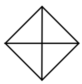


1 Why

We want to visualize symmetric relations.

2 Definition

An *undirected graph* is a pair (V, E) in which V is a finite nonempty set and E is a subset of unordered pairs of elements in V. We call the elements of V the *vertices* of the graph and the elements of E the *edges*. We call (V, E) an undirected graph *on* V.

Two vertices are *adjacent* if their pair is in the edge set. We say that the corresponding edge is *incident* to those vertices. The *adjacency set* of a vertex is the set of vertices adjacent to it. The *degree* of a vertex is the number of vertices adjacent to it; in other words, the size of its adjacency set. A graph is *complete* if each pair of two distinct vertices is adjacent. A *clique* is a maximal complete subgraph.

Other Terminology

Some authors define a clique as any set of vertices whose corresponding subgraph is complete; we prefer the term *complete subgraph* here. Some authors call the adjacency set the *neighborhood* of the vertex and call the union of the adjacency set of a vertex with the singleton of that same vertex the *closed neighborhood* of the vertex.

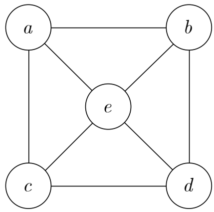


Figure 1: Undirected graph.

Notation

Let V be a non-empty set. Let $E \subset \{\{v, q\} \mid v, w \in V\}$. Then the pair (V, E) is an undirected graph. We regularly say "Let $G = (V, E)$" be a graph, in which the relevant properties of V and E are implicit.

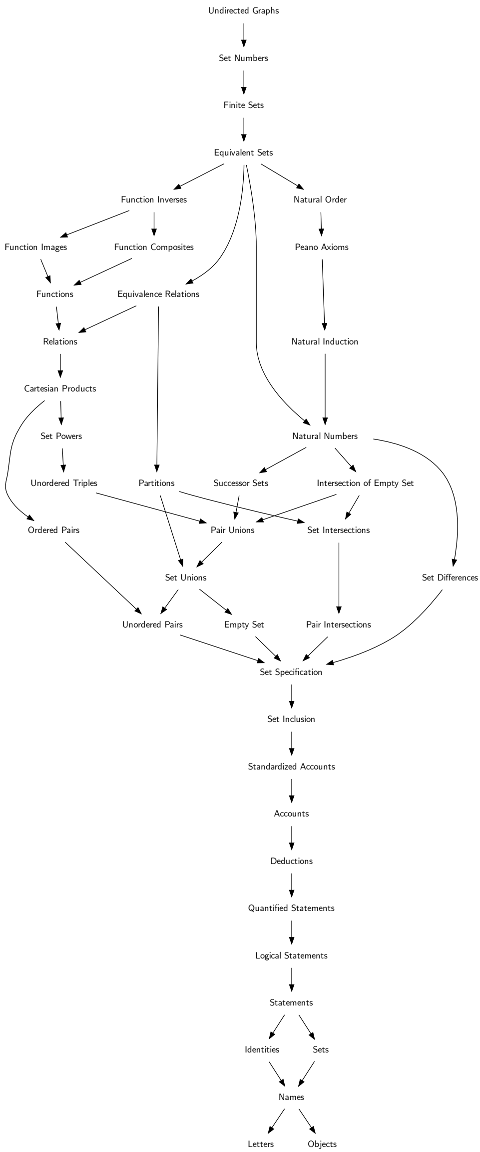
The notation $\{v, w\} \in E$ for an edge between vertices $v, w \in V$ reminds us that the edges are unordered pairs of distinct vertices.

Example

For example, let a, b, c, d, e be objects and consider an undirected graph (V, E) defind by $V = \{a, b, c, d, e\}$ and

$$E = \{\{a, b\}, \{a, c\}, \{a, e\}, \{b, d\}, \{b, e\}, \{c, d\}, \{c, e\}, \{d, e\}\}.$$

In visualizations of undirected graphs, the vertices are frequently represented as circles or rectangles in the plane and edgesa re shown as lines connecting the vertices.


Undirected Graphs
Set Numbers
Finite Sets
Equivalent Sets
Function Inverses
Natural Order
Function Images
Function Composites
Peano Axioms
Functions
Equivalence Relations
Relations
Natural Induction
Cartesian Products
Set Powers
Natural Numbers
Unordered Triples
Partitions
Successor Sets
Intersection of Empty Set
Ordered Pairs
Pair Unions
Set Intersections
Set Unions
Set Differences
Unordered Pairs
Empty Set
Pair Intersections
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects