

Homework 2, deadline 11.01.2017, 14:30

1. (3 points) Write a grammar (syntax) for the Bingo game. Before you write the rules, describe what exactly you want to represent (various perspectives are possible and your solution is considered correct if your rules produce what you state you want to represent)
2. (3 points) Implement a function `listAtoms` that collects the names of propositional atoms that occur in a formula.
3. (8 points) Implement the following syntax fragment:
  - a. Basic expressions:
    - i. Names: Bob, Nils, John
    - ii. One-place predicates: HasMustache, IsBald
    - iii. Two-place predicates: Sees, Likes, Knows
  - b. Formulas:
    - i. If  $\delta$  is a one-place predicate and  $\alpha$  is a name, then  $\delta \alpha$  is a formula. Make sure that you display such a formula as  $\delta(\alpha)$  by appropriately defining show.
    - ii. If  $\gamma$  is a two-place predicate and  $\alpha$  and  $\beta$  are names, then  $\gamma \beta \alpha$  is a formula. Make sure that you display such a formula as  $\gamma(\alpha, \beta)$  by appropriately defining show.
    - iii. If  $\phi$  is a formula, then  $\sim \phi$  (the negation of  $\phi$ ) is a formula.
    - iv. If  $\phi$  and  $\psi$  are formulas, then  $\phi \wedge \psi$  (the conjunction of  $\phi$  and  $\psi$ ) is a formula.
    - v. If  $\phi$  and  $\psi$  are formulas, then  $\phi \vee \psi$  (the disjunction of  $\phi$  and  $\psi$ ) is a formula.