**Barron’s Math 360: A Complete Study Guide to Geometry**

# Chapter 1: Building A Geometry Vocabulary

## The Building Blocks of Geometry

* Undefined Terms. Terms so fundamental they cannot be defined, but they can be described.
* Defined Terms.
* Postulates. A postulate is a statement that is accepted without proof.
* Theorems. A theorem is a generalization that can be proved to be true.

Geometry is an example of a postulational system in which a beginning set of assumptions and undefined terms is used as a starting point in developing new relationships that are expressed as theorems.

### Undefined Terms

* Point. Indicates position, but has no length, width or dept.
* Line. A line is a set of continuous points that extend indefinitely in either direction.
* Plane. A plane is a set of points that forms a flat surface that has no depth and extends indefinitely in all directions.

### Defined Terms

1. Line Segment. A *line segment* is part of a line consisting of two points, called *endpoints*, and the set of all points between them.
2. Ray. A *ray* is part of a line consisting of a given point, called the *endpoint*, and the set of all points on one side of the endpoint.
3. Opposite rays. Opposite rays are rays that have the same endpoint and that form a line.
4. Angle. An *angle* is the union of two rays having the same endpoint. The endpoint is called a *vertex* of the angle, and the rays are called the *sides* of the angle.

### Naming Angles

An angle may be named in one of three ways.

1. Using three letters, the center letter corresponding to the vertex of the angle and the other letters representing points on the sides of the angle.
2. Placing a number at the vertex and the *interior* of the angle.
3. Using a single letter that corresponds to the vertex, provide this does not cause any confusion.

## Definitions and Postulates

### Definitions

The purpose of a definition is to make the meaning of the term clear. A good definition must:

* Clearly identify the word being defined.
* State the distinguishing characteristics.
* Be expressed in a grammatically correct sentence.
* A good definition must be reversible.

### Definitions of Collinear and Non-Collinear Points

* *Collinear points* are points that lie on the same line.
* *Non-collinear points are points that do not lie on the same line.*

### Definition of a Triangle

A *triangle* is a figure formed by connecting three non-collinear points with three different line segments, each of which has two of these points as endpoints.

#### The Reversibility Test

The reverse of a definition must be true.

A *midpoint* of a segment may be defined as a point that divides a segment into two segments of equal length.

A point that divides a segment into two segments of equal length is the midpoint of that segment.

### Initial Postulates

Not everything can be proved. There must be some basic assumptions, called postulates (or axioms), that are needed at the beginning.

1. Two points *determine* a line.

## Inductive Versus Deductive Reasoning

*Inductive reasoning* involves examining a few examples, observing a pattern, and then assuming the pattern will never end. Inductive reasoning is ***not*** a valid form of proof.

*Deductive reasoning* uses accepted *facts* (undefined terms, defined terms, postulates, and previously established theorems) to reason in a step-by-step fashion until a desired conclusion is reached.

## The IF… THEN… Sentence Structure

The statement in the “If” clause identifies the *condition* that must be met.

* *After* a theorem is proved, the “then” clause represents the fact you are allowed to apply whenever the condition in the “if” clause is true.
* *Before* a proposed theorem is proved, the “if” clause contains what we know and the “then” clause identifies what we need to prove.

## Summary

* Geometry is a postulational system built upon undefined terms, defined terms, and postulates, which are used to build theorems through a logical chain of reasoning, either inductive or deductive.
* Undefined terms are point, line, and plane.
* Defined terms in this chapter are line segment, ray, opposite rays, angle, collinear points, and non-collinear points.
* Using correct techniques in naming terms is essential for appropriate mathematical communication.