

The Dijkstra Algorithm

Antonio Carzaniga

Faculty of Informatics
Università della Svizzera italiana

May 17, 2022

- Very similar to Prim's algorithm

- Very similar to Prim's algorithm
- Variables storing values known at each iteration

- Very similar to Prim's algorithm
- Variables storing values known at each iteration
 - ▶ $D[v]$, cost of the least-cost path from u to v

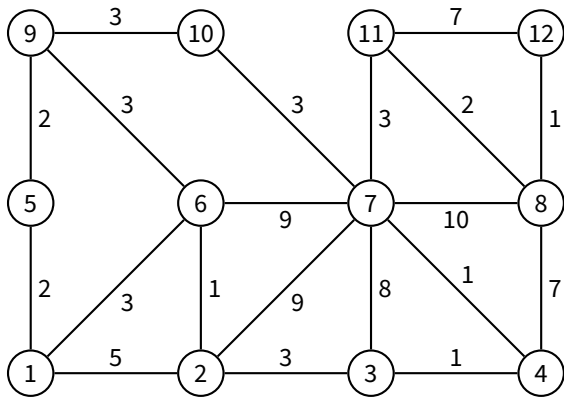
- Very similar to Prim's algorithm
- Variables storing values known at each iteration
 - ▶ $D[v]$, cost of the least-cost path from u to v
 - ▶ $P[v]$, node preceding v (neighbor of v) on the least-cost path from u to v

- Very similar to Prim's algorithm
- Variables storing values known at each iteration
 - ▶ $D[v]$, cost of the least-cost path from u to v
 - ▶ $P[v]$, node preceding v (neighbor of v) on the least-cost path from u to v
 - ▶ N , nodes of G whose least-cost path from u is definitely known

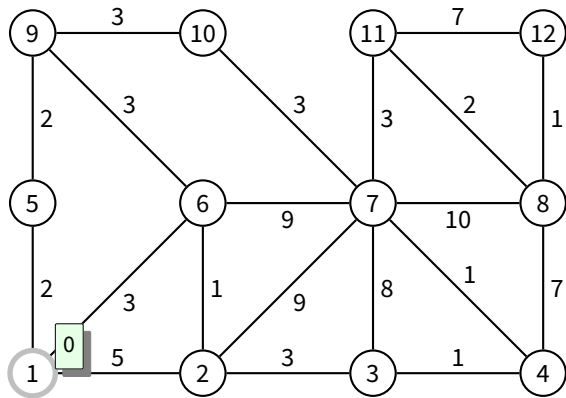
DIJKSTRA(G, u, w)

```
1   $N = \emptyset$ 
2  for each vertex  $v \in V(G)$ 
3       $D[v] = \infty$ 
4       $P[v] = \text{NIL}$ 
5   $D[u] = 0$ 
6  while  $N \neq V(G)$ 
7      find  $u \notin N$  such that  $D[u]$  is minimal
8       $N = N \cup \{u\}$ 
9      for all  $v \in \text{Adj}(u) \setminus N$ 
10         if  $D[u] + w(u, v) < D[v]$ 
11              $D[v] = D[u] + w(u, v)$ 
12              $P[v] = u$ 
```

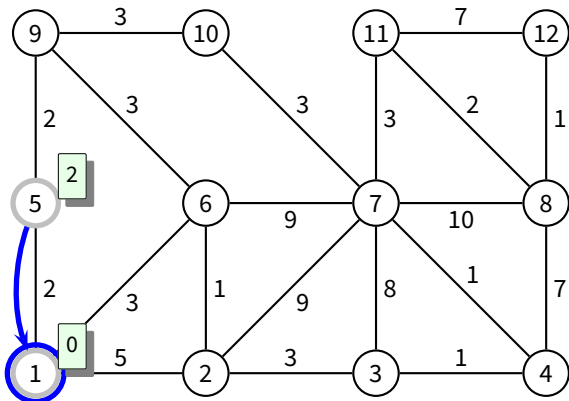
Example



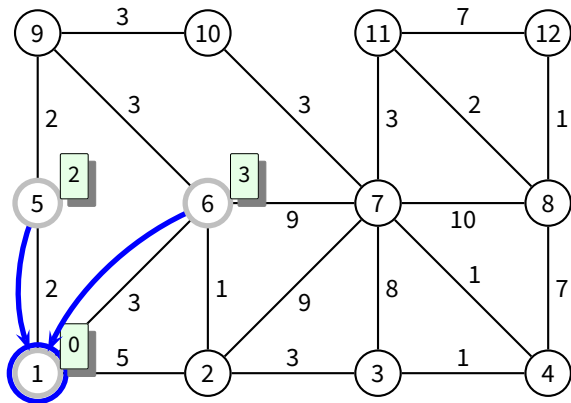
Example



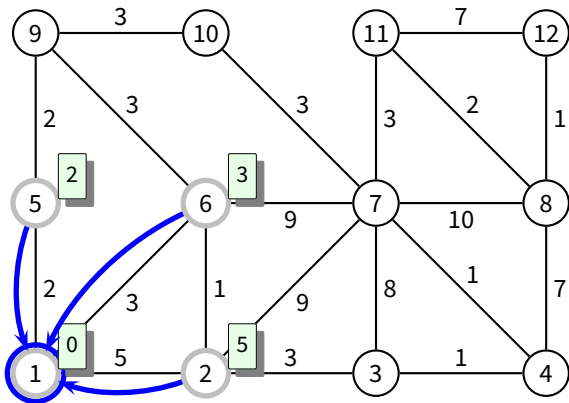
Example



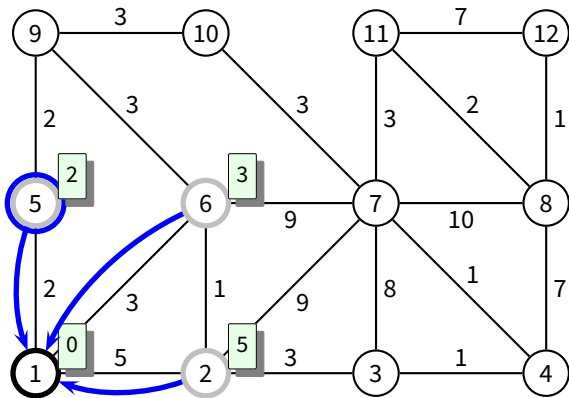
Example



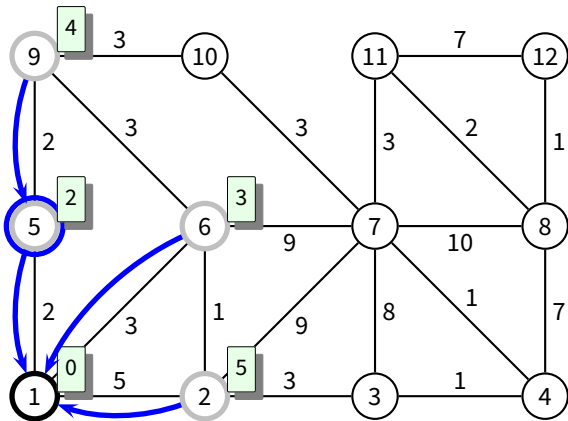
Example



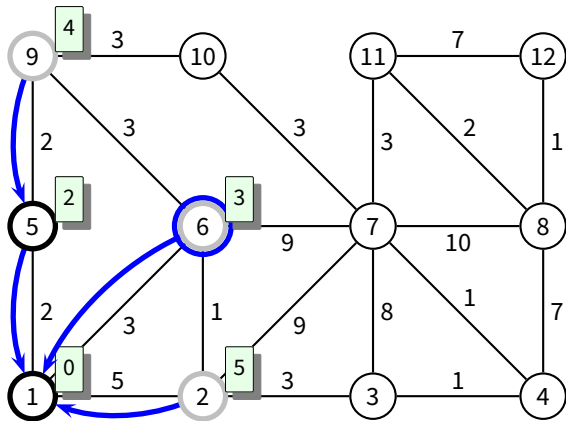
Example



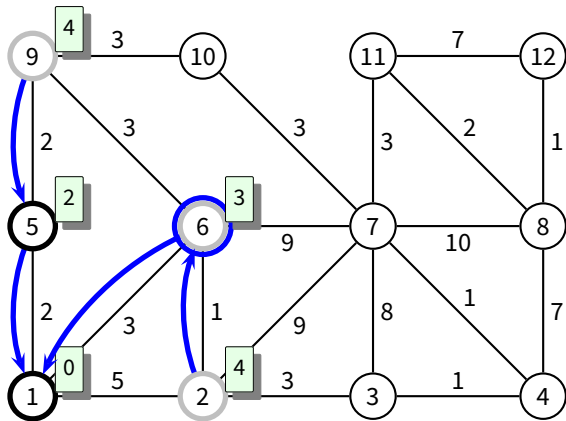
Example



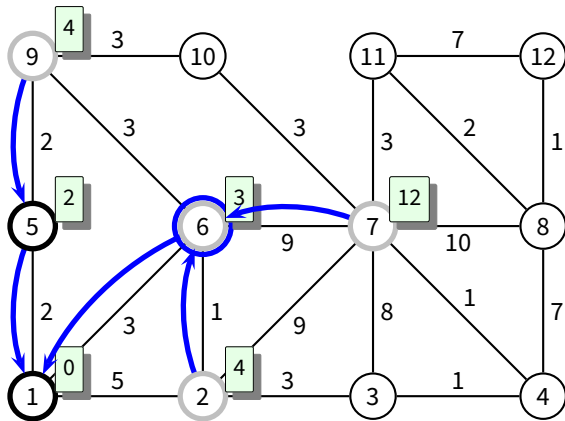
Example



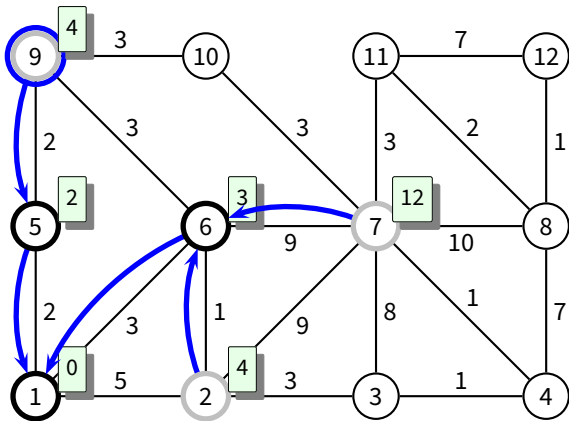
Example



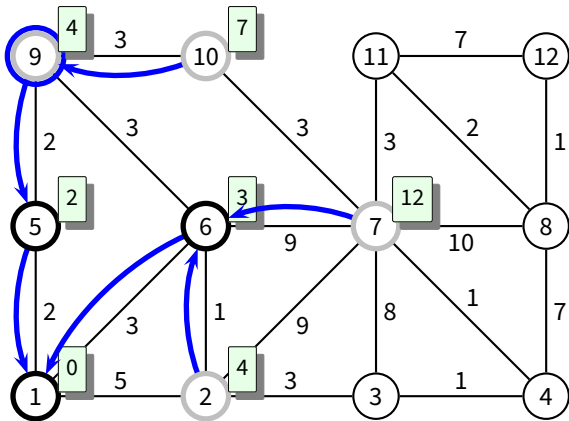
Example



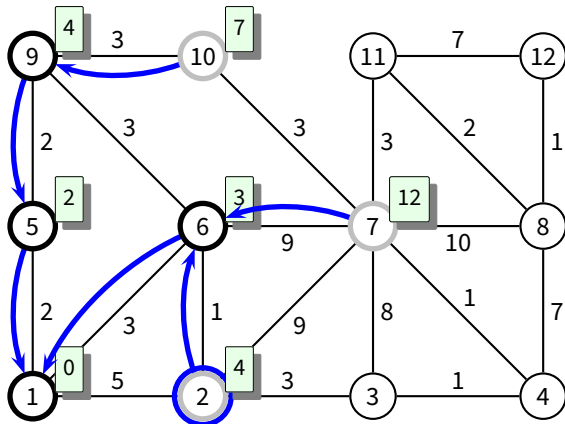
Example



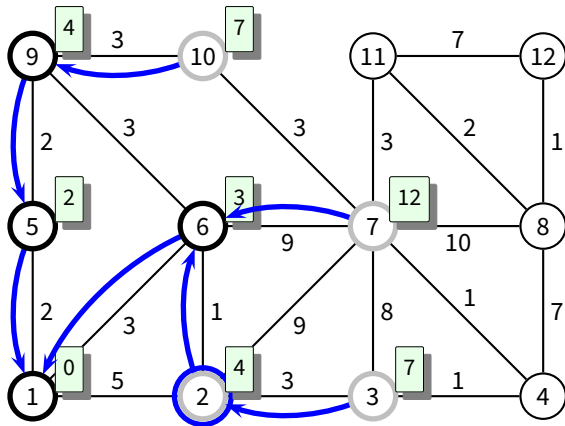
Example



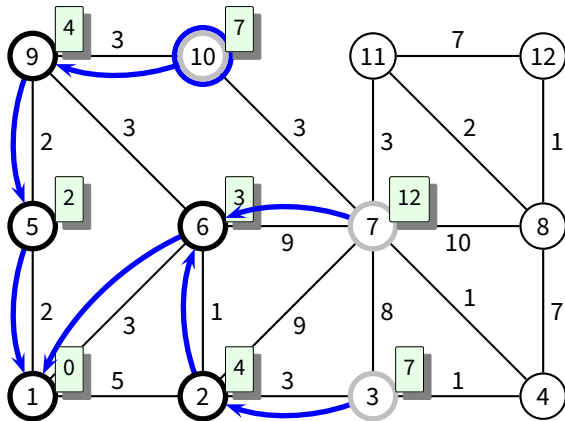
Example



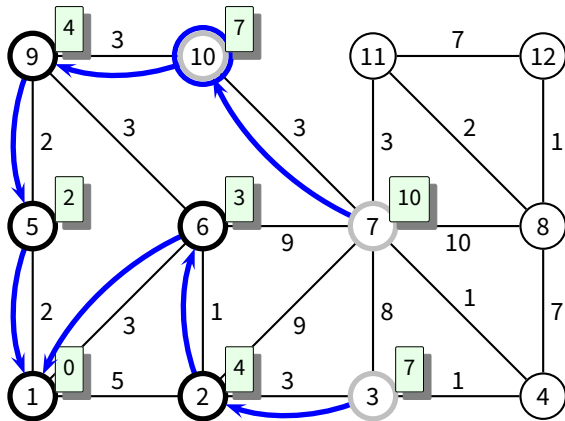
Example



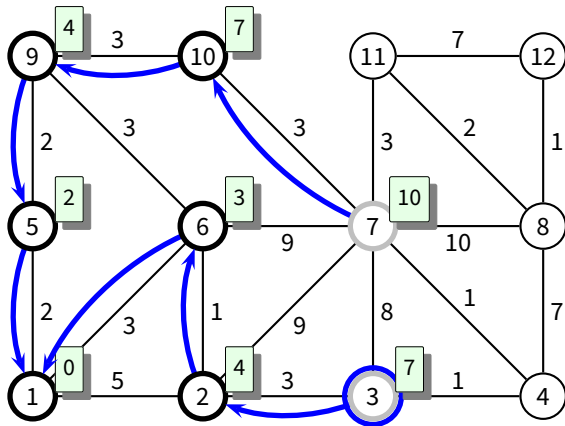
Example



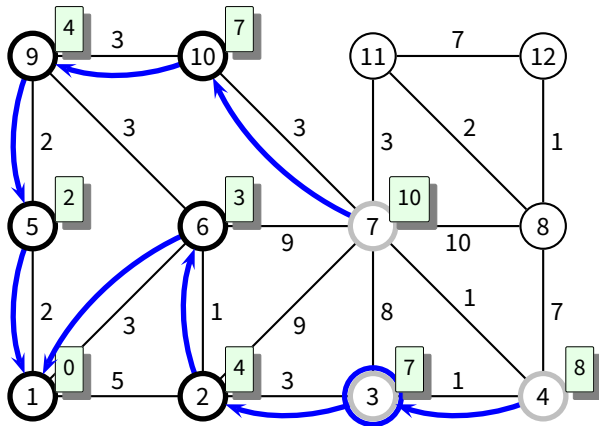
Example



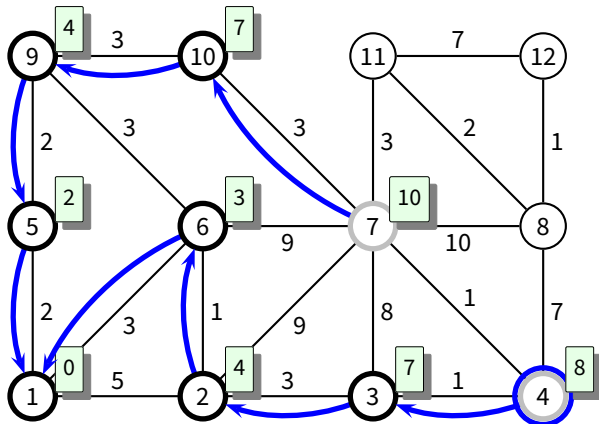
Example



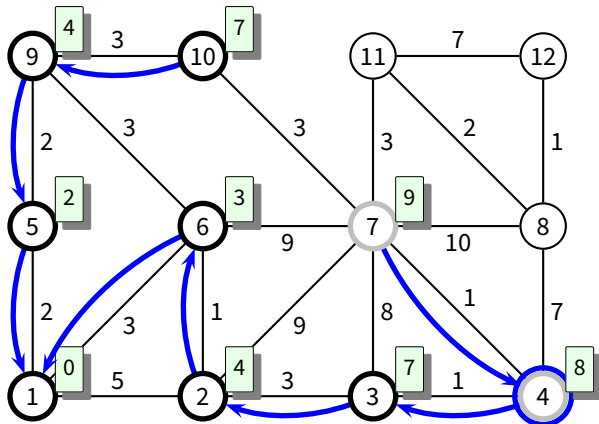
Example



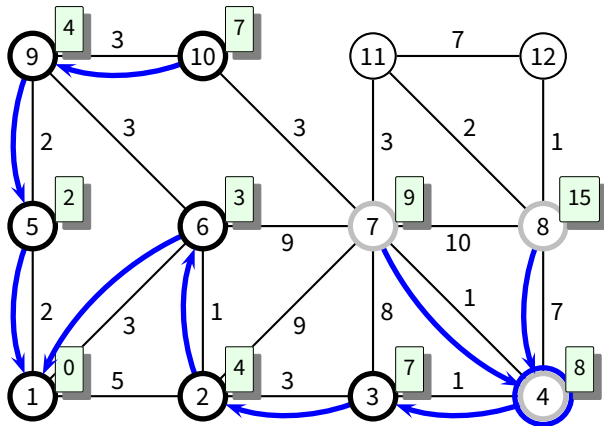
Example



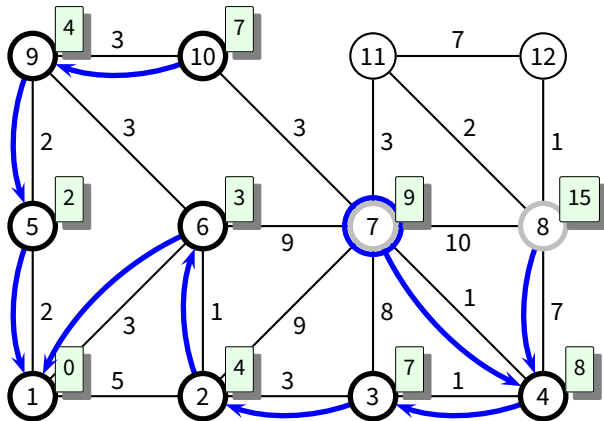
Example



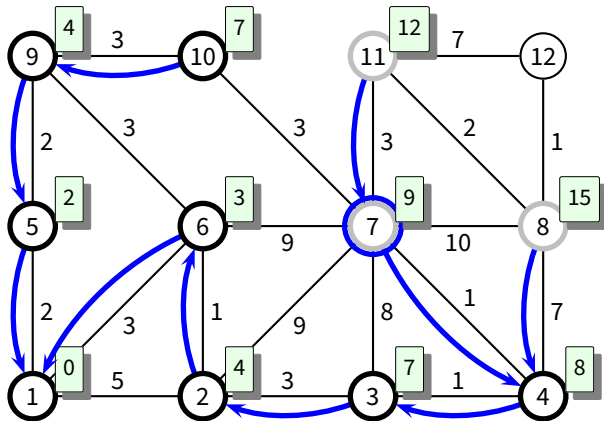
Example



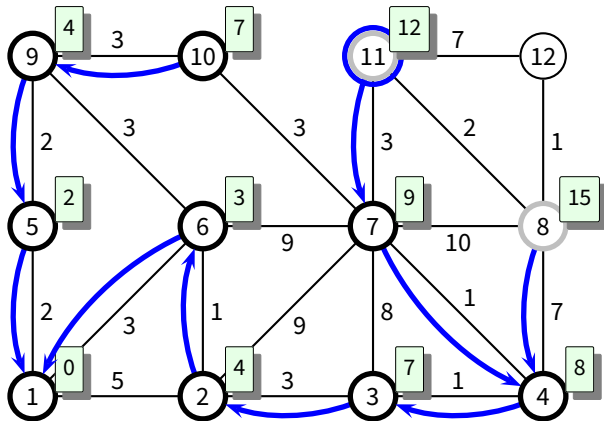
Example



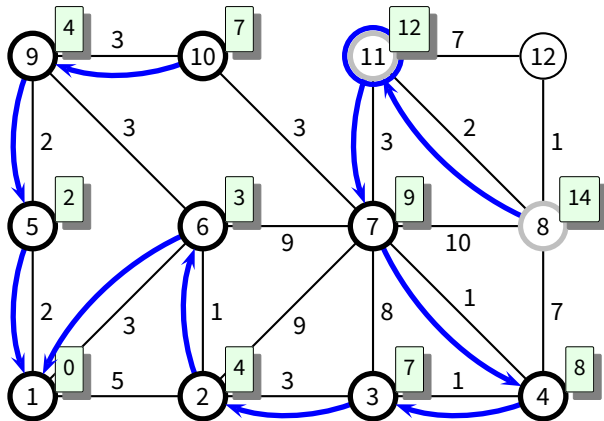
Example



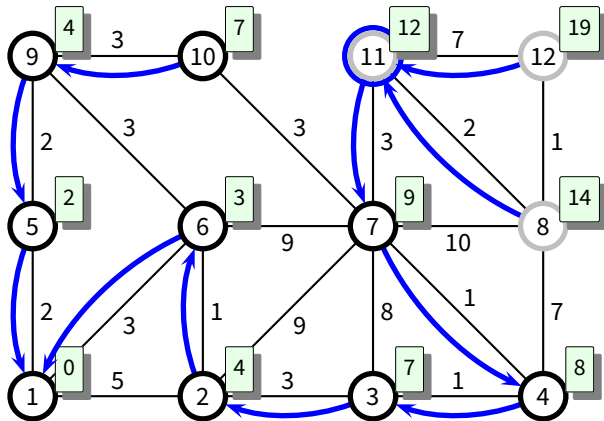
Example



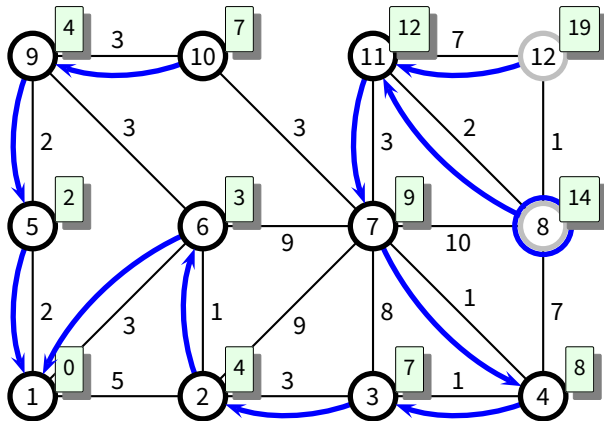
Example



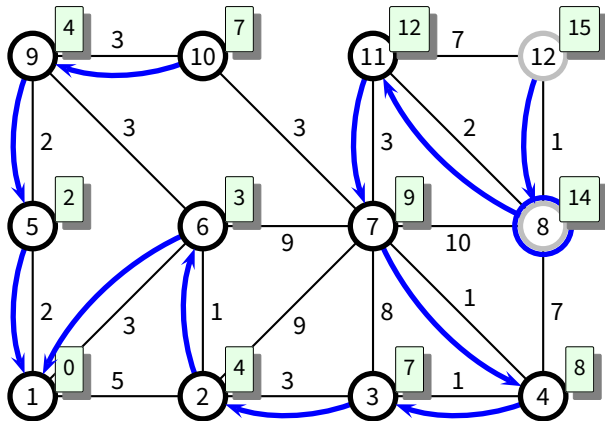
Example



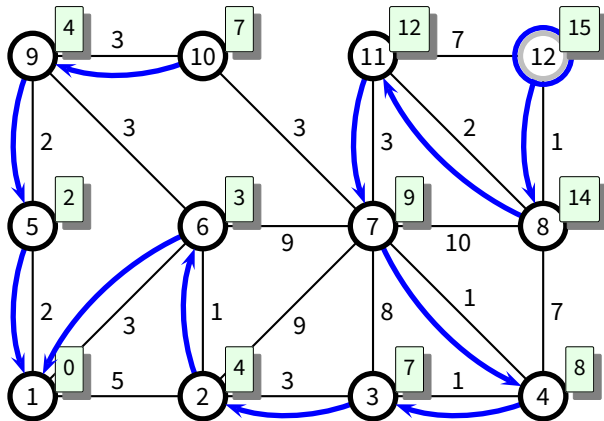
Example



Example



Example



Example

