

P1: Lists in Prolog (1)

1. (a) Write a predicate that returns the difference of two sets.
(b) Write a predicate that adds the value 1 after every even element in a list.
2. (a) Write a predicate that determines the least common multiple of the elements of a list of integers.
(b) Write a predicate that adds a given value v after the 1st, 2nd, 4th, 8th, ... element of a list.
3. (a) Write a predicate that transforms a list into a set, preserving the order of first appearance. Example: $[1,2,3,1,2]$ is transformed into $[1,2,3]$.
(b) Write a predicate that decomposes a list of numbers into a list of the form [list-of-even-numbers, list-of-odd-numbers] (i.e., a list with two elements, each being a list of integers), and also returns the number of even and odd elements.
4. (a) Write a predicate that substitutes an element in a list with another list.
(b) Remove the element at the n -th position of a linear list.
5. (a) Write a predicate that deletes all occurrences of a certain atom from a list.
(b) Define a predicate that, from a list of atoms, produces a list of pairs (atom n), where atom appears n times in the initial list. For example: `numar([1, 2, 1, 2, 1, 3, 1], X)` will produce $X = [[1, 4], [2, 2], [3, 1]]$.
6. (a) Write a predicate that removes from a list all elements that are repeated (e.g., $l=[1,2,1,4,1,3,4] \Rightarrow l=[2,3]$).
(b) Remove all occurrences of the maximum element from a list of integers.
7. (a) Write a predicate that returns the union of two sets.
(b) Write a predicate that, given a list, returns the set of all pairs from the list. For example, with $[a, b, c, d]$ it will produce $[[a, b], [a, c], [a, d], [b, c], [b, d], [c, d]]$.
8. (a) Write a predicate that tests if a list is a set.
(b) Write a predicate that removes the first 3 occurrences of an element from a list. If the element appears less than 3 times, it will be removed as many times as it appears.
9. (a) Write a predicate that returns the intersection of two sets.
(b) Construct the list (m, \dots, n) , i.e., the set of integers in the interval $[m, n]$.
10. (a) Insert an element at the n -th position of a list.
(b) Define a predicate that returns the greatest common divisor of the numbers in a list.
11. (a) Write a predicate that tests if a list of integers has a "valley" shape (a set is said to have a "valley" shape if the elements decrease up to a point, then increase. For example: 10 8 6 9 11 13).
(b) Calculate the alternating sum of the elements of a list $(l_1 - l_2 + l_3 \dots)$.
12. (a) Write a predicate that substitutes an element in a list with another.
(b) Construct the sublist (l_m, \dots, l_n) of the list (l_1, \dots, l_k) .

13. (a) Write a predicate that transforms a list into a set, in the order of the last appearance.
Example: $[1,2,3,1,2]$ is transformed into $[3,1,2]$.
(b) Calculate the greatest common divisor of the elements of a list.
14. (a) Write a predicate that tests the equality of two sets, without using the difference of two sets.
(b) Define a predicate that selects the n -th element of a list.
15. (a) Write a predicate that succeeds if a list has an even number of elements and fails otherwise, without counting the elements of the list.
(b) Remove the first occurrence of the minimum element from a list of integers.