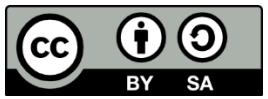
Greedy Algorithm for TSP



Concept Challenge: Procedure

- **Pause** Try to solve the problem yourself
- **Discuss** with other learners (if you can)
- **Watch** the UC San Diego learners video
- **Answer** the question again
- **Confirm** your understanding with our explanation

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

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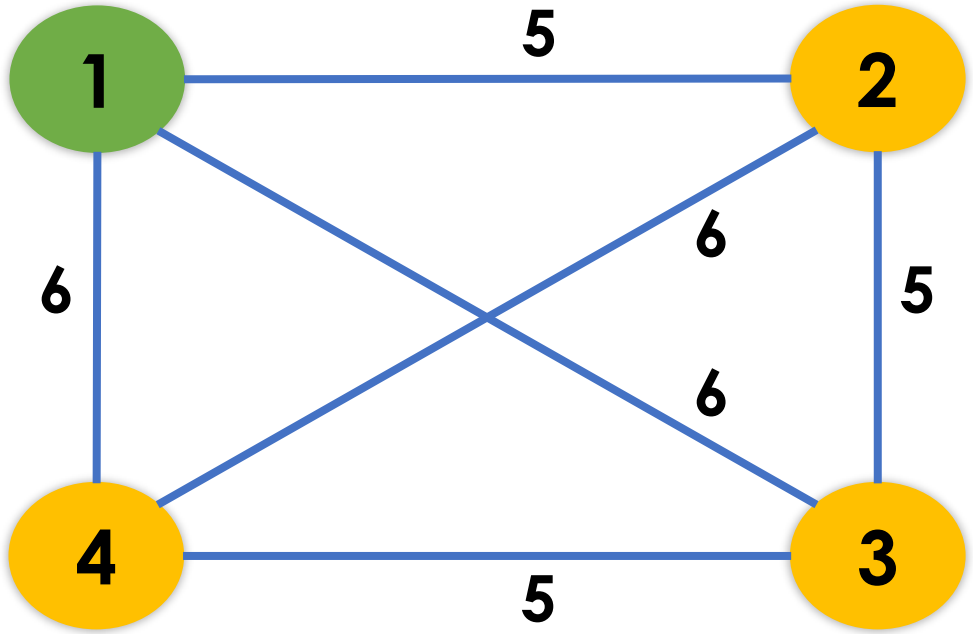
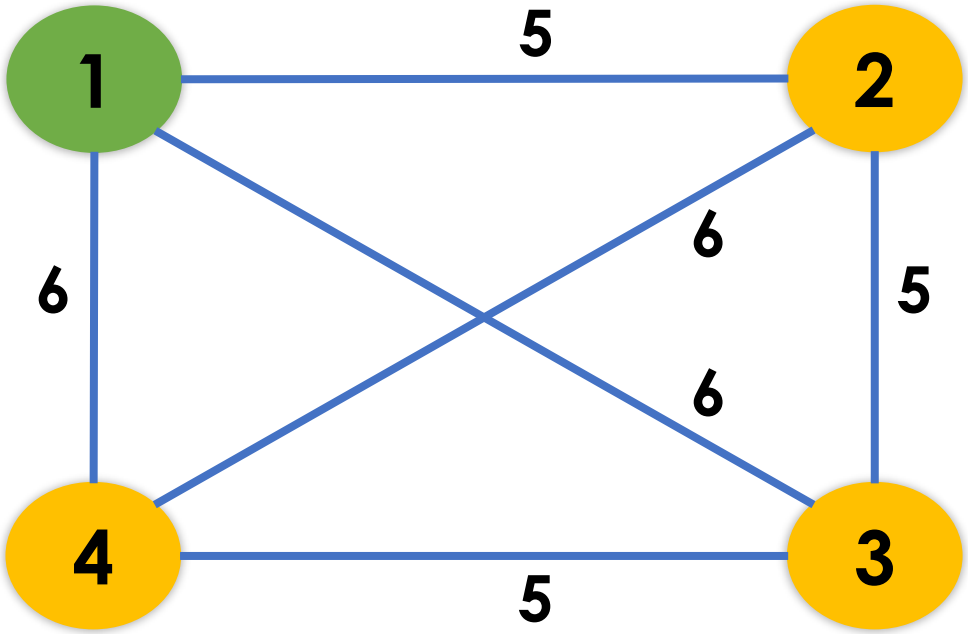
Greedy algorithm: pick best next choice

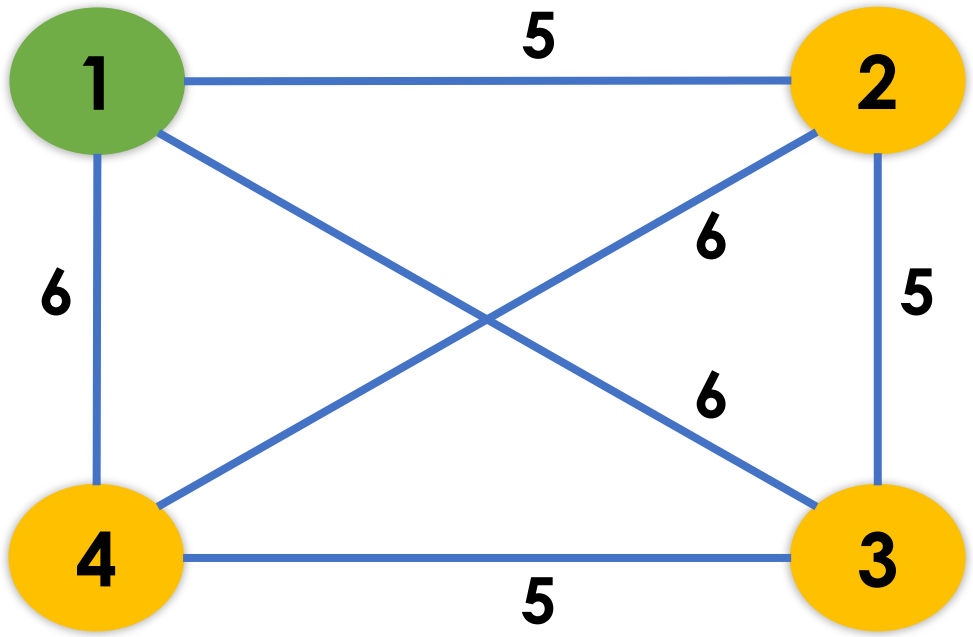
Warmup: What tour does the Greedy algorithm construct for this graph?



Is this the best possible tour for this graph?



Is this the best possible tour for this graph?

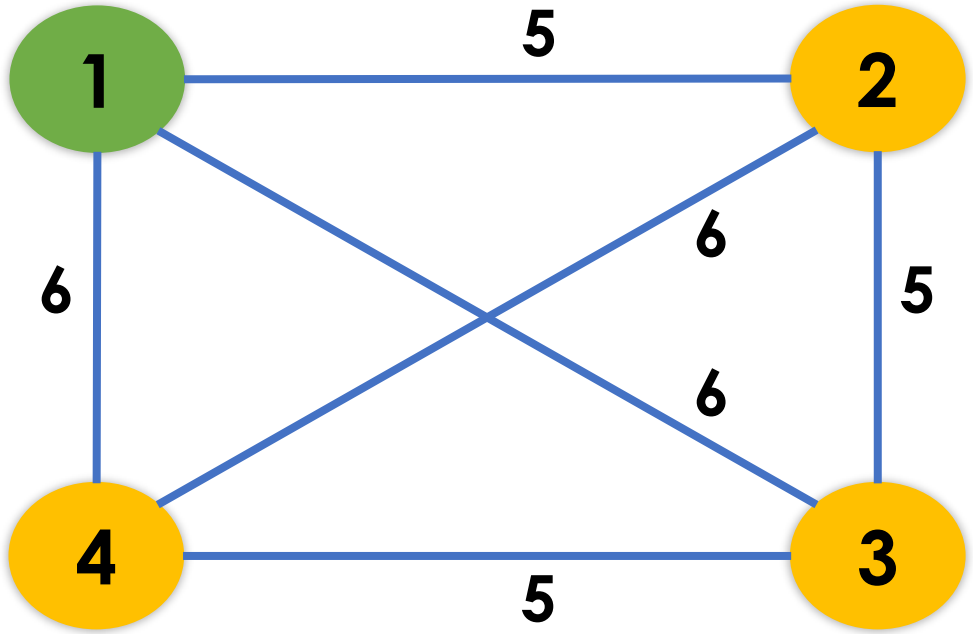


1 → 2 → 3 → 4 → 1

1 → 2 → 4 → 3 → 1

1 → 3 → 2 → 4 → 1

Is this the best possible tour for this graph?



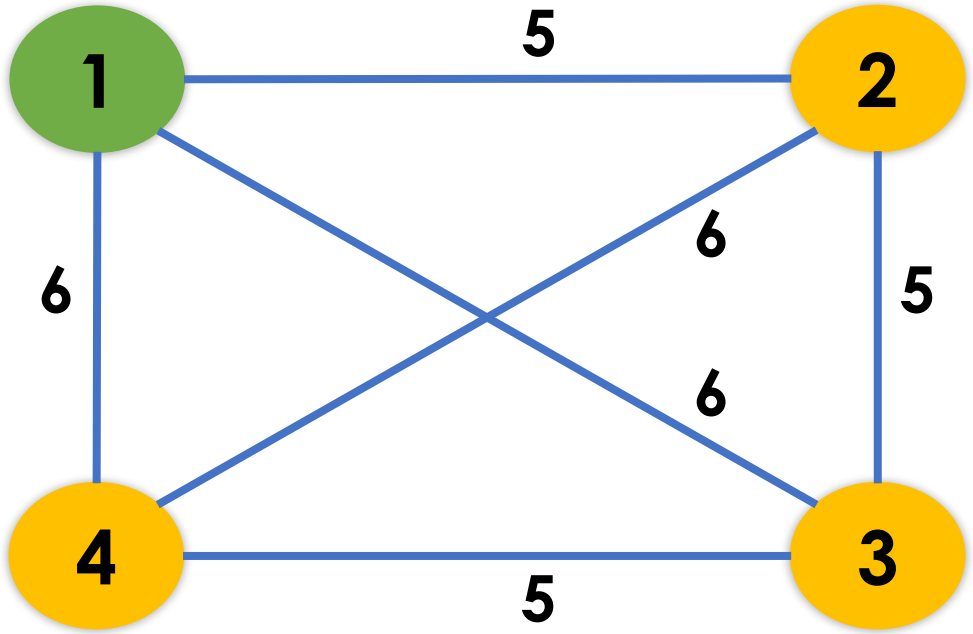
1 → 2 → 3 → 4 → 1

1 → 2 → 4 → 3 → 1

1 → 3 → 2 → 4 → 1

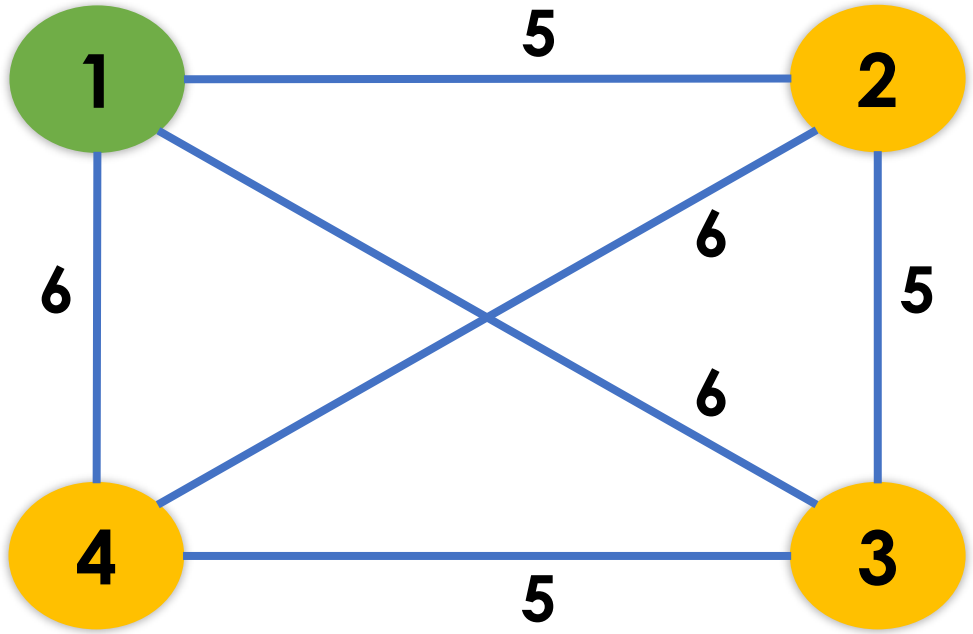
21

Is this the best possible tour for this graph?



1 → 2 → 3 → 4 → 1	21
1 → 2 → 4 → 3 → 1	22
1 → 3 → 2 → 4 → 1	

Is this the best possible tour for this graph?



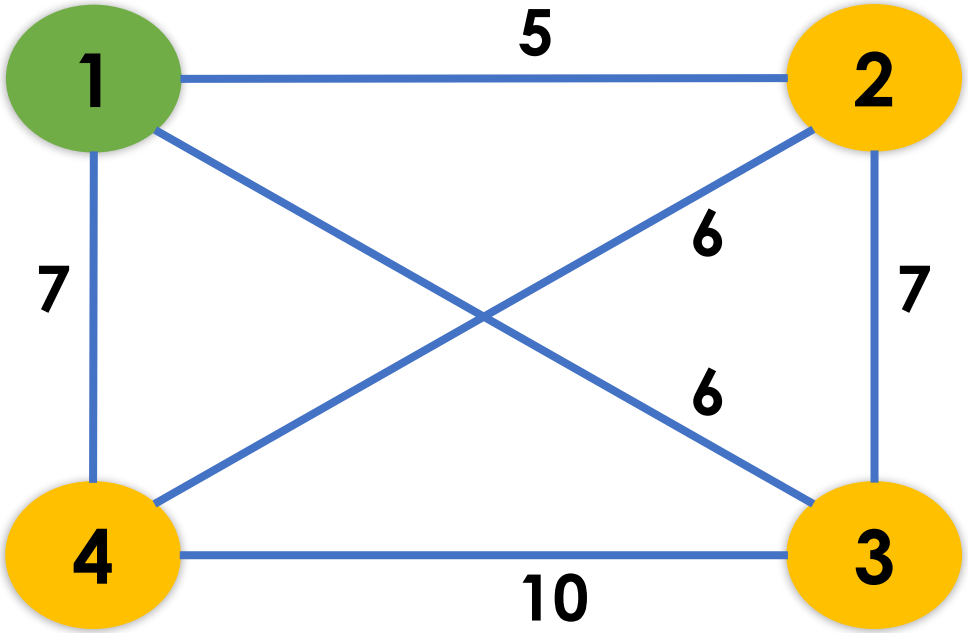
1 → 2 → 3 → 4 → 1	21
1 → 2 → 4 → 3 → 1	22
1 → 3 → 2 → 4 → 1	23

In TSP, given n cities with one Hometown and all pairwise distances, plan a tour starting and ending at Hometown that visits every city exactly once and has minimum distance.

Greedy algorithm: pick best next choice

Will the greedy algorithm always work?

If yes, why? ***If no, find counterexample.***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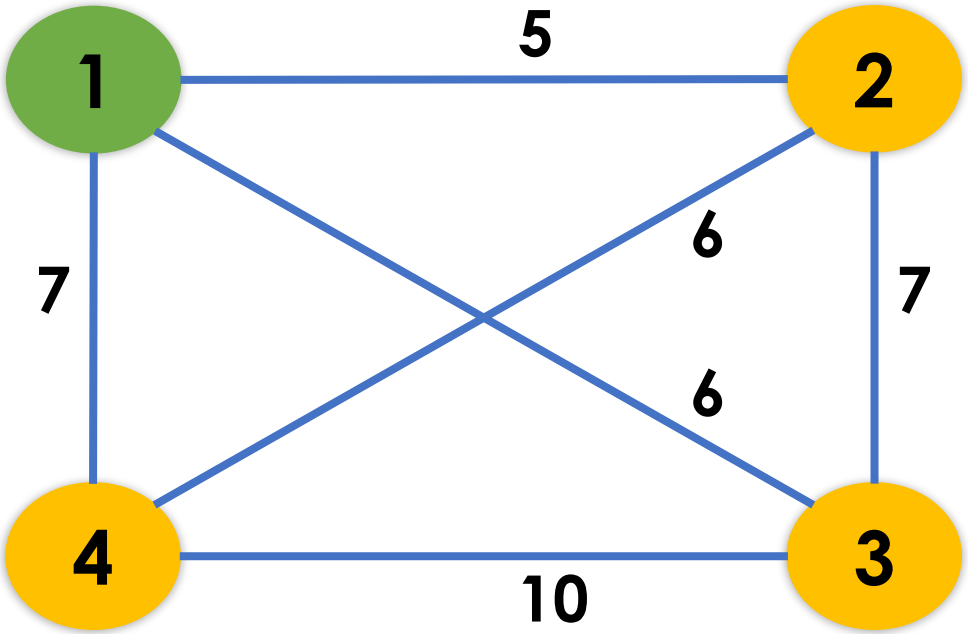
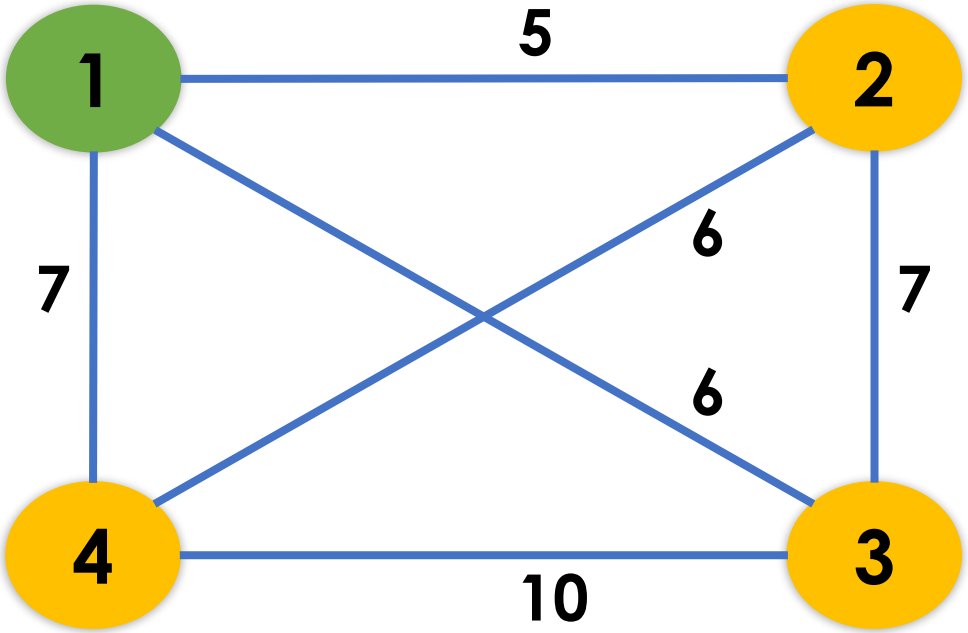


Greedy:

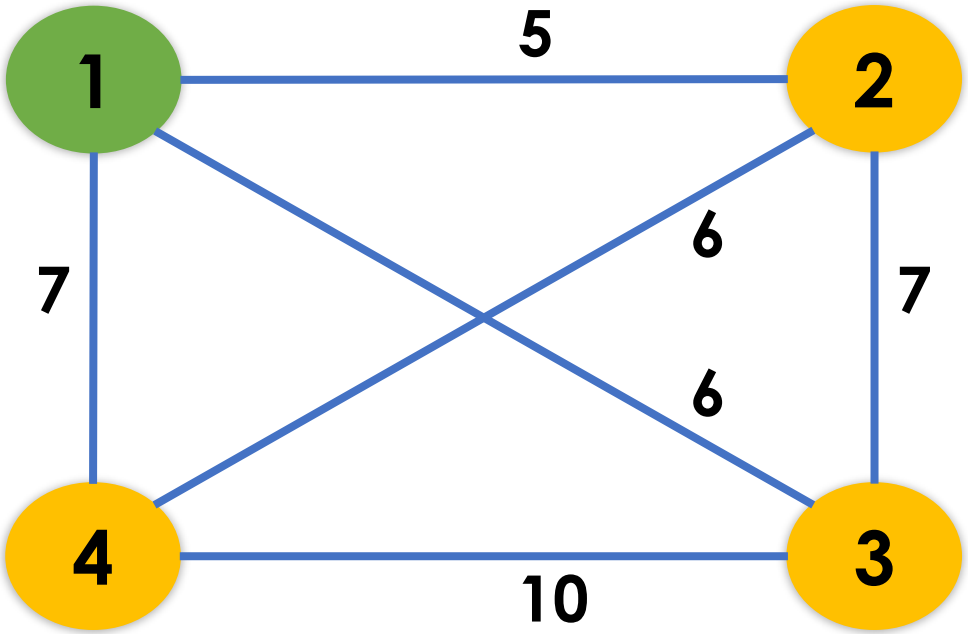
1 → 2 → 4 → 3 → 1



Greedy:

1 → 2 → 4 → 3 → 1

27

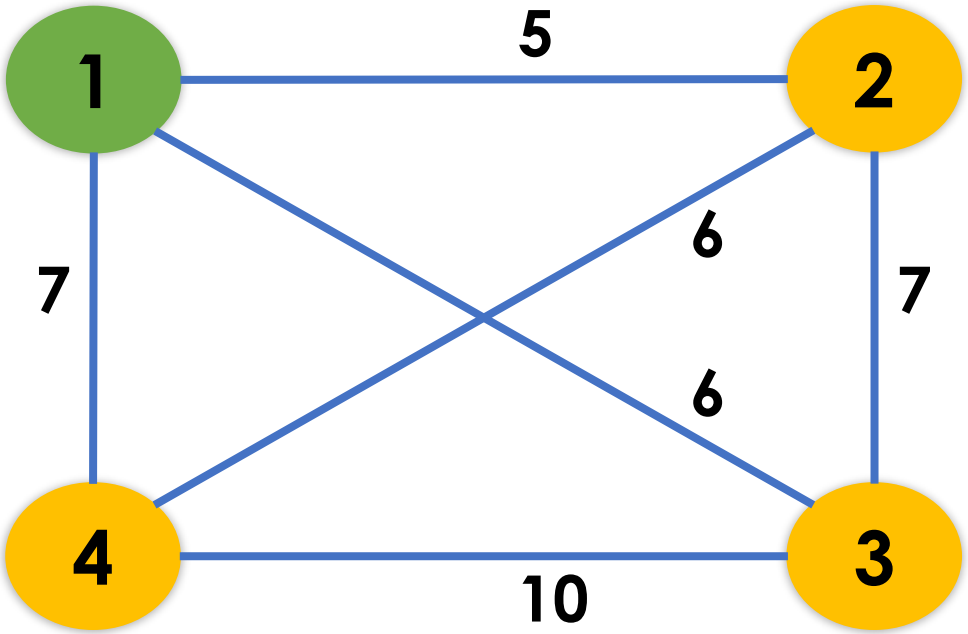


1 → 2 → 3 → 4 → 1

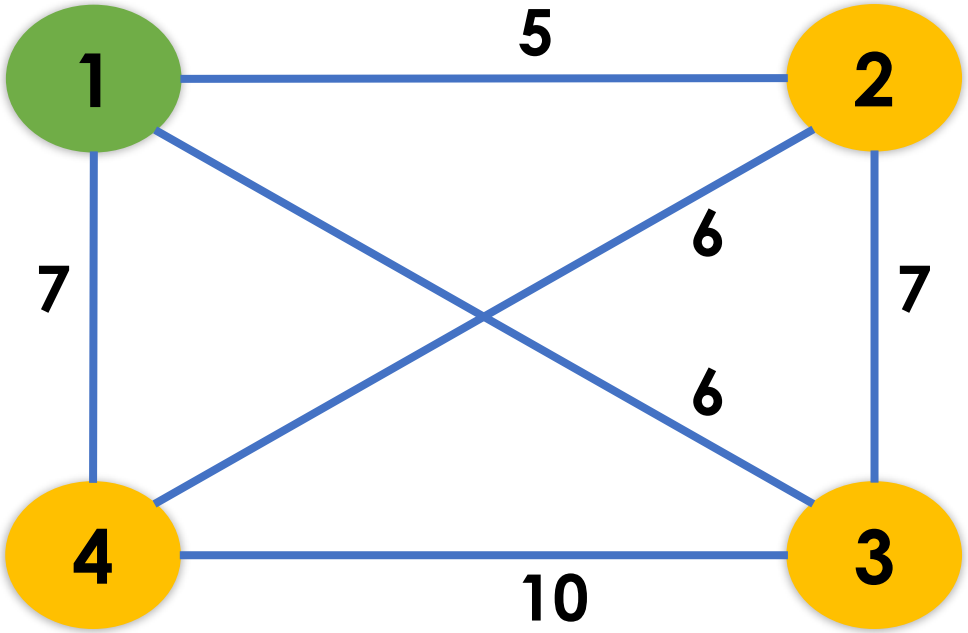
1 → 2 → 4 → 3 → 1

1 → 3 → 2 → 4 → 1

27



1 → 2 → 3 → 4 → 1	29
1 → 2 → 4 → 3 → 1	27
1 → 3 → 2 → 4 → 1	



1 → 2 → 3 → 4 → 1	29
1 → 2 → 4 → 3 → 1	27
1 → 3 → 2 → 4 → 1	26