

§7.1 Binary Relations (2nd pass) and §7.2 n-ary Relations Longin Jan Latecki

Slides adapted from Kees van Deemter who adopted them
from Michael P. Frank's
Course Based on the Text
Discrete Mathematics & Its Applications
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by Kenneth H. Rosen

§7.1 Binary Relations (2nd pass)

- Let A, B be any sets. A *binary relation* R from A to B is a subset of $A \times B$.
 - E.g., $<$ can be seen as $\{(n,m) \mid n < m\}$
- $(a,b) \in R$ means that a is related to b (by R)
- Also written as aRb ; also $R(a,b)$
 - E.g., $a < b$ and $<(a,b)$ both mean $(a,b) \in <$
- A binary relation R corresponds to a characteristic function $P_R: A \times B \rightarrow \{T, F\}$

Complementary Relations

- Let $R:A,B$ be any binary relation.
- Then, $\bar{R}:A \times B$, the *complement* of R , is the binary relation defined by
$$\bar{R} \equiv \{(a,b) \in A \times B \mid (a,b) \notin R\} = (A \times B) - R$$
- Note this is just \bar{R} if the universe of discourse is $U = A \times B$; thus the name *complement*.
- Note the complement of \bar{R} is R .

Example: $\bar{<} = \{(a,b) \mid (a,b) \notin <\} = \{(a,b) \mid \neg a < b\} = \geq$