

10 Prolog (acr31)

In this question we will write a program to assign guests to seats around a dinner table. The table is rectangular with the same number of seats along both of the long sides. There are no seats along the short sides. Two guests sit *near* each other if they occupy adjacent seats on the same side of the table, or sit directly opposite one another. Each guest at the dinner table may express a preference to sit near to one or more other guests.

When answering this question you should ensure that each of your predicates has a comment giving a declarative reading of its behaviour and you should avoid unnecessary use of cut. Your solutions should not use any extra-logical predicates (such as `assertz`) and you should not assume the existence of any library predicates.

- (a) Define the concept of *generate and test* using this problem as an example. [2 marks]
- (b) Describe a suitable approach for representing guests, their places at the table and their preferences. [2 marks]
- (c) Implement a predicate `nextTo(A,B,Assigned)` which is true if guest `A` is sitting adjacent-to or directly opposite guest `B` in the seating assignment `Assigned`. [4 marks]
- (d) Implement a predicate `satisfied(Assigned,Prefs)` which is true if `Assigned` is a seating assignment which meets all the preferences specified in `Prefs`. [3 marks]
- (e) Implement a predicate `assign(N,Prefs,Assigned)` which succeeds if `Assigned` is a valid seating assignment for `N` guests with preferences `Prefs`. Your predicate should be able to generate the assignment and should fail if an odd number of guests are requested. [6 marks]
- (f) What technique could you use to find the best assignment in those cases where it is not possible to meet the preferences of all the guests? Explain in words how you would alter your solution to do this. [3 marks]