§7.1 Binary Relations (2nd pass) and §7.2 n-ary Relations
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Slides adapted from Kees van Deemter who adopted them
from Michael P. Frank's
Course Based on the Text
Discrete Mathematics & Its Applications
(5th Edition)
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)∈ **<**
- 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, $\not R{:}A\times B$, the *complement* of R, is the binary relation defined by

  $$\not R :\equiv \{(a,b) \in A\times B \mid (a,b) \notin R\} = (A\times B) - R\}$$

- Note this is just $\overline{R}$ if the universe of discourse is $U = A\times B$; thus the name *complement*.
- Note the complement of $\not R$ is R.

Example: $\not< \; = \{(a,b) \mid (a,b) \notin <\} = \{(a,b) \mid \neg a<b\} = \; \geq$