Graphs
Shortest-Path Problems: Airline Example (mileage)
Shortest-Path Problems: Airline Example (flight times)
Shortest-Path Problems: Airline Example (fares)
Greedy Algorithms

**Definition**: A *greedy algorithm* is any algorithm that attempts to solve an optimization problem by making the locally optimal choice at each step, with the hope of finding a global optimum.

In other words, it’s simply an algorithm that makes what seems to be the best choice at each step.

Greedy algorithms are usually fairly simple to implement, but they are NOT guaranteed to find the best answer.
Greedy Algorithms: Maze Example
Dijkstra's Algorithm

Dijkstra's Algorithm finds the shortest path between two vertices in a connected simple undirected weighted graph.

label the start vertex with \( L(\text{start}) = 0 \)
label all other vertices with cost \( L(\text{vertex}) = \infty \)
mark all vertices "not visited"
set all vertices' path history to ()

while end vertex has not been marked "visited":
    find \( u \), the vertex with the cheapest path
    mark \( u \) visited
    for each \( v \), a neighbor of \( u \):
        if \( \text{weight}(u,v) + L(u) < L(v) \):
            \( L(v) = \text{weight}(u,v) + L(u) \)
            set \( v \)'s history to \( u \)'s path history + \( u \)