# ordering relation

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| Canonical name | OrderingRelation |
| Date of creation | 2013-03-22 11:52:04 |
| Last modified on | 2013-03-22 11:52:04 |
| Owner | djao (24) |
| Last modified by | djao (24) |
| Numerical id | 9 |
| Author | djao (24) |
| Entry type | Definition |
| Classification | msc 03-00 |
| Classification | msc 81-00 |
| Classification | msc 18-00 |
| Classification | msc 17B37 |
| Classification | msc 18D10 |
| Classification | msc 18D35 |
| Classification | msc 16W30 |
| Related topic | TotalOrder |
| Related topic | PartialOrder |
| Related topic | Relation |
| Defines | opposite ordering |

Let $S$ be a set. An *ordering relation* is a relation $\leq$ on $S$ such that, for every $a, b, c \in S$:

- Either $a \leq b$, or $b \leq a$,
- If $a \leq b$ and $b \leq c$, then $a \leq c$,
- If $a \leq b$ and $b \leq a$, then $a = b$.

Equivalently, an ordering relation is a relation $\leq$ on $S$ which makes the pair $(S, \leq)$ into a totally ordered set. **Warning:** In some cases, an author may use the term "ordering relation" to mean a partial order instead of a total order.

Given an ordering relation $\leq$, one can define a relation $<$ by: $a < b$ if $a \leq b$ and $a \neq b$. The *opposite ordering* is the relation $\geq$ given by: $a \geq b$ if $b \leq a$, and the relation $>$ is defined analogously.