

Assignment Series 2

Foundations and Introduction to O'Caml

Assignment 3: α -equivalence

The term α -equivalence has informally been introduced during the lecture as syntactic equivalence modulo the naming of bound variables. Give a formal (inductive) definition of α -equivalence as an equivalence relation on λ -terms.

Assignment 4: Programming in O'Caml

In a public swimming pool the base entrance fee for an adult is 6 Euros. The reduced entrance fee for children, students, etc is 4 Euros. If someone stays less than two hours in the pool the base fee is reduced by two Euros. In case the sauna is to be utilised as well there is a surcharge of 6 Euros. Last not least, guests are only charged half the regular fee on their birthday.

Summarise the parameters that determine the exact entrance fee to the swimming pool and associate an O'Caml type with each of them. Document certain restrictions on the legal value range of parameters by means of comments. Implement an O'Caml function that computes the correct entrance fee to the swimming pool depending on the above parameters.

Assignment 5: More Programming in O'Caml

Implement the following functions in O'Caml:

1. The function `isLeapYear` checks if a given integer number refers to a leap year according to the Gregorian calendar introduced in 1582, i.e. a year is a leap year if and only if it is a year after 1582 that can be divided by 4, but not by 100, or it can be divided by 400.
2. The function `isDate` checks if a triple of integer numbers (day, month, year) is a correct date according to the Gregorian calendar.
3. The function `date2str` yields to a given correct calendar triple (day, month, year) a proper English date as a character string, e.g. the 9th of February 2010 shall be represented as "February 9th, 2010".
4. The function `firstDigit` yields the first digit of an integer number as a character.
5. The function `digitSum` computes the sum of the digits of an integer number.
6. The function `isPalindrome` checks if a given character string is a palindrome, i.e. it is identical whether being read from left to right or from right to left.
7. The function `isPrime` checks if a given integer number is a prime number.

For each function, give the most general type and document the purpose of auxiliary functions not specified above using appropriate comments.

Assignment due date: February 16, 2010, lecture