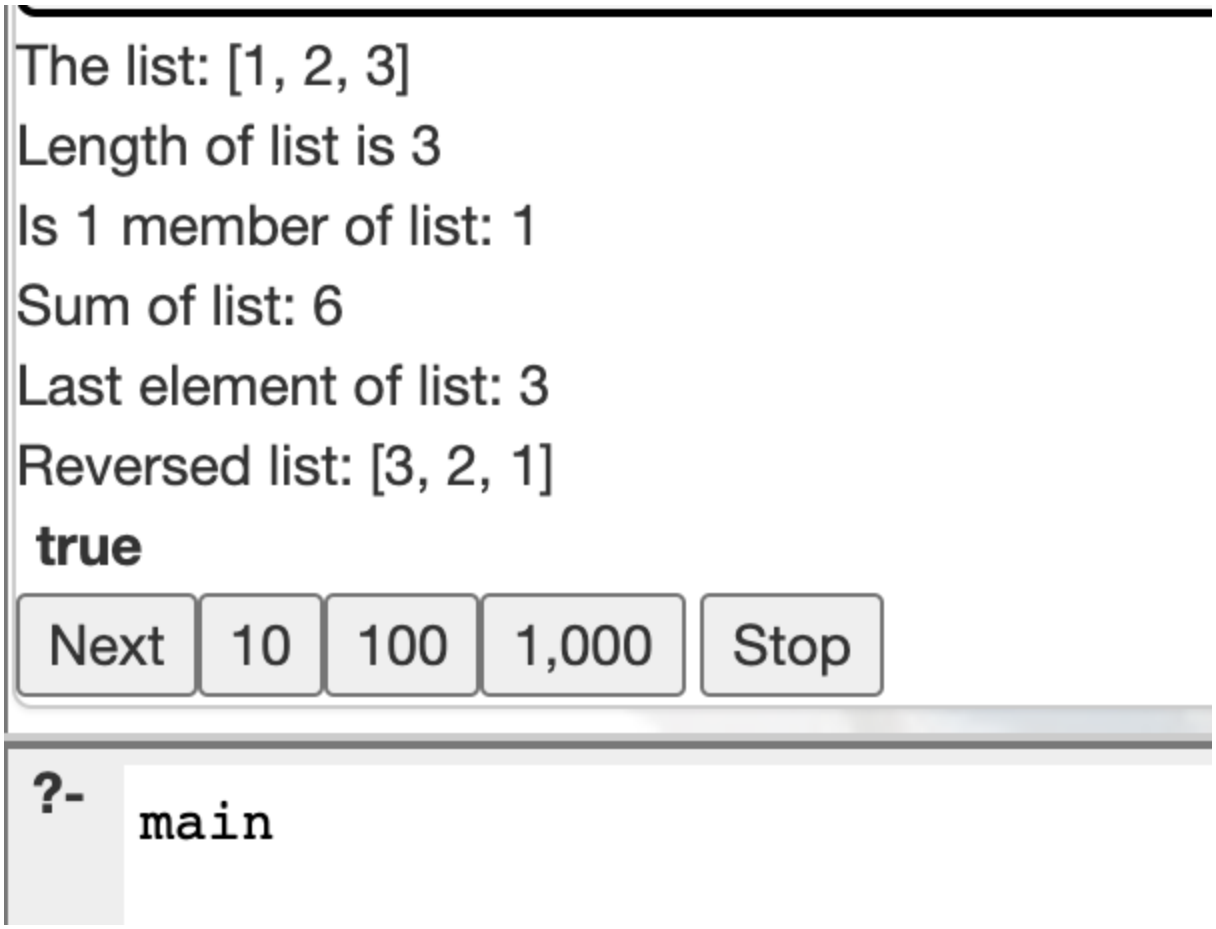
Artificial Intelligence

Nehal Jhajharia (U20CS093)

Lab Assignment 5

Q1.Write a PROLOG program based on list:-
A) To find the length of a list.
B) To find whether a given element is a member of a list.
C) To add the member of a given list (sum of elements of List).
D) To find the last element of a list.
E) To reverse a list.
Code:

```
% list length
lisLen([], 0).
lisLen([_|TAIL], LEN) :- lisLen(TAIL, N), LEN is N+1.
% membership test
isLisMem(X, [X|_], Found):- Found is 1.
isLisMem(X, [_|T], Found) :- isLisMem(X, T, Found).
% add members
addLisMem([], 0).
addLisMem([H|T], SUM) :- addLisMem(T, ST), SUM is H + ST.
% last element
lisLasEle([H], LE) :- LE is H.
lisLasEle([_|T], LE) :- lisLasEle(T, LE).
% Reverse a list
lisConcat([],L,L).
lisConcat([H1|T1],L2,[H1|T3]) :- lisConcat(T1,L2,T3).
lisRev([],[]).
lisRev([H|T],RL) :- lisRev(T, RT),lisConcat(RT, [H],RL).
main:-
   write("The list: [1, 2, 3]"),nl,
   write("Length of list is "),
   lisLen([1, 2, 3], LEN),
            write(LEN),nl,
            write("Is 1 member of list: "),
            isLisMem(1, [1, 2, 3], Found),
   write(Found), nl,
   write("Sum of list: "),
   addLisMem([1, 2, 3], SUM),
   write(SUM), nl,
   write("Last element of list: "),
   lisLasEle([1, 2, 3], LE),
   write(LE), nl,
   write("Reversed list: "),
   lisRev([1, 2, 3], RL),
   write(RL),nl.
```



Q2. Implement A* algorithm. You can implement the algorithm in any language. Try to solve following problem as shown figure 1 below -Find shortest path from A to J

```
import heapq

def astar(graph,start_node,end_node):
  f_distance={node:float('inf') for node in graph}
  f_distance[start_node]=0
   g_distance={node:float('inf') for node in graph}
  g_distance[start_node]=0
   came_from={node:None for node in graph}
  came_from[start_node]=start_node
   queue=[(0,start_node)]
  while queue:

      current_f_distance, current_node = heapq.heappop(queue)

      if current_node == end_node:
```

```
            return f_distance, came_from

        for next_node,weights in graph[current_node].items():
            temp_g_distance = g_distance[current_node] + weights[0]

            if temp_g_distance<g_distance[next_node]:
                g_distance[next_node]=temp_g_distance
                heuristic=weights[1]
                f_distance[next_node]=temp_g_distance+heuristic
                came_from[next_node]=current_node

                heapq.heappush(queue, (f_distance[next_node], next_node))

    return f_distance, came_from


if __name__ == "__main__":
    # node: [weight, h(n)]
    graph = {
        'A':{'B':[6,8],'F':[3,6]},
        'B':{'C':[3,5],'D':[2,7]},
        'C':{'D':[1,7], 'E':[5,3]},
        'D':{'E': [8,3]},
        'E':{'I':[5,1], 'J':[5,0]},
        'F':{'G':[1,5], 'H':[7,3]},
        'G':{'I':[3,1]},
        'H':{'I':[2,1]},
        'I':{'J': [3, 0]},
        'J':{}
    }

    start_node = 'A'
    end_node = 'J'

    ret = astar(graph, start_node, end_node)

    path = [end_node]
    cur_node = end_node
    while cur_node != start_node:
        cur_node = ret[1][cur_node]
        path.append(cur_node)
```

```
path.reverse()


print("Path: ", path)
```

```
jhajharia@Nehals-MacBook-Air Asmt5 % python3 main.py
Path:  ['A', 'F', 'G', 'I', 'J']
jhajharia@Nehals-MacBook-Air Asmt5 %
```