Artificial Intelligence (CS308)

Assignment - 5

U19CS012

1.) Perform Towers of Hanoi.

Prolog Code

```
% Base Case - Only 1 disk to be moved from A To C
toh(1, A, C, _) :-
    write(' Move Top Disk from '),
    write(A),
    write(' to '),
    write(C),
    nl.

% Recursive toh defination to Move N disks from A to C using B {Helper}
toh(N, A, C, B) :-
    N>1,
    M is N-1,
    % Move N-1 disks from src (A) to intermediate (B)
    toh(M, A, B, C),
    % Move the Nth disk from src (A) to destination (C)
    toh(1, A, C, _),
    % Move the Remaining N-1 disks from intermediate (B) to destination (C)
    toh(M, B, C, A).
```

Output

```
?- toh(2,src,dest,aux).
 Move Top Disk from src to aux
 Move Top Disk from src to dest
 Move Top Disk from aux to dest
true .

?- toh(3,src,dest,aux).
 Move Top Disk from src to dest
 Move Top Disk from src to aux
 Move Top Disk from dest to aux
 Move Top Disk from src to dest
 Move Top Disk from aux to src
 Move Top Disk from aux to dest
 Move Top Disk from src to dest
true .
```

2.) WAP to check whether the number is **present** in the list or not.

Prolog Code

```
% If the Element is Equal to Head of the List
present(X, [X|_]).

% Recursive Call for Remaining List
present(X, [_|T]) :-
    present(X, T).
```

Output

```
?- present(3,[1,2,3,4,5,6]).
true .

?- present(7,[1,2,3,4,5,6]).
false.
```

3.) WAP to add a number {in Front} of list.

Prolog Code

```
add_number(X, L1, [X|L1]).
```

Output

```
?- add_number(1,[2,3,4,5],Ans).
Ans = [1, 2, 3, 4, 5].
```

4.) WAP to **Concat Two Lists** and store the result in **Third list**.

Prolog Code

```
% Usage - append_list(L1, L2, Concat_List)

% If L1 is empty, resultant list will be equal to L2 (base case)
append_list([], L2, L2).

% Recursive Defination of List Concatanation
append_list([H | T], L2, [H | L3]) :-
    % Tail & L2 will be Concatanated to L3
    append_list(T, L2, L3).
```

Output

```
?- append_list([1,2,3],[a,b],Ans).
Ans = [1, 2, 3, a, b].
```

5.) WAP to delete an element from the list.

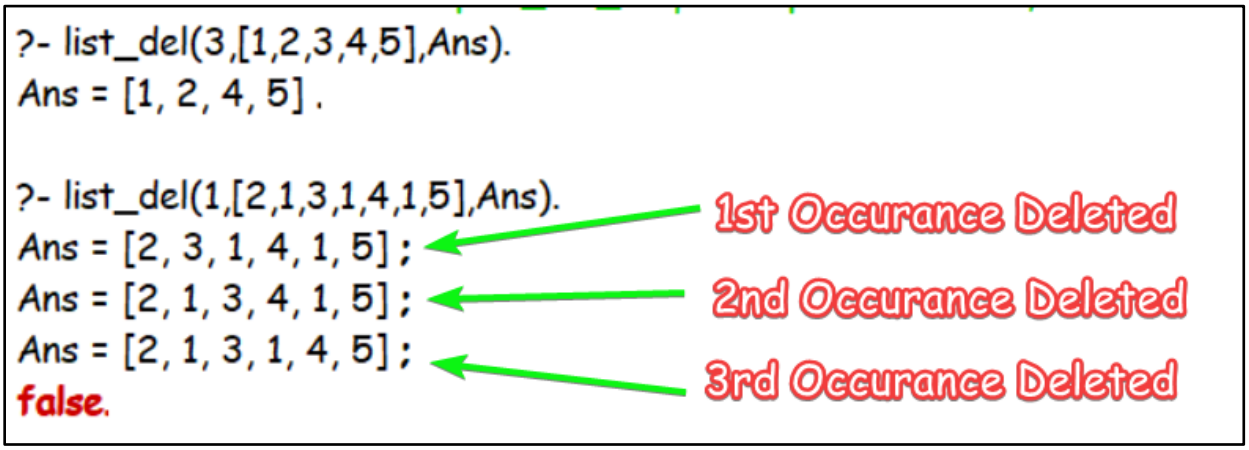
Prolog Code

```
% Base Case - Remove X from List Containing [X], will lead to Empty List
list_del(X, [X], []).

% If X is Present in the Head, Delete it
list_del(X,[X|Tail], Tail).

% Recursive Function
list_del(X, [Head|Tail], [Head|NewTail]) :-
    % Recursively Braking List into Head & Tail
    list_del(X,Tail,NewTail).
```

Output



6.) WAP to sum the elements of a list of numbers.

Prolog Code

```
% Base Case - Sum of Empty List = 0
sumlist([],0).

% Recursive Defination
sumlist([H|T],N) :- sumlist([T],N1), N is N1 + H.
```

Output

```
?- sumlist([1,0,-1],Ans).
Ans = 0.

?- sumlist([1,2,3,4], Ans).
Ans = 10.

?- sumlist([-1,-2,-3], Ans).
Ans = -6.
```

```
?- sumlist([10000000000000000,10101010101010101010101101010],Ans).
Ans = 10101010101020101010101101010.
```

[Note: This also helps us to add **Really Big Numbers** as well!]

SUBMITTED BY: U19CS012

BHAGYA VINOD RANA