# Relations Tutorial Problems

### 1. Constructing a concrete relation

Construct a relation $R$ on the set $\{1, 2, 3\}$ such that all the following are true:

- $1R2$
- $R$ is symmetric
- $R$ is transitive
- $R$ is not an equivalence relation

*(You are constructing just one relation which satisfies all four conditions,* not *a separate relation for each condition. You can specify the relation however you want: a diagram with arrows, a table of related pairs, etc.)*

### 2. Discussion manual problems

Do the following problems from the discussion manual:

- 4.2 parts (a) and (b)
- 4.3 part (a), except you do not need to prove the relation is an equivalence relation.
- 4.3 part (b)

### 3. Abstract relation proof

Let $R$ and $S$ be symmetric relations on some set $A$. Define a relation $\sim$ on $A$ such that $x \sim y$ if and only if $xRy$ and $\neg(xSy)$. Prove that $\sim$ is symmetric.