in the given prism. Solution: The flat surfaces in the prism are as given below: Rectangle AECB, Rectangle DCEF, Rectangle ABDF form the rectangular faces of the prism. △ BCD and △ AEF form the triangular faces of the prism. Attend this Quiz & Test your knowledge.ABCDCorrect answer is: BA closed shape that does not cross itself is a simple closed curve. It has the same start and end points.ABCDCorrect answer is: DThe given shape is a 3d shape and is called a cube.Correct answer is: 10 sides and 10 cornersThe star shaped figure is made of 10 straight lines. Thus, it has 10 sides and 10 corners. What is the relationship between mathematics and geometry? Mathematics is an umbrella term for various disciplines that focus on logic and abstract concepts. Geometry is one of the branches of mathematics that deals with shapes and sizes of figures and their properties. What are some applications of geometry? Geometry can be applied to many areas such as architecture, electronics, engineering, and construction. It can also be used in fields like science to develop projects or programs for space exploration. What is the main difference between 2D and 3D shapes? The main difference between 2D and 3D shapes is the absence of depth or height in 2D shapes. They are flat figures. 3D shapes exist in three dimensions with length, breadth, and height and do not appear flat. What is the difference between algebra and geometry? Algebra is a branch of mathematics that uses variables, in the form of letters, to act as numbers or quantities in equations and formulas. Geometry is a branch of mathematics that studies the sizes, shapes, positions, angles, and dimensions of things. home / geometryGeometry is a branch of mathematics that includes the study of shape, size, and other properties of figures. It is one of the oldest branches of mathematics and may have been used even in prehistoric times. We can produce geometric figures from real-life situations. Below is a picture where points, lines, and planes are visible. These basic objects represent the walls and structural components of buildings. Geometry is often divided into plane geometry and solid geometry. Plane Geometry Plane geometry includes the study of points, line, and geometric figures such as circles and polygons that lie in a plane. There are three terms in geometry that are widely used that cannot really be defined using well-defined objects. There is however, a general agreement as to what they mean; that is, the definitions of these terms are axiomatic. They are the basis for creating and working with any geometric figure. Point A point indicates a location in space. It has no dimension and is represented by a dot. Points are typically labeled with capital letters. • Point A Line A line has one dimension, its length, and is represented with a line containing arrows indicating it extends in either direction indefinitely. Two non-overlapping points determine a unique line and we can name the line with those two points or any other two points on the line. line AB or BA Plane A plane has two dimensions, length and width, and forms a flat surface (such as a piece of notebook paper) extending in both directions indefinitely. A plane can be named by three noncollinear points or by a letter. Plane ABC or plane P The shapes formed in plane geometry have perimeter and area if they are polygons, circumference and area if they are circles, and length if they are one dimensional, like a line. Solid Geometry Solid geometry is the branch of geometry that studies solid (three-dimensional) figures. The solids are polyhedra (plural for polyhedron) or non-polyhedra. Polyhedron A polyhedron is a solid whose faces are polygons. Octahedron whose faces are triangles Rectangular prism whose faces are rectangles. Non-polyhedron A non-polyhedron is a solid that has all or partly curved surfaces. A right cone has a circular base that tapers to a tip. A sphere's surface is completely round like a ball. The shapes formed in solid geometry have volume and surface area. You can also find the surface area for a part of a solid such as the lateral area, or the length of an edge for a rectangular prism or the radius of a sphere. Types of Geometry There are numerous branches of geometry that are classified based on various criteria such as the methods of study, the types of objects studied, and more. The following are some of said branches: Analytic Geometry Analytic geometry is the study of plane and solid geometry that uses Algebra and incorporates the two-dimensional coordinate plane or three-dimensional coordinate plane. Since analytic geometry uses Algebra and the coordinate planes for geometric figures, it tends to be more numerical in nature, and thus has proven to be an important branch of mathematics used by engineers and physicists. Euclidean Geometry Euclidean geometry is the study of plane and solid geometry which uses axioms, postulates, and deductive reasoning to prove theorems about geometric concepts. The kind of geometry most students usually study was recorded in The Elements, a set of books written about 300 BC by Euclid, a Greek mathematician. There are now other kinds of geometry as well. These other kinds originated about 2,000 years after Euclid's work. Non-Euclidean Geometry Non-Euclidean geometry typically uses most of the ideas of Euclidean geometry but uses a different version of Euclid's parallel postulate. In Euclidean geometry two parallel lines never intersect. In Non-Euclidean geometry, parallel lines can intersect depending on which type of geometry is chosen. There are two basic types: Spherical and Hyperbolic Non-Euclidean geometries. Think of folding a plane in Euclidean geometry onto a sphere or a hyperboloid (a three-dimensional hyperbola). The lines are bent and circular or elliptical in spherical geometry, and parabolic or hyperbolic in hyperbolic geometry. Geometry (from the Ancient Greek: geo- "earth", -metron "measurement") is a branch of mathematics that is primarily concerned with the shapes and sizes of the objects, their relative position, and the properties of space. There are many postulates and theorems applied by the Greek mathematician Euclid, who is often referred to as the "Father of Geometry". Let us explore all the important topics in Geometry. What is Geometry? Geometry is the branch of mathematics that relates the principles covering distances, angles, patterns, areas, and volumes. All the visually and spatially related concepts are categorized under geometry. There are three types of geometry: Euclidean Hyperbolic Elliptical Euclidean Geometry The Euclidean geometry refers to the study of plane and solid figures on the basis of axioms (a statement or proposition) and theorems. The fundamental concepts of Euclidean geometry include Points and Lines, Euclid's Axioms and Postulates, Geometrical Proof, and Euclid's Fifth Postulate. There are 5 basic postulates of Euclidean Geometry that define geometrical figures. A straight line segment is drawn from any given point to any other. A straight line is extended indefinitely in both directions. A circle is drawn with any given point as its center and any length as its radius. All right angles are congruent. Any two straight lines are infinitely parallel that are equidistant from one another at two points. Euclid's Axioms: Axioms or postulates are based on assumptions and have no proof for them. A few of Euclid's axioms in geometry that are universally accepted are: The things that are equal to the same things are equal to one another. If A = C and B = C then A = C If equals are added to equals, the wholes are equal. If A = B and C = D, then A + C = B + D If equals are subtracted from equals, the remainders are equal. The coinciding things are equal to one another. The whole is greater than its part. If A > B, then there exists C such that A = B + C. The things that are double the same are equal to one another. The things that are halves of the same thing are equal to one another. Non-Euclidean Geometry Spherical geometry and hyperbolic geometry are the two non-Euclidean geometries. Non-Euclidean geometry differs in its postulates on the nature of the parallel lines and angle of curvature, as compared to the plane surface as studied by Euclidean geometry. Spherical geometry is the study of plane geometry on a sphere. Lines are defined as the shortest distance between two points lying on the sphere. This line on a sphere is an arc and is called the great circle. The sum of the angles in the triangle is greater than 180º. Hyperbolic geometry refers to a curved surface. This geometry finds its application in topology. Depending on the inner curvature of the curved surface, the planar triangle has the sum of the angles lesser than 180º. Plane Geometry Plane geometry involves the study of geometry in a plane. A two-dimensional surface extending infinitely in both the opposite directions forms the plane. Planes are used in every area of geometry and graph theory. The basic components of planes in geometry are analogous to points, lines, and angles. A point is the no-dimensional basic unit of geometry. Points lying on the same line are the collinear points. A line is a uni-dimensional unit that refers to a set of points that extends in two opposite directions and the line is said to be the intersection of two planes. A line has no endpoints. It is easy to differentiate a line, line segment, and ray. Lines may be parallel or perpendicular. Angles in Geometry When two straight lines or rays intersect at a point, they form an angle. Angles are usually measured in degrees. The angles can be an acute, obtuse, right angle, straight angle, or obtuse angle. The pairs of angles can be supplementary or complementary. The construction of angles and lines is an intricate component of geometry. The study of angles in a unit circle and that of a triangle forms the stepping stone of trigonometry. Transversals and related angles establish the interesting properties of parallel lines and their theorems. Plane Shapes in Geometry The properties of plane shapes help us identify and classify them. The plane geometric shapes are two-dimensional shapes or plane shapes. Polygons are closed curves that are made up of more than two lines. A triangle is a closed figure with three sides and three vertices. There are many theorems based on the triangles that help us understand the properties of triangles. In geometry, the most significant theorems based on triangles include Heron's formula, The exterior angle theorem, the angle sum property, the basic proportionality theorem, the similarity and Congruence in Triangles, the Pythagoras Theorem, and so on. These help us recognize the angle-side relationships in triangles. Quadrilaterals are polygons with four sides and four vertices. A circle is a closed figure and has no edges or corners. It is defined as the set of all points in a plane that are equidistant from a given point called the center of the circle. Various concepts centered around symmetry, transformations in shapes, construction of shapes are the formative chapters in geometry. Solid Geometry Solid shapes in geometry are three-dimensional in nature. The three dimensions that are taken into consideration are length, width, and height. There are different types of solid figures like a cylinder, cube, sphere, cone, cuboids, prism, pyramids, and so on and these figures acquire some space. They are characterized by vertices, faces, and edges. The five platonic solids and the polyhedrons have interesting properties in Euclidean space. The nets of the plane shapes can be folded into solids. Measurement in Geometry Measurement in geometry ascertains the calculation of length or distance, the area occupied by a flat shape, and the volume occupied by the solid objects. Mensuration in geometry is applied to the computation of perimeter, area, capacity, surface areas, and volumes of geometric figures. Perimeter is the distance around the plane shapes, the area is the region occupied by the shape, volume is the amount of region occupied by a solid, and the surface area of a solid is the sum of the areas of its faces. Two-dimensional Analytical Geometry Analytical geometry is popularly known as coordinate geometry is a branch of geometry where the position of any given point on a plane is defined with the help of an ordered pair of numbers, or coordinates using the rectangular Cartesian coordinate system. The coordinate axes divide the plane into four quadrants. Identifying and plotting points will be a building block of visualizing the geometric objects on the coordinate plane. In the example below, point A is defined as (4,3) and Point B is defined as (-3,1). The various properties of the geometric figures like straight lines, curves, parabolas, ellipse, hyperbola, circles, and so on can be studied using coordinate geometry. In analytical geometry, the curves are represented as algebraic equations, and this gives a deeper understanding of algebraic equations through visual representations. The distance formula, the section formula, midpoint formula, the centroid of a triangle, the area of the triangle formed by three given points, and the area of the quadrilateral formed by four points are determined using the known coordinates in the cartesian coordinate system. The equation of a straight line passing through a point, or two points, the angle between two straight lines are computed easily using the analytical geometry as they are generalized using formulas. Three-dimensional Geometry The three-dimensional geometry discusses the geometry of shapes in 3D space in the cartesian planes. Every point in the space is denoted by 3 coordinates, represented as an ordered triple (x, y,z) of real numbers. Direction Cosines of a Line If a straight line makes angles α, β and γ with the x-axis, y-axis, and z-axis respectively then cosα, cosβ, cosγ are called the direction cosines of a line. These are denoted as l = cosα, m = cosβ, and n = cosγ. For l, m, and n, l2 + m2 + n2 = 1, direction cosines of a line joining the points P(\(x_1, y_1, z_1\)) and Q(\(x_2, y_2, z_2\)) are given as :\ (\dfrac{x_2-x_1}{PQ}, \dfrac{y_2-y_1}{PQ}, \dfrac{z_2-z_1}{PQ}\), where PQ = \(\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2 + (z_2-z_1)^2}\) Direction Ratios of a Line The directional ratios of a line are the numbers that are proportional to the direct cosines of the line. If l, m, n are the direction cosines, and a,b c are the direction ratios, then l = \(\dfrac{a}{\sqrt{a^2+b^2+c^2}}\), m = \(\dfrac{b}{\sqrt{a^2+b^2+c^2}}\) and n = \(\dfrac{c}{\sqrt{a^2+b^2+c^2}}\). Direction ratios of line joining the points P(\(x_1, y_1, z_1\)) and Q(\(x_2, y_2, z_2\)) are: \((x_2-x_1),(y_2-y_1), (z_2 -z_1)\) or \((x_1-x_2),(y_1-y_2), (z_1 -z_2)\) Skew lines in Geometry The skew lines are the lines in space that are neither parallel nor intersecting, and they lie in different planes. The angle between two lines is cos θ = |\(l_1l_2 + m_1m_2 + n_1n_2\)| where θ is the acute angle between the lines. Also Cos θ = |\(\dfrac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2}\sqrt{a_1^2+b_1^2+c_1^2}}\)| Equation of Line in 3-D Geometry Vector equation of the line passing through a point with the position vector \(\vec a\) and parallel to vector \(\vec b\) is \(\vec r = \vec a+ \lambda \vec b\) Cartesian equation of the line passing through the point (\(x_1, y_1, z_1\)) and direction cosines l, m, n is \(\dfrac{x -x_1}{l} =\dfrac{y -y_1}{m}= \dfrac{z -z_1}{n}\) Vector equation of the line passing through two points with the position vectors \(\vec a\) and \(\vec b\) is \(\vec r = \vec a+ \lambda(\vec b -\vec a)\) Cartesian equation of the line passing through the points (\(x_1, y_1, z_1\)) and (\(x_2, y_2, z_2\)) is \(\dfrac{x -x_1}{x_2 -x_1} =\dfrac{y -y_1}{y_2 -y_1}= \dfrac{z -z_1}{z_2 -z_1}\) Angle Between Two Lines Angle between intersecting lines drawn parallel to each of the skew lines is the angle between skew lines. If θ is the angle between \(\vec r = \vec a_1+ \lambda \vec b_1\) and \(\vec r = \vec a_2+ \lambda \vec b_2\), then cos θ = |\(\dfrac{\vec b_1 . \vec b_2}{|\vec b_1| |\vec b_2|}\)| Also Check: Example 1. Given ABC and ADE are two triangles that are similar. Find the length of BC if AD = 7 units, DB = 3 units, AE = 4 units and DE = 7 units. Solution: In geometry, we know that similar triangles are proportional. In the given triangles, ABC and ADE are similar. Thus, AB/ AD = AC / AE = BC/ DE To find: BC Given: AB , AD, DB, DE and AE. AB = AD + DB = 7 + 3 = 10 units We know that AB/ AD = BC/ DE 10/7 = BC/7 70/7 = BC BC = 10 units Answer: The missing side BC = 10 units Example 2. What is the vertex of the given parabola? Solution: According to coordinate geometry, the vertex is the point where the axis of symmetry intersects the parabola. Here the parabola opens up, so the axis of symmetry is vertical. Looking at the graph we know that the axis of symmetry is the y-axis, which is x = -1. The y-coordinate is 3. Thus the vertex is at (-1, 3) Answer: The vertex of the given parabola is at (-1, 3) Example: 3 Find the direction cosines of the z-axis. Solution: In 3-dimensional geometry, if a straight line makes angles α, β and γ with the x-axis, y-axis, and z-axis respectively then cosα, cosβ, cosγ are called the direction cosines of a line. The z-axis makes 90º, 90º, and 0º with x, y, and z axes respectively. Thus their cosines are cos 90º, cos 90º, and cos 0º cos 90º = 0, cos 0º = 1. Therefore the direction cosines are 0,0,1 Answer: The direction cosines of the z-axis are 0,0,1. View More > go to slidego to slidego to slide Great learning in high school using simple cues Indulging in rote learning, you are likely to forget concepts. With Cuemath, you will learn visually and be surprised by the outcomes. Book a Free Trial Class FAQs on Geometry Geometry is the branch of mathematics that studies the shape, size, patterns, angle positions, dimensions, and properties of the objects around us and the spatial relationships among the objects. What are The Three Types of Geometry? The three types of geometry are Euclidean, Hyperbolic, and Elliptical Geometry. Who is The Father of Geometry? The father of Geometry is Euclid, a Greek mathematician. His book 'Elements' is the most influential work in maths serves as the fundamentals of geometry. It is a collection of propositions and postulates. The book consists of 13 volumes and it was second to the Bible in publications. What are The Five Basic Postulates of Euclidean Geometry? The five basic postulates are meant to be the fundamentals of geometry learned in the formative years. A straight line segment may be drawn from any given point to any other. A straight line may be extended indefinitely in both directions. A circle may be drawn with any given point as its center and any length as its radius. All right angles are congruent. Any two straight lines are infinitely parallel that are equidistant from one another at two points. What is LW in Geometry? LW is the formula used in geometry to find the area of a rectangle. Length and width are the parameters of a rectangle. The product of length and width is the area of the rectangle. Area of a rectangle = LW square units. How Do You Use Euclidean Geometry? Euclidean geometry studies the basic and complex geometric structures that are both plane shapes and solid shapes. Thus Euclidean geometry is used in art and architecture, computer science, astronomy, and other fields of mathematics. Euclidean geometry considers the study of points, lines, angles, and similarity and congruence in shapes, their patterns, and their transformations. Thus it has its practical applications in our day-to-day life. Why is it Called Hyperbolic Geometry? The 5th Euclidean postulate on parallel lines is not validated by the hyperbolic geometry. Hyperbolic geometry illustrates three key points that differ from Euclidean geometry. Two parallel lines converge in one direction and diverge in the other. The sum of angles in a triangle is less than 180º. Similar polygons of different areas don't exist. What Is The Difference Between Euclidean and Non-Euclidean Geometry? Euclidean Geometry is the study of the geometry of flat shapes on a plane, while non-Euclidean geometry aims at studying curved surfaces. What are the 2 Types of Geometry? Two types of geometry are plane geometry and solid geometry. Plane geometry deals with two-dimensional shapes and planes (x-axis and y-axis), while solid geometry deals with three-dimensional objects and 3D planes. These are the two types of geometry. What Is The Difference Between Solid and Plane Geometry? The study of shapes and objects that have length, width, and height is called the solid geometry, whereas the study of the shapes that have no thickness and can be represented only on a two-dimensional plane surface is called plane geometry. What is Elliptic Geometry Used For? Elliptic geometry studies the geometric structures that have curved surfaces. We use elliptic geometry to find the distance between the heavenly bodies in space, to calculate the distance between the places on the earth. How do you Teach Geometry? Teaching geometry is not an easy task that can be done with a textbook and drawing some shapes on the board. It requires a range of activities that demand learners' involvement to understand this concept with much more clarity. Some of the teaching-learning activities are listed below: Visualization- It involves learning through real-life experiences. We can take learners outside the classroom and help them to observe different shapes of objects, x-axis, and y-axis on the floor or any other flat surface, etc. Demonstration- It includes bringing some real-life objects to represent a concept in geometry. For example, it is always better to bring dice or any other object that represents a cubical shape to make learners understand the properties of a cube. DIY activities- We can ask learners to participate in some Do-It-Yourself activities that help them to work and play around with shapes and other concepts in geometry. Introducing Scientific Concepts- After all these activities, we can introduce the names and properties used in geometry using scientific terms. It includes introducing the terms like a cartesian plane, polyhedrons, quadrilaterals, etc. What is Geometry Divided Into? Geometry is the branch in mathematics that is further divided into various sub-branches that are given in the list below: Euclid's Geometry Lines Angles Plane Shapes Solid Shapes Coordinate Geometry Vectors What are the Basics of Geometry? The basics of geometry are the proper understanding of points, lines, and planes. It then helps in building all other concepts in geometry that are based on these basic concepts. Q1: If an exterior angle of a triangle is 140 degrees and its opposite interior angles are equal to each other, which of the following is the measure of the equal angles of the triangle?30 degrees80 degrees50 degrees70 degreesQ2: In a right-angled triangle, the measure of an angle is 40°. Find the measure of other angles of the triangle in degrees.$$40° and 60°$$$$60° and 30°$$$$90° and 70°$$$$90° and 50°$$Q3: What is the supplementary angle of 30 degrees?60 degrees90 degrees120 degrees150 degreesQ4: How many sides does a hexagon has?10746Q5: A triangle has the measure of its angles as 70 degrees, 60 degrees, and 70 degrees. What is the type of triangle?ScaleneEquilateralIsoscelesThe triangle does not exist 1. Lines and angles 13. Transformations Geometry is the branch of mathematics that deals with the study of points, lines, angles, surfaces, and solids. Understanding these fundamental concepts lays the foundation for exploring more advanced topics in geometry. This lesson introduces these basic geometric elements with definitions, examples, and visual aids to enhance your comprehension. Definition: A point is a precise location in space. It has no size, dimension, or area—only position. It is represented by a dot.Notation: Points are usually named with uppercase letters (e.g., Point A).Real-Life Example: A specific location on a map, such as the location of a city. A Definition: A line is a collection of points that extends infinitely in both directions. It has length but no width or thickness. The two arrows are used to show that it extends forever.Notation: Lines are named using two points on the line (e.g., Line AF or Line FA).Real-Life Example: A straight road that extends endlessly in both directions. A F We put two points in order to name the line as line AF. However, there are an infinite amount of points. You can also name it line FA. Definition: A line segment is a part of a line that has two distinct endpoints. A segment has two endpoints while a line has no endpoints.Example: Segment AF has endpoints at Point A and Point F.Real-Life Example: A specific section of a road between two intersections. A F 4. Ray Definition: A ray starts at one point (the endpoint) and extends infinitely in one direction.Example: Ray AF starts at Point A and passes through Point F, extending indefinitely beyond Point F.Real-Life Example: A laser beam that starts at a specific point and continues indefinitely in one direction. A F 5. Angle Definition: An angle is formed by two rays that share the same endpoint, called the vertex.Example: Angle FAC is formed by Ray FA and Ray AC with Point A as the vertex.Real-Life Example: The corner of a book or the intersection where two streets meet. A F C Definition: A plane is a flat, two-dimensional surface that extends infinitely in all directions. We can use arrows to show that it extends in all directions forever. A plane has length and width but no thickness.Notation: Planes are often named using three non-collinear points (e.g., Plane ABC) or represented with a symbol.Real-Life Example: The surface of a tabletop or a perfectly flat sheet of paper. 7. Parallel Lines Definition: Parallel lines are two lines in the same plane that never meet, no matter how far they are extended.Example: Lines m and n are parallel because they never intersect.Real-Life Example: Railroad tracks that run side by side without ever meeting. m n 8. Intersecting Lines Definition: Intersecting lines are lines that meet or cross each other at a single point.Example: Lines p and q intersect at Point X.Real-Life Example: Crossroads where two roads meet. p q X 9. Vertex Definition: The vertex is the common endpoint where two rays meet to form an angle.Example: Below and in blue you can see what the vertex looks like for an angle, a cube, intersecting lines, and a triangle.Real-Life Example: The corner of a room where two walls meet. Intersecting Lines V Angle V Triangle Vertex V Cube Vertex V Understanding these basic geometric concepts is essential for delving deeper into the study of geometry. These elements form the building blocks for more complex shapes, theorems, and proofs. Practice identifying and drawing these geometric entities to strengthen your grasp of the subject.