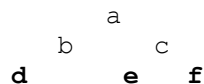# Being a reasoner

A TBox contains the following axioms :

```
Tree ≡ child only Tree
SmallTree1 ≡ child only Leaf
SmallTree2 ≡ left only Leaf and right only Leaf
right subproperty of child
left subproperty of child
right is functional
left is functional
```

1. Given the ABox

```
Tree(a)  Tree(b)  Tree(c)  Tree(d)  Tree(e)  Tree(f)
Leaf(d)  Leaf(e)  Leaf(f)
left(a,b)  right(a,c)  left(b,d)   left(c,e)  right(c,f)


      a
    b      c
  d     e    f
```

what would be the inferred members of SmallTree1 and SmallTree2? Motivate your answers (remember that we are doing open-world reasoning).

2. Consider the ABox

```
Tree(a)  Tree(b)
child(a,b)  child(b,a)
```

   a) What about the consistency of this ABox together with the TBox?
   b) What does this (in)consistency mean?

3. Write additional axioms to define the notion of *incomplete tree* (a binary tree is complete if it is either a leaf (no child) or its left and right children are complete)

Answers to question 3

3.1

SmallTree1: **no inferred instance**. It cannot be proved that all the children of a, b, … are in Leaf because they may have some yet unknown child.
SmallTree2: **c** because left(c,e) and e is in Leaf and left is functional => only Leaf can be proved. The same is true for right(c, f). This is not true for b because its right child is unknown

3.2

   a) This ABox is consistent with the Tbox
   b) These axioms are not sufficient to specify a tree.

3.3

CompleteTree = Leaf or (left only CompleteTree and right only CompleteTree)
InCompleteTree = Tree and (not CompleteTree)