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- E.g., Specifying all *mammals* are warm blooded is more concise than specifying each individual is warm blooded.
- A **class** is the set of those actual and potential individuals that would be members of the class.  
E.g., class of chairs includes chairs that have not been build or may never be built.

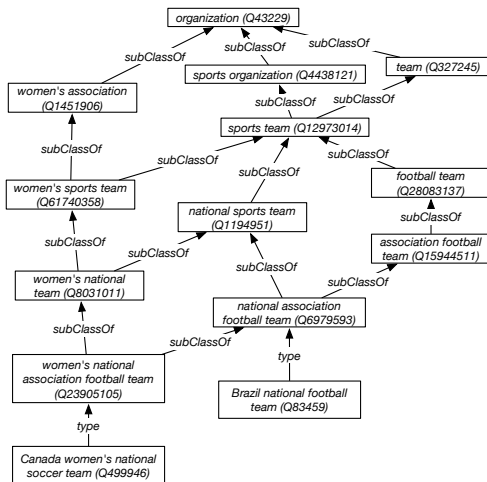
# Class Hierarchies

- Class  $S$  is a **subclass** of class  $C$  means  $S$  is a subset of  $C$ .  
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- Part of the Wikidata class structure:



# Property Hierarchies

- Property  $p_1$  is a **sub-property** of property  $p_2$  if every pair related by  $p_1$  is also related by  $p_2$ .
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- “part of” (P361) is a sub-property of “partially coincident with” (P1382)

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These are not (currently) part of Wikidata!



Aristotle [350 B.C.] suggested the definition of a class  $C$  in terms of:

- **Genus**: a super-class
- **Differentia**: the attributes that make members of the class  $C$  different from other members of the super-class

*“If genera are different and co-ordinate, their differentiae are themselves different in kind. Take as an instance the genus ‘animal’ and the genus ‘knowledge’. ‘With feet’, ‘two-footed’, ‘winged’, ‘aquatic’, are differentiae of ‘animal’; the species of knowledge are not distinguished by the same differentiae. One species of knowledge does not differ from another in being ‘two-footed’.”*

Aristotle, *Categories*, 350 B.C.

*The art of ranking things in genera and species is quite important, and greatly helps our judgment as well as our memory. . . . Order largely depends on it, and many good authors write in such a way that their whole account could be divided and subdivided according to a procedure related to genera and species. This helps one not merely to retain things in one's memory, but also to find them there. Writers who have laid out all sorts of notions under certain headings or categories have done something very useful.*

– G. W. Leibniz [1705]

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- Each attribute gives a property and a value.
- For each property, define the domain to be most general class for which it makes sense.
- Make the range of the property another class that makes sense (perhaps requiring this range class to be defined, either by enumerating its values or by defining it using an Aristotelian definition).

# Designing Classes

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What is a most specific superclass of square?

A square is both a rectangle and a rhombus.

Neither is more specific than the other.