

**The Basics of Sets, Relations and Functions**

A. The Intuitive Notion of Set

1. One might understand set and the corresponding notion of membership in terms of the set-builder.
2. The set-builder is a device for forming one from many. It is governed by irrelevance of repetition and order (and that's all). We allow a set (the null set  $\emptyset$ ) to be formed from no objects.
3. Sets are the products of the set-builder; membership the relationship between a set and the objects from which it is built.

B. The Brace Notation

1. The basic use is enumerative.
2. This is extended in at least two ways: predicatively - as in  $\{x: A\}$ ; operationally - as in  $\{t:A\}$ .

C. The Basic Boolean Relations and Operations on Sets

1. Inclusion, proper and improper; union, intersection, difference, symmetric difference.
2. Venn diagram representation.
3. Some basic principles governing these relations and operations.
4. Indexed Union and Intersection. Generalized Laws for these.

D. Ordered Couples

1. The distinction between *unordered* and *ordered* couples. The basic principle governing ordered couples.
2. The 'definition' of ordered couples in terms of sets.
3. Proof that it satisfies the basic principle.

E. Cartesian Products

1. Definition of Cartesian Product. Connection with multiplication.
3. Basic Principles.

F. Relations and Functions

1. The definition of relation in terms of ordered couple. Notation.
2. Functions as a special case of relations. Notation.
3. Basic notions concerning relations (and hence functions): domain (*from* for functions); range (*onto* for functions); one-one correspondence.
3. Basic operations on relations (and hence functions): image; inverse image; restriction; converse; relative product (composition).