Day 2

Discrete Mathematics

Cartesian Product, Binary relation, Partial ordering

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Reference book for this material is

Rosen, K. H., & Krithivasan, K. (1999). *Discrete mathematics and its applications* (Vol. 6). New York: McGraw-hill.

Cartesian Product

Discussed with illustrated examples in Day 1 lecture

Binary relation

Discussed with illustrated examples in Day 1 lecture

Partial ordering

A relation R on a set S is called a partial ordering or partial order if it is reflexive, antisymmetric, and transitive. A set S together with a partial ordering R is called a partially ordered set, or poset, and is denoted by (S, R). Members of S are called elements of the poset.

- ❖ Show that the "greater than or equal" relation ($\geq$) is a partial ordering on the set of integers.

Solution:

- ✓ Because $a \geq a$ for every integer a, $\geq$ is reflexive.
- ✓ If $a \geq b$ and $b \geq a$, then $a = b$. Hence, $\geq$ is antisymmetric.
- ✓ Finally, $\geq$ is transitive because $a \geq b$ and $b \geq c$ imply that $a \geq c$.
- ✓ It follows that $\geq$ is a partial ordering on the set of integers and $(Z, \geq)$ is a poset.

Partial ordering

The elements a and b of a poset$(S, \preccurlyeq)$ are called comparable if either $a \preccurlyeq b$ or $b \preccurlyeq a$. When a and b are elements of S such that neither $a \preccurlyeq b$ nor $b \preccurlyeq a$, a and b are called incomparable.

If $(S, \preccurlyeq)$ is a poset and every two elements of S are comparable, S is called a totally ordered or linearly ordered set, and is called a total order or a linear order. A totally ordered set is also called a chain.

Thank you

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