Geometry

Tutoring Centre Ferndale

Introduction

Geometry is a branch of mathematics concerned with the properties and relations of points, lines, surfaces, and solids. It is divided into several subfields, including plane geometry, solid geometry, and coordinate geometry.

Basic Definitions

Point

A point is an exact location in space with no size, dimension, or shape. It is typically represented by a dot and labeled with a capital letter.

Line

A line is a one-dimensional figure that extends infinitely in both directions. It is defined by two distinct points and is typically represented by a straight line with arrows at both ends.

Line Segment

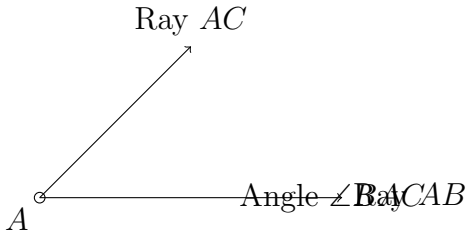
A line segment is a portion of a line that has two endpoints. It is the straight path connecting these two points.

Ray

A ray starts at a point and extends infinitely in one direction. It has a fixed starting point and no endpoint.

Angle

An angle is formed by two rays (called the sides of the angle) that share a common endpoint (called the vertex). The measure of an angle is typically given in degrees or radians.



Key Concepts

Parallel Lines

Parallel lines are lines in a plane that never intersect, no matter how far they are extended.

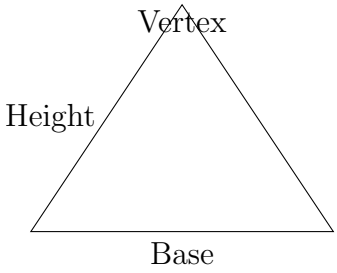
Perpendicular Lines

Perpendicular lines intersect at a right angle (90 degrees).

Triangles

A triangle is a three-sided polygon. The sum of the interior angles of a triangle is always 180 degrees. There are various types of triangles:

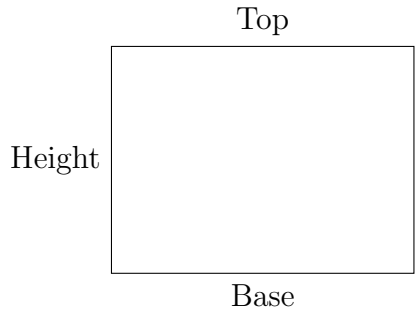
- **Equilateral Triangle:** All three sides and angles are equal.
- **Isosceles Triangle:** Two sides and two angles are equal.
- **Scalene Triangle:** All sides and angles are different.



Quadrilaterals

A quadrilateral is a four-sided polygon. Some common types are:

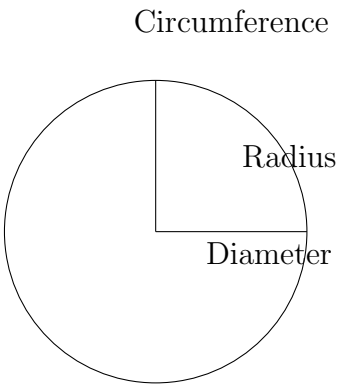
- **Square:** All sides and angles are equal.
- **Rectangle:** Opposite sides are equal, and all angles are right angles.
- **Parallelogram:** Opposite sides are parallel and equal in length.
- **Trapezoid:** Only one pair of opposite sides are parallel.



Circles

A circle is a set of all points in a plane that are equidistant from a fixed point, called the center. Key terms include:

- **Radius:** The distance from the center to any point on the circle.
- **Diameter:** A line segment passing through the center with endpoints on the circle (twice the radius).
- **Circumference:** The distance around the circle.
- **Arc:** A part of the circumference.
- **Chord:** A line segment connecting two points on the circle.



Examples and Applications

Example 1: Finding the Area of a Triangle

To find the area of a triangle, use the formula:

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

Given a triangle with a base of 5 cm and a height of 4 cm:

$$\text{Area} = \frac{1}{2} \times 5\,\text{cm} \times 4\,\text{cm} = 10\,\text{cm}^2$$

Example 2: Finding the Circumference of a Circle

To find the circumference of a circle, use the formula:

$$\text{Circumference} = 2\pi \times \text{radius}$$

Given a circle with a radius of 7 cm:

$$\text{Circumference} = 2\pi \times 7\,\text{cm} \approx 43.98\,\text{cm}$$

Conclusion

Geometry is a fundamental branch of mathematics that deals with shapes, sizes, and the properties of space. Understanding basic geometric concepts provides a foundation for more advanced topics and practical applications in various fields.