

```

class PQueue():
    def __init__(self):
        self.dict = {}
        self.keys = []
        self.sorted = False
    def push(self, k, v):
        self.dict[k] = v
        self.sorted = False
    def _sort(self):
        self.keys = sorted(self.dict, key=self.dict.get, reverse=True)
        self.sorted = True
    def pop(self):
        try:
            if not self.sorted:
                self._sort()
            key = self.keys.pop()
            value = self.dict[key]
            self.dict.pop(key)
            return key, value
        except:
            return None

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def heuristics(path):
    h = {}
    with open(path, 'r') as file:
        for line in file:
            k, v = line.split(", ")
            h[k] = int(v)
    return h

```

```

def path_costs(path):
    c = {}
    with open(path, 'r') as file:
        for line in file:
            line = line.split(", ")
            v = int(line.pop())
            e1 = line.pop()
            e2 = line.pop()
            if e1 not in c:
                c[e1] = {}
            if e2 not in c:
                c[e2] = {}
            c[e1][e2] = c[e2][e1] = v
    return c

```

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def a_star(start, goal, h, g):
    frontier = PQueue()
    # pushing path and cost to pqueue
    frontier.push(start, h[start])
    while True:
    # popping path with least cost
        path, cost = frontier.pop()
        print(path+ " " +str(cost))
    # splitting out end node in path
        end = path.split("->")[-1]
    # removing heuristic value of end node from cost
        cost -= h[end]
        if goal == end:
            break
        for node, weight in g[end].items():
    # adding edge weight(cost) and node heuristic to total cost
            new_cost = cost + weight + h[node]
            new_path = path + "->" + node
    # adding new path and cost to pqueue
            frontier.push(new_path, new_cost)

a_star('Arad', 'Bucharest', heuristics('/home/Heuristics.txt'),

path_costs("/home/Paths.txt"))

```

```

☞ Arad 366
  Arad->Sibiu 393
  Arad->Sibiu->Rimnicu Vilcea 413
  Arad->Sibiu->Fagaras 415
  Arad->Sibiu->Rimnicu Vilcea->Pitesti 417
  Arad->Sibiu->Rimnicu Vilcea->Pitesti->Bucharest 418

```

+ Code

+ Text

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