# Transitivity, symmetry, reflexicvity

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The list below consist of all properties with identical domain and range plus ‘P165 incorporates (is incorporated in)’. The latter needs some extra comments.

1. By transitivity we mean that for all x,y,z: [P(x,y) ∧ P(y,z)] ⇒ P(x,z).
   1. A property P is not transitive if there exists at least one triple x,y,z so that [P(x,y) ∧ P(y,z)] ⇒ P(x,z) is not the case
   2. An axiom of the form [P(x,y) ∧ P(y,z)] ⇒ ¬P(x,z) states that there exists no triple that fulfils the transitivity criterion.
2. By symmetry we mean that for all x,y: P(x,y) ⇒ P(y,x).
   1. A property P is not symmetric if there exists at least one pair x,y so that P(x,y) ⇒ P(y,x) is not the case
   2. An axiom of the form P(x,y) ⇒ ¬ P(y,x) states that there is no pair that fulfils the symmetry criterion
3. By reflexivity we mean that for all x,y: P(x,x).
   1. A property P is not reflexive if there exists at least one x so that P(x,x) is not the case
   2. An axiom of the form ¬ P(x,x) states that there is no x that fulfils the reflexivity criterion.

In general if we write ‘The property is not transitive (symmetric, reflexive)’ in the scopenote, the axiom of type 1b (2b, 3b) may be stronger than we actually intend. We have to add an existential quantor and negate the criterion. For example ‘P5 is not symmetric’ : ∃x,y ¬ [P5(x,y) ⇒ P5(y,x)]

We also use the term ‘non-symmetric’. Apparently we mean by this that for all pairs x,y if P5(x,y) then we can conclude that the reflexive case, P5(y,x), is not the case. This is expressed as ∀x,y: [P(x,y) ⇒ ¬ P(y,x)].

We should state this difference in the terminology part and check the document.

## P5 consists of (forms part of)

Domain: Ε3 Condition State

Range: Ε3 Condition State

Quantification: many to many (0,n:0,n)

This property is transitive and non-reflexive.

## P9 consists of (forms part of)

Domain: E4 Period

Range: E4 Period

Subproperty of: E92 Spacetime Volume. P10i contains: E92 Spacetime Volume

Quantification: many to many (0,n:0,n)

This property is transitive and non-symmetric

## P10 falls within (contains)

Domain: E92 Spacetime Volume

Range: E92 Spacetime Volume

Subproperty of: E92 Spacetime Volume. P132 spatiotemporally overlaps with: E92 Spacetime Volume

Quantification: many to many, necessary, dependent (1,n:0,n)

This property is transitive and reflexive.

## P46 is composed of (forms part of)

Domain: E18 Physical Thing

Range: E18 Physical Thing

Superproperty of: E19 Physical Object. P56 bears feature (is found on): E26 Physical Feature

Quantification: many to many (0,n:0,n)

This property is transitive and non-reflexive

## P69 has association with (is associated with)

Domain: E29 Design or Procedure

Range: E29 Design or Procedure

Quantification: many to many (0,n:0,n)

The property is not transitive reflexive?

P73i has translation (is translation of)

Domain: E33 Linguistic Object

Range: E33 Linguistic Object

Subproperty of: E70 Thing. P130i features are also found on: E70 Thing

Quantification: many to many (0,n:0,n)

This property is non-symmetric. Not transitive?

## P86 falls within (contains)

Domain: E52 Time-Span

Range: E52 Time-Span

Quantification: many to many (0,n:0,n)

This property is transitive. Reflexive?

## P89 falls within (contains)

Domain: E53 Place

Range: E53 Place

Quantification: many to many, necessary, dependent (1,n:0,n)

This property is transitive and reflexive.

## P106 is composed of (forms part of)

Domain: E90 Symbolic Object

Range: E90 Symbolic Object

Superproperty of:E73 Information Object. P165 incorporates (is incorporated in): E90 Symbolic Object

Quantification: many to many (0,n:0,n)

This property is transitive and non-reflexive.

## P121 overlaps with

Domain: E53 Place

Range: E53 Place

Quantification: many to many (0,n:0,n)

This property is symmetric. This property is not transistive

## P122 borders with

Domain: E53 Place

Range: E53 Place

Quantification: many to many (0,n:0,n)

This property is not transitive. This property is symmetric.

## P127 has broader term (has narrower term)

Domain: E55 Type

Range: E55 Type

Quantification: many to many (0,n:0,n)

This property is transitive Reflexive?

## P130 shows features of (features are also found on)

Domain: E70 Thing

Range: E70 Thing

Superproperty of: E33 Linguistic Object. P73i is translation of: E33 Linguistic Object

E18 Physical Thing. P128 carries (is carried by): E90 Symbolic Object

Quantification: many to many (0,n:0,n)

This property is not transitive. Reflexive?

## P132 spatiotemporally overlaps with

Domain: E92 Spacetime Volume

Range: E92 Spacetime Volume

Superproperty of: E4 Period. P9 consists of (forms part of): E4 Period

E92 Spacetime Volume. P10 falls within (contains): E92 Spacetime Volume

Quantification: many to many (0,n:0,n)

This property is symmetric.This property is not tranitive

## P133 is spatiotemporally separated from

Domain: E92 Spacetime Volume

Range: E92 Spacetime Volume

Quantification: many to many (0,n:0,n)

This property is not transitive. This property is symmetric.

## P134 continued (was continued by)

Domain: E7 Activity

Range: E7 Activity

Subproperty of: E7 Activity. P15 was influenced by (influenced): E1 CRM Entity

E2 Temporal Entity. P176i starts before the start of (starts after the start of): E2 Temporal Entity

Quantification: many to many (0,n:0,n)

This property is not transitive. Reflexive?

## P139 has alternative form

Domain: E41 Appellation

Range: E41 Appellation

Quantification: many to many (0,n:0,n)

The relationship is not transitive Reflexive?

## P148 has component (is component of)

Domain: E89 Propositional Object

Range: E89 Propositional Object

Quantification: many to many (0:n,0:n)

This property is transitive Reflexive?

## P150 defines typical parts of (defines typical wholes for)

Domain: E55 Type

Range: E55 Type

Quantification: many to many (0,n:0,n)

This property is not transitive. Reflexive?

## P152 has parent (is parent of)

Domain: E21 Person

Range: E21 Person

Quantification: many to many, necessary (2,n:0,n)

This property is not transitive. (and of course not reflexive or symmetric)

## P165 incorporates (is incorporated in)

Domain: E73 Information Object

Range: E90 Symbolic Object

Subproperty of: E90 Symbolic Object. P106 is composed of (forms part of): E90 Symbolic Object

Quantification: many to many (0,n:0,n)

When restricted to information objects, that is, seen as a property with E73 Information Object as domain and range the property is transitive. Reflexive?

## P173 starts before or with the end of (ends after or with the start of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Superproperty of: E2 Temporal Entity. P174 starts before the end of (ends after the start of): E2

Temporal Entity

Quantification: many to many (0,n:0,n)

The property is not transitive Transitive in a non fuzzy model(?)

## P174 starts before the end of (ends after the start of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P173 starts before or at the end of (ends after or with the start of):

E2 Temporal Entity

Superproperty of: E2 Temporal Entity. P175 starts before or with the start of (starts after or with the

start of): E2 Temporal Entity

E2 Temporal Entity. P184 ends before or with the end of (ends with or after the end of): E2 Temporal Entity

Quantification: many to many (0,n:0,n)

This property is not transitive. Reflexive?

## P175 starts before or with the start of (starts after or with the start of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P174 starts before the end of (ends after the start of): E2 Temporal

Entity

Superproperty of: E2 Temporal Entity. P176 starts before the start of (starts after the start of): E2

Temporal Entity

Quantification: many to many (0,n:0,n)

In a model with fuzzy borders, this property will not be transitive. Reflexive?

## P176 starts before the start of (starts after the start of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P175 starts before or with the start of (starts after or with the start

of): E2 Temporal Entity

Superproperty of: E7 Activity. P134i was continued by: E7 Activity

E2 Temporal Entity. P182 ends before or at the start of (starts after or with the end of): E2 Temporal Entity

Quantification: many to many (0,n:0,n)

This property is transitive. Reflexive?

## P182 ends before or with the start of (starts after or with the end of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P176 starts before the start of (starts after the start of): E2

Temporal Entity (transitive)

E2 Temporal Entity. P185 ends before the end of (ends after the end of): E2 Temporal

Entity (transitive)

Superproperty of: E2 Temporal Entity. P183 ends before the start of (starts after the end of): E2

Temporal Entity

Quantification: many to many (0,n:0,n)

This property is transitive(?)

## P183 ends before the start of (starts after the end of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P182 ends before or at the start of (starts after or with the end of):

E2 Temporal Entity

Quantification: many to many (0,n:0,n)

This property is transitive. Reflexive?

## P184 ends before or with the end of (ends with or after the end of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P174 starts before the end of (ends after the start of): E2 Temporal

Entity (not transitive)

Superproperty of: E2 Temporal Entity. P185 ends before the end of (ends after the end of): E2 Temporal

Entity (transitive)

Quantification: many to many (0,n:0,n)

Transitive in a non fuzzy model(?)

## P185 ends before the end of (ends after the end of)

Domain: E2 Temporal Entity

Range: E2 Temporal Entity

Subproperty of: E2 Temporal Entity. P184 ends before or with the end of (ends with or after the end of):

E2 Temporal Entity

Superproperty of: E2 Temporal Entity. P182 ends before or at the start of (starts after or with the end

of): E2 Temporal Entity

Quantification: many to many (0,n:0,n)

This property is transitive. Reflexive?

## P189 approximates (is approximated by)

Domain: E53 Place

Range: E53 Place

Quantification: many to many (0,n:0,n)

This property is not transitive. Reflexive?

## P198 holds or supports (is held or supported by)

Domain: E18 Physical Thing

Range: E18 Physical Thing

Quantification: one to many (0,n:0,n)

This property is transitive Reflexive?