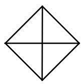


## Why

We want to generalize the notion of continuity.

## Definition

A *topological space* is a base set and a set distinguished subsets of this set for which: (1) the empty set base set are distinguished (2) the intersection of a finite family of distinguished subsets is distinguished, and (3) the union of a family of distinguished subsets is distinguished. We call the set of distinguished subsets the *topology* and we call its members the *open sets*.

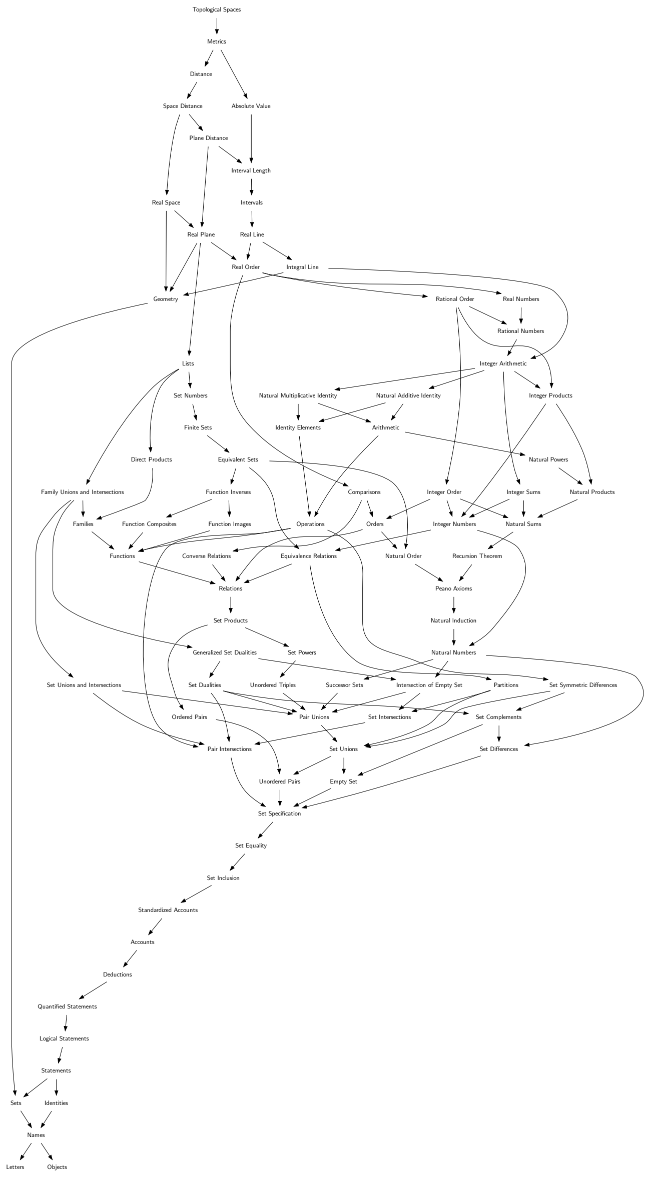
### Notation

Let $X$ be a non-empty set. For the set of distinguished sets, we tend to use $\mathcal{T}$, a mnemonic for topology, read aloud as "script T". We tend to denote elements of $\mathcal{T}$ by $O$, a mnemonic for open. We denote the topological space with base set $X$ and topology $\mathcal{T}$ by $(X, \mathcal{T})$. We denote the properties satisfied by elements of $\mathcal{T}$:

1. $X, \varnothing \in \mathcal{T}$
2. $\{O_i\}_{i=1}^{n} \subset \mathcal{T} \longrightarrow \cap_{i=1}^{n} O_i \in \mathcal{T}$
3. $\{O_\alpha\}_{\alpha \in I} \subset \mathcal{T} \longrightarrow \cup_{\alpha \in I} \in \mathcal{T}$

## Examples

**R** with the open intervals as the open sets is a topological space.


Topological Spaces
Metrics
Distance
Space Distance
Absolute Value
Plane Distance
Interval Length
Real Space
Intervals
Real Plane
Real Line
Real Order
Integral Line
Geometry
Rational Order
Real Numbers
Rational Numbers
Lists
Integer Arithmetic
Set Numbers
Natural Multiplicative Identity
Natural Additive Identity
Integer Products
Finite Sets
Identity Elements
Arithmetic
Direct Products
Equivalent Sets
Natural Powers
Family Unions and Intersections
Function Inverses
Comparisons
Integer Order
Integer Sums
Natural Products
Families
Function Composites
Function Images
Operations
Orders
Integer Numbers
Natural Sums
Functions
Converse Relations
Equivalence Relations
Natural Order
Recursion Theorem
Relations
Peano Axioms
Set Products
Natural Induction
Generalized Set Dualities
Set Powers
Natural Numbers
Set Unions and Intersections
Set Dualities
Unordered Triples
Successor Sets
Intersection of Empty Set
Partitions
Set Symmetric Differences
Ordered Pairs
Pair Unions
Set Intersections
Set Complements
Pair Intersections
Set Unions
Set Differences
Unordered Pairs
Empty Set
Set Specification
Set Equality
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects