UM 204
With ForTheL

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Contents

1 Number Systems

1.1 Natural Numbers

1.1.1 Definition

A relation R on A is a **partial order** if it satisfies

- Reflexivity, i.e., $xRy \; \forall x \in A$
- Anti-symmetry, i.e., $xRy \wedge yRx \implies x = y \; \forall x, y \in A$
- Transitivity, i.e., $xRy \wedge yRz \implies xRz \; \forall x, y, z \in A$

Additionally, if R satisfies

- xRy or $yRx \; \forall x, y \in A$

then R is an **order** (or total order) on A. A set with a partial order is called a partially ordered set or **poset**, and a set with a total order is called an ordered set or **totally ordered set**.

```
[set/sets] [element/elements]
[belong/belongs]

Signature SetSort.
    A set is a notion.

Signature ElmSort.
    Let S be a set.
    An element of S is a notion.

Let x belongs to y stand for (x is an
   element of y).
Let x is in y stand for (x belongs to y)
   .
```