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Relations in Logic: Transitivity, Symmetricity, Reflexivity and Equivalence

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Reflexivity

- A relation R is reflexive iff, everything bears R to itself. For example, being the same height as is a reflexive relation: everything is the same height as itself.
- A relation R is irreflexive iff, nothing bears R to itself. For example, being taller than is an irreflexive relation: nothing is taller than itself.
- A relation R is non-reflexive iff it is neither reflexive nor irreflexive. For example, loves is a non-reflexive relation: there is no logical reason to infer that somebody loves herself or does not love herself.

Symmetricity

- A relation R is symmetric iff, if x is related by R to y , then y is related by R to x . For example, being a cousin of is a symmetric relation: if John is a cousin of Bill, then it is a logical consequence that Bill is a cousin of John.
- A relation R is asymmetric iff, if x is related by R to y , then y is not related by R to x . For example, being the father of is an asymmetric relation: if John is the father of Bill, then it is a logical consequence that Bill is not the father of John.
- A relation R is non-symmetric iff it is neither symmetric nor asymmetric. For example, loves is a non-symmetric relation: if John loves Mary, then, alas, there is no logical consequence concerning Mary loving John.

Transitivity

- A relation R is transitive if and only if (henceforth abbreviated “iff”), if x is related by R to y , and y is related by R to z , then x is related by R to z . For example, being shorter than is a transitive relation: if Ben is shorter than Bill, and Bill is shorter than Fred, then it is a logical consequence that Ben is shorter than Fred.
- A relation R is intransitive iff, if x is related by R to y , and y is related by R to z , then x is not related by R to z . For example, being next in line to is an intransitive relation: if

Ben is next in line to Bill, and Bill is next in line to Fred, then it is a logical consequence that Ben is not next in line to Fred.

- A relation R is non-transitive iff it is neither transitive nor intransitive. For example, likes is a non-transitive relation: if Ben likes Bill, and Bill likes Fred, there is no logical consequence concerning Ben liking Fred.

Equivalence

A relation R is an equivalence iff R is transitive, symmetric and reflexive. For example, identical is an equivalence relation: if x is identical to y , and y is identical to z , then x is identical to z ; if x is identical to y then y is identical to x ; and x is identical to x .

-Manishika

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