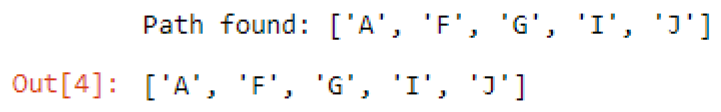
PROGRAM-1

Implement A* Search algorithm.

```
def aStarAlgo(start_node, stop_node):
    open_set=set(start_node)
    closed_set = set()
    g = {}
    parents = {}
    g[start_node]= 0
    parents[start_node] = start_node

    while len(open_set) > 0:
        n = None
        for v in open_set:
            if n == None or g[v] + heuristic(v) < g[n]+ heuristic(n):
                n = v
        if n == stop_node or Graph_nodes[n] == None:
            pass
        else:
            for (m, weight) in get_neighbors(n):
                if m not in open_set and m not in closed_set:
                    open_set.add(m)
                    parents[m] = n
                    g[m] = g[n] + weight
                else:
                    if g[m] > g[n] +weight:
                        g[m] = g[n] + weight
                        parents[m] = n
                        if m in closed_set:
                            closed_set.remove(m)
                            open_set.add(m)
        if n == None:
            print("Path doesn't Exist")
            return None
        if n == stop_node:
            path= []
            while parents[n] != n:
                path.append(n)
                n = parents[n]
            path.append(start_node)
            path.reverse()
            print('Path found: {} '.format(path))
            return path
        open_set.remove(n)
        closed_set.add(n)
    print("Path--- doesn't exist")
    return None



def get_neighbors(v):
    if v in Graph_nodes:
        return Graph_nodes[v]
    else:
        return None


def heuristic(n):
    H_dist = {
        'A':10,
        'B':8,
        'C':5,
        'D':7,
        'E':3,
        'F':6,
        'G':5,
        'H':3,
        'I':1,
        'J':0
    }

    return H_dist[n]
```

```
Graph_nodes = {
    'A':[('B',6),('F',3)],
    'B':[('C',3),('D',2)],
    'C':[('D',1),('E',5)],
    'D':[('C',1),('E',8)],
    'E':[('I',5),('J',5)],
    'F':[('G',1),('H',7)],
    'G':[('I',3)],
    'H':[('I',2)],
    'I':[('E',5),('J',3)]
}

aStarAlgo('A', 'J')
```

OUTPUT:



```
        Path found: ['A', 'F', 'G', 'I', 'J']
Out[4]: ['A', 'F', 'G', 'I', 'J']
```