# Relation 6: Part-Whole

## Definition

Part-Whole(X, Y) is true for a sentence S that mentions entities X and Y if and only if:

(1) X and Y appear close in the syntactic structure of S (we do not assign the relation to entities from separate clauses in a composite sentence);

(2) according to common sense, the situation described in S entails that X is part of Y;

(3) X and Y follow the constraints proposed by Winston, Chaffin and Hermann in a classification into six specialized types of the Part-Whole relation, of which we consider five – see a note below.

## Definition – proviso

We discuss the specialized types to help the annotators better identify the relation, but the automated classification task will only categorize the examples into Part-Whole / not Part-Whole.

## Definition – note

Winston, Chaffin, and Hermann (1987) performed psycholinguistic experiments to identify part-whole instances based on the way in which the parts contribute to the structure of the wholes. They proposed six subcategories of Part-Whole. For the purpose of this competition, we do not consider the 'Feature-Activity' subcategory, due to the complexities of nominalizations present in such instances. The other five categories are:

a) Component-Integral object,
b) Member-Collection,
c) Portion-Mass,
d) Stuff-Object, and
e) Place-Area.

The specific definitions are as follows:

a) The Component-Integral relation is the relation between components and the objects to which they belong.

Examples: cup-handle, kitchen-apartment, and wing-bird.

b) The Member-Collection relation represents the membership in a collection.

Examples: soldier-army, professor-faculty, and tree-forest.

c) Portion-Mass captures the relations between portions and masses, extensive objects and physical dimensions. The parts are similar to each other and to the wholes which they comprise.

Examples: slice-pie (here 'slice' is metonymic and refers to 'a slice of a pie') and meter-kilometer.

d) The Stuff-Object category encodes the relations between an object and the stuff of which it is partly or entirely made of. The parts are not similar to the wholes which they comprise and cannot be separated from the whole.

Examples: silk-dress, steel-car, and alcohol-wine.

e) Place-Area captures the relation between an area and a sub-area or a place within the area. This relation also holds between the extent of a physical object -- its area, as it were -- and part of that extent. A Place-Area part cannot be separated from its whole.

Examples in the (general) geographical sense: an oasis is part of a desert; a county is part of a state; a path is part of a forest.

Examples in the (general) geometrical sense: the end (of a stick) is part of (that) stick; the surface (of a lake) is part of (that) lake; the side (of a building) is part of (that) building.

## Positive examples

"Some sophisticated <e2>tables</e2> have three <e1>legs</e1>."
WordNet(e1) = "n3", WordNet(e2)="n2"; Part-Whole(e1, e2) = "true"

**Comment:** This is a typical example of Component-Integral subclass of Part-Whole. However, in general, the verb 'have' is ambiguous since it can encode other relations as well.

"John opened the <e1>door</e1> of the <e2>car</e2> with difficulty."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "true"

**Comment:** A typical example of Component-Integral subclass of Part-Whole in a noun phrase pattern.

"The <e2>substance</e2> consists of three <e1>ingredients</e1>."
WordNet(e1) = "n1", WordNet(e2)="n2"; Part-Whole(e1, e2) = "true"

**Comment:** This is also a typical true example of Stuff-Object subclass of Part-Whole.

"Usually, more than one <e2>daisy</e2> <e1>flower</e1> grows on top of a single stem."
WordNet(e1) = "n2", WordNet(e2)="n1"; Part-Whole(e1, e2) = "true"

**Comment:** This is a prototypical example of Component-Integral subclass of Part-Whole. Here 'daisy' refers to that part of the plant that blooms.

"Mary looked back and whispered: 'I know every <e1>tree</e1> in this <e2>forest</e2>, every scent.'"
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "true"

**Comment:** This is a prototypical example of Member-Collection subclass of Part-Whole.

"Peel each fruit and then cut one <e1>slice</e1> from the center of the <e2>orange</e2> and set aside."
WordNet(e1) = "n2", WordNet(e2)="n1"; Part-Whole(e1, e2) = "true"

**Comment:** This is a prototypical example of Portion-Mass, a subclass of Part-Whole.

"And now envision quiet, secluded, special place like a charming <e1>oasis</e1> in the <e2>desert</e2>."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "true"

**Comment:** This is a prototypical example of Place-Area, a subclass of Part-Whole.

## Near-miss negative examples

"That's as sad as the song of a <e2>bird</e2> without <e1>wings</e1>."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "false"

**Comment:** Here the preposition 'without' shows this is not a Part-Whole relation, although usually birds have wings.

"The little <e1>girl</e1> has four <e2>cats</e2>."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "false"

**Comment:** The verb 'have' can encode a multitude of relations. Here it is Possession.

"The <e2>woman</e2> with her <e1>triplets</e1> received a lot of attention."
WordNet(e1) = "n2", WordNet(e2)="n1"; Part-Whole(e1, e2) = "false"

**Comment:** The preposition 'with' is ambiguous. Here it encodes Kinship and Accompaniment.

"Try them with orange or yellow flowers of red-hot poker, solidago or other late <e1>daisy</e1> <e2>flowers</e2>, such as rudbeckias and heliopsis."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "false"

**Comment:** The relationship here is IS-A (also called Hypernymy) since daisy has the sense of a type of flower.

"He was <e1>part</e1> of the <e2>game</e2> now, and therefore had a strong motive for justifying his own actions."
WordNet(e1) = "n1", WordNet(e2)="n1"; Part-Whole(e1, e2) = "false";

**Comment:** To be 'part of something' is a typical Part-Whole pattern. However, this example is a metonymic case encoding a Participant-Event relation.