## Hi-Level Logical Characteristics of Three Dyadic Relations - v1.1

Reflexivity
Involves one individual

## Reflexive

A relation, $R$, is reflexive iff any individual that enters into the relation bears $R$ to itself.
*Identical with: Divisible by

## Irreflexive

A relation, $R$, is irreflexive iff no individual bears $R$ to itself.
*Stand next to: Father of

## Nonreflexive

A relation which is neither reflexive nor irreflexive is nonreflexive.
*Respecting: Killing

Symmetry
Involves two individuals

## Symmetric

If any individual bears the relation to a second individual, then the second bears it to the first.
*Touching

## Asymmetric

A relation, $R$, is asymmetrical iff, if any individual bears $R$ to a second, then the second does not bear $R$ to the first.
*North of: Heavier than; Child of

Nonsymmetric
A relation which is neither symmetrical nor asymmetrical is nonsymmetric.
*Likes: Seeing

Transitivity
Involves three (or more) individuals

## Transitive

If any individual bears this relation to a second and the second bears it to a third, then the first bears it to the third. *Greater than; North of: Included in

## Intransitive

A relation, $R$, is intransitive iff, if any individual bears $R$ to a second and the second bears $R$ to a third, then the first does not bear $R$ to the third. *Father of; 2" taller than

## Nontransitive

A relation which is neither transitive nor intransitive is nontransitive.
*Admiring: Fearing

Logical Characteristics: Three Dyadic Relations

| Reflexive | Symmetric | Transitive |
| :---: | :---: | :---: |
| Irreflexive | Asymmetric | Intransitive |
| Nonreflexive | Nonsymmetric | Nontransitive |



| Permutations of Relation Properties with Unique Identifiers and Matrix Icons - v1.6 (for Discovery Mode) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| RST- $[1,1,1]$ \#Objects=4 | Reflexive, Symmetric, Transitive | $\begin{array}{lll} \hline 1 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { RSI- } \\ {[1,1,2]} \\ \text { \#Objects=4 } \end{array}$ |  | $\begin{array}{lll\|} \hline 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ \hline \end{array}$ | RSN- $[1,1,3]$ \#Objects=4 | Reflexive, Symmetric, Nontransitive | $\begin{array}{lll} \hline 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { IST- } \\ {[2,1,1]} \\ \text { \#Objects=4 } \end{array}$ | Irreflexive, Symmetric, Transitive | $\begin{array}{lll} \hline 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { ISI- } \\ {[2,1,2]} \\ \text { \#Objects=4 } \end{array}$ |  | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { ISN- } \\ {[2,1,3]} \\ \text { \#Objects=4 } \end{array}$ | Symmetric, Nontransitive | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
|  | Nonreflexive, Symmetric, Transitive | $\begin{array}{lll} 0 & 1 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{array}$ | $\begin{array}{r} \mathrm{NSI-} \\ {[3,1,2]} \\ \text { \#Objects=4 } \end{array}$ |  | $\begin{array}{lll} 0 & 0 & 1 \\ 1 & 0 & 0 \\ \hline \end{array}$ | $\mathrm{NSN}-$ $[3,1,3]$ \#Objects=4 | Symmetric, <br> Nontransitive | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{array}$ |
| RAT- $[1,2,1]$ \#Objects=4 | Asymmetric, Transitive | $\begin{array}{lll} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { RAI- } \\ {[1,2,2]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Asymmetric, Intransitive | $\begin{array}{lll} 0 & 1 & 1 \\ 0 & 0 & 0 \end{array}$ | RAN- $[1,2,3]$ \#Objects=4 | Asymmetric, Nontransitive | $\begin{array}{llll} \hline 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { IAT- } \\ {[2,2,1]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Asymmetric, Transitive | $\begin{array}{lll} 0 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { IAI- } \\ {[2,2,2]} \\ \text { \#Objects }=4 \\ \hline \end{array}$ | Intransitive | $\begin{array}{lll} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { IAN- } \\ {[2,2,3]} \\ \text { \#Objects=4 } \end{array}$ | Asymmetric, Nontransitive |  |
| $\begin{array}{r} \text { NAT- } \\ {[3,2,1]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Asymmetric, Transitive | $\begin{array}{lll} \hline 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { NAI- } \\ {[3,2,2]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Intransitive | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{array}$ | NAN- $[3,2,3]$ \#Objects=4 |  | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \\ \hline \end{array}$ |
| RNT- $[1,3,1]$ \#Objects=4 | Nonsymmetric, Transitive | $\begin{array}{lll} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{array}$ | $\begin{array}{r} \text { RNI- } \\ {[1,3,2]} \\ \text { \#Objects }=4 \\ \hline \end{array}$ | Reflexive, <br> Nonsymmetric, Intransitive | $\begin{array}{lll} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{array}$ | RNN- $[1,3,3]$ \#Objects=4 | Reflexive, <br> Nonsymmetric, <br> Nontransitive | $\begin{array}{llll} \hline 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { INT- } \\ {[2,3,1]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Nonsymmetric, Transitive | $\begin{array}{lll} \hline 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{array}$ | $\begin{array}{r} \mathrm{INI}- \\ {[2,3,2]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Irreflexive, <br> Nonsymmetric, Intransitive | $\begin{array}{lll} 1 & 0 & 1 \\ 0 & 1 & 0 \end{array}$ | $\begin{array}{r} \mathrm{INN}- \\ {[2,3,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Irreflexive, Nonsymmetric, Nontransitive | $\begin{array}{llll} \hline 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{array}$ |
| NNT- $[3,3,1]$ \#Objects=4 | Nonreflexive, Nonsymmetric, Transitive | $\begin{array}{l\|ll\|} \hline 0 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 1 & 0 \end{array}$ | $\begin{array}{r} \mathrm{NNI}- \\ {[3,3,2]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Nonreflexive, Nonsymmetric, Intransitive | $\begin{array}{llll} \hline 0 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \\ \hline \end{array}$ | NNN- $[3,3,3]$ \#Objects=4 | Nonreflexive, Nonsymmetric, Nontransitive |  |


| Permutations of Relation Properties with Unique Identifiers and Matrix Icons - v1.6 (for Design Mode) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| RST $[1,1,1$ \#Objects $=3$ | Reflexive, Symmetric, Transitive | 1 1 1 <br> 0 0 0 <br> 0 0 0 | $\begin{array}{r} \text { RSI- } \\ {[1,1,2]} \\ \text { \#Objects=3 } \end{array}$ | Reflexive, Symmetric, Intransitive | $\begin{array}{lll} \hline 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ \hline \end{array}$ | RSN- $[1,1,3]$ \#Objects=4 | Reflexive, Symmetric, Nontransitive | $\begin{array}{lll} \hline 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { IST- } \\ {[2,1,1]} \\ \text { \#Objects=3 } \end{array}$ |  | $\begin{array}{lll} \hline 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { ISI- } \\ {[2,1,2]} \\ \text { \#Objects=3 } \end{array}$ |  | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { ISN- } \\ {[2,1,3]} \\ \text { \#Objects=4 } \end{array}$ | Irreflexive, Symmetric, Nontransitive | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
| $\begin{gathered} \mathrm{N} \\ {[3,} \end{gathered}$ <br> \#Object |  | $\begin{array}{lll} 0 & 1 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{array}$ | $\begin{array}{r} \mathrm{NSI}- \\ {[3,1,2]} \\ \text { \#Objects=3} \end{array}$ |  | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} {[3,1,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ |  | $\begin{array}{lll} \hline 0 & 1 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { RA } \\ {[1,2,} \\ \text { \#Objects= } \end{array}$ | Asymmetric, Transitive | $\begin{array}{lll} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { RAI- } \\ {[1,2,2]} \\ \text { \#Objects=3 } \end{array}$ | Asymmetric, Intransitive | $\begin{array}{lll} \hline 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { RAAN- } \\ {[1,2,3]} \\ \text { \#Objects }=4 \end{array}$ | Asymmetric, Nontransitive | $\begin{array}{llll} \hline 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ \hline \end{array}$ |
| IAT $[2,2,1]$ \#Objects= | Asymmetric, Transitive | $\begin{array}{\|lll} \hline 0 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} {[2,2,2]} \\ \text { \#Objects=3 } \end{array}$ | Asymmetric, Intransitive | $\begin{array}{lll} 0 & 0 & 0 \\ 1 & 1 & 1 \\ 0 & 0 & 0 \end{array}$ | $\begin{array}{r} \text { IAN- } \\ {[2,2,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Asymmetric, Nontransitive | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 0 & 1 \end{array}$ |
| NAT $[3,2,1]$ \#Objects= | Asymmetric, Transitive | $\begin{array}{lll} \hline 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { NAI- } \\ {[3,2,2]} \\ \text { \#Objects=3 } \\ \hline \end{array}$ | Asymmetric, Intransitive | $\begin{array}{lll} 0 & 1 & 1 \\ 1 & 0 & 0 \end{array}$ | $\begin{array}{r} {[3,2,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ |  | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \\ \hline \end{array}$ |
| RNT- $[1,3,1]$ \#Objects=3 | Nonsymmetric, Transitive | $\begin{array}{lll} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 1 & 0 \end{array}$ | $\begin{array}{r} \mathrm{RNI}- \\ {[1,3,2]} \\ \text { \#Objects=3 } \\ \hline \end{array}$ | Reflexive, Nonsymmetric, Intransitive | $\begin{array}{lll} \hline 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { RNN- } \\ {[1,3,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Reflexive, Nonsymmetric, Nontransitive | $\begin{array}{lll} \hline 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 1 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { INT- } \\ {[2,3,1]} \\ \text { \#Objects=3 } \\ \hline \end{array}$ | Nonsymmetric, Transitive | 0 0 1 <br> 1 0 0 <br> 0 1 0 | $\begin{array}{r} \mathrm{INI}- \\ {[2,3,2]} \\ \text { \#Objects=3 } \\ \hline \end{array}$ | Irreflexive, Nonsymmetric, Intransitive | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { INN- } \\ {[2,3,3]} \\ \text { \#Objects=4 } \\ \hline \end{array}$ | Irreflexive, Nonsymmetric, Nontransitive | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \\ \hline \end{array}$ |
| $\begin{array}{r} \text { NNT- } \\ {[3,3,1]} \\ \text { \#Objects=3 } \end{array}$ | Nonreflexive, Nonsymmetric, Transitive | $\begin{array}{lll} \hline 0 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 1 & 0 \end{array}$ | $\begin{array}{r} \mathrm{NNI}- \\ {[3,3,2]} \\ \text { \#Objects=3 } \end{array}$ | Nonreflexive, Nonsymmetric, Intransitive | $\begin{array}{lll} 0 & 0 & 1 \\ 1 & 1 & 0 \\ \hline \end{array}$ | $\begin{array}{r} \text { NNN- } \\ {[3,3,3]} \\ \text { \#Objects=4 } \end{array}$ | Nonreflexive, Nonsymmetric, Nontransitive | $\begin{array}{lll} \hline 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{array}$ |

