Background

Having collections of data: Good.

Knowing the connections between collections: Better!

Example(s):
Definition: (Binary) Relation

Example(s):

Definition: Related

Example(s):
Example #1: Presidents–Parties

Recall: $A = \{\text{Kennedy, Johnson, Nixon, Carter, Reagan}\}$
$B = \{\text{Dem, Rep}\}$
$R = \{(\text{Kennedy, Dem}), (\text{Johnson, Dem}), (\text{Nixon, Rep}), (\text{Carter, Dem}), (\text{Reagan, Rep})\}$

Example #2: $x \% y = 0$, $x \neq y$

Recall: $H = \{1, 2, 3, 4, 5, 6\}$
$R = \{(2, 1), (3, 1), (4, 1), (5, 1), (6, 1), (4, 2), (6, 2), (6, 3)\}$
Properties of Relations: Reflexivity

Definition: Reflexivity

Example(s):

Properties of Relations: Symmetry (1 / 2)

Definition: Symmetry

Example(s):
Properties of Relations: Symmetry (2 / 2)

Example(s): Graph Representations & Symmetry

Properties of Relations: Antisymmetry (1 / 2)

Definition: Antisymmetry

Example(s):
Properties of Relations: Antisymmetry (2 / 2)

Example(s): Graph Representations & Antisymmetry

Properties of Relations: Transitivity (1 / 2)

Definition: Transitivity

Example(s):
Properties of Relations: Transitivity (2 / 2)

Example(s):

Relational Composition Examples (1 / 4)

Three examples of creating relations from relations.

Example #1: Set Operators
Example #2: Swapping content of ordered pairs

Definition: Inverse

Example #3: Composites

Definition: Composite

Example(s):
Example #3: Composites (cont.)

Example(s):

Definition: Complement

Equivalence Relations (1 / 4)

You may have already implemented one in Java...

Definition: Equivalence Relation
Equivalence Relations (3 / 4)

So . . . why are these called \textit{equivalence} relations?

Recall:

\[
R = \{ (0, 0), (1, 1), (1, -1), (-1, 1), (-1, -1), (2, 2), (2, -2), (-2, 2), (-2, -2) \}
\]
Definition: Equivalence Class

Example(s):

Partial Orders (1 / 3)

Consider scheduling the construction of a house.

Definition: Reflexive (a.k.a. Weak) Partial Order
Definition: Irreflexivity (of Relations)

Definition: Irreflexive (a.k.a. Strict) Partial Order
Total Orders (1 / 2)

Definition: Comparable

Definition: Total Order

Total Orders (2 / 2)

Example(s):