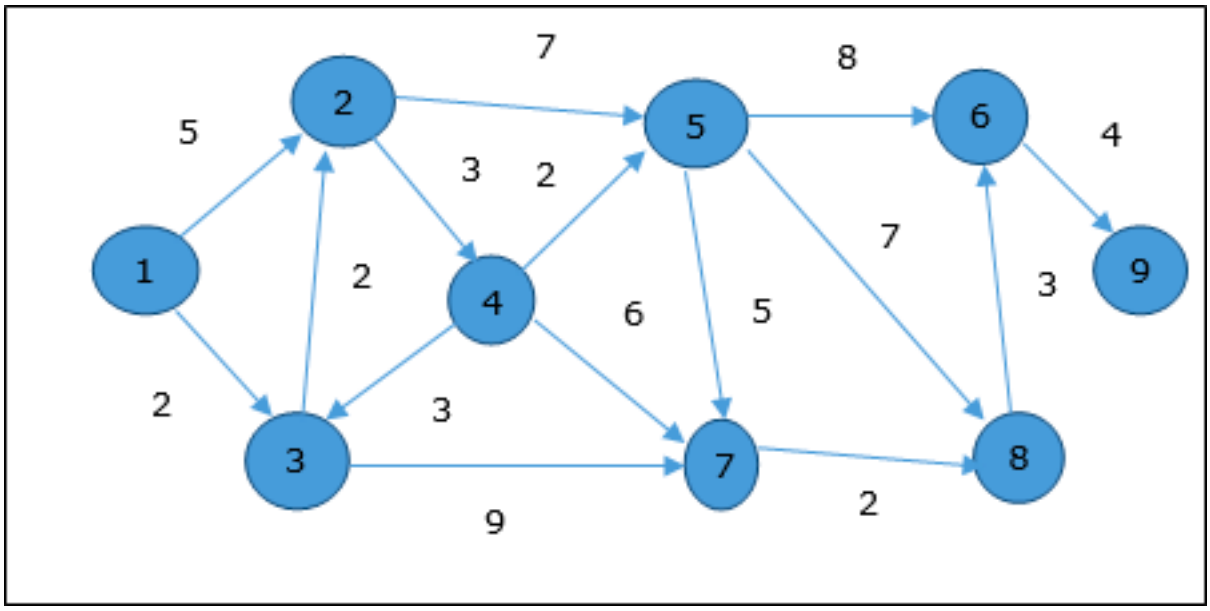
Dijkstra's Algorithm tutorial

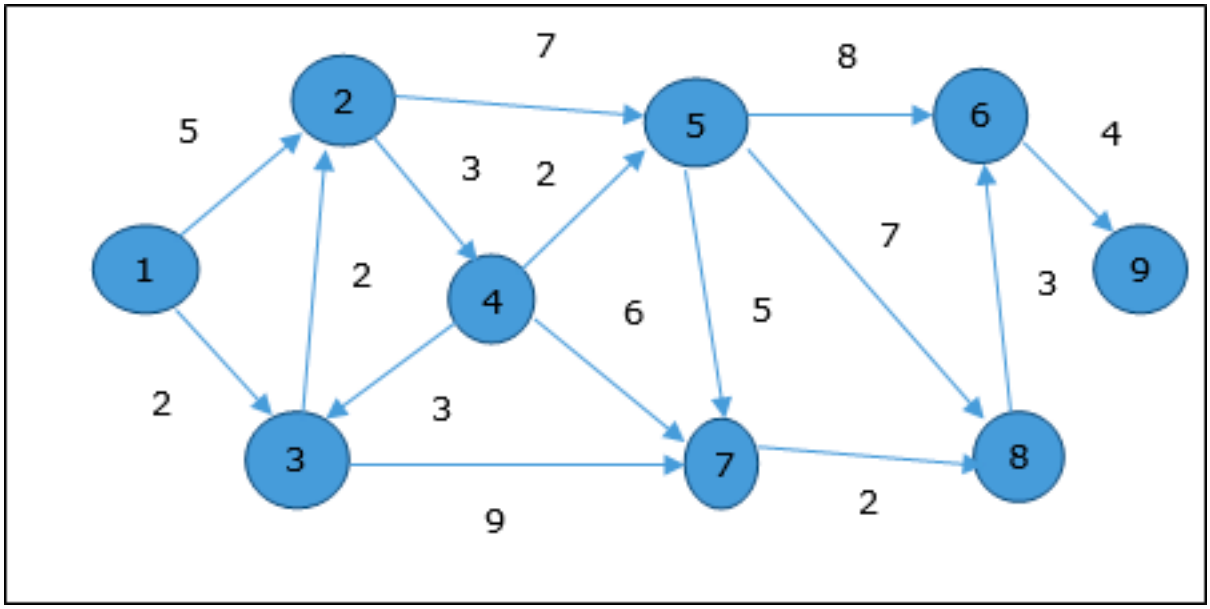
Consider the example graph below and assume we want to find the shortest path from Node 1 to Node 9.




a- Fill in the following table summarising the workings of the algorithm:

| Vertex\ Node Visited | Initial | Step1 V1 | Step2 V3 | Step3 V2 | Step4 V4 | Step5 V5 | Step6 V7 | Step7 V8 | Step8 V6 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | | | | | | | | |
| 2 | ∞ | | | | | | | | |
| 3 | ∞ | | | | | | | | |
| 4 | ∞ | | | | | | | | |
| 5 | ∞ | | | | | | | | |
| 6 | ∞ | | | | | | | | |
| 7 | ∞ | | | | | | | | |
| 8 | ∞ | | | | | | | | |
| 9 | ∞ | | | | | | | | |

b- Prove the same result using the graph directly:


1
2
3
4
5
6
7
8
9
5
7
8
4
3
2
2
2
3
6
5
7
3
9
2

Solution:

| Vertex\ Node Visited | Initial | Step1 V1 | Step2 V3 | Step3 V2 | Step4 V4 | Step5 V5 | Step6 V7 | Step7 V8 | Step8 V6 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | ∞ | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 3 | ∞ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 4 | ∞ | ∞ | ∞ | 7 | 7 | 7 | 7 | 7 | 7 |
| 5 | ∞ | ∞ | ∞ | 11 | 9 | 9 | 9 | 9 | 9 |
| 6 | ∞ | ∞ | ∞ | ∞ | ∞ | 17 | 17 | 16 | 16 |
| 7 | ∞ | ∞ | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 8 | ∞ | ∞ | ∞ | ∞ | ∞ | 16 | 13 | 13 | 13 |
| 9 | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | ∞ | 20 |

Hence the minimum path from 1 to 9 is {9,6,8,7,3,1} by backtracking from 9.