✅ **Congratulations! You passed!**

Grade received 100%   **Latest Submission Grade** 100%   **To pass** 80% or higher

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1. We will apply Bellman ford algorithm for the following graph with the source vertex 1.

1 / 1 point
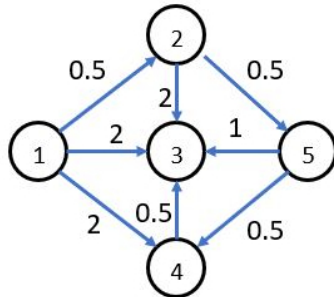
Suppose the current distance estimates and the parents are :

Node	Distance (d)	Parent(pi)
1	0	NIL
2	0.5	1
3	2.5	4
4	2	1
5	infinity	NIL

☑ Since there is no negative weight cycle in this graph running 4 iterations of relax, each iteration involving every edge in some order will guarantee that all shortest weight paths are found.

> ✅ **Correct**
> Correct.

☑ The distance estimate of 2.5 for node 3 is the weight of the non-shortest path 1-> 4 -> 3

> ✅ **Correct**
> Correct – we see that the parent of 3 is 4 and the parent of 4 is 1.

☐ The shortest path distances are all final since no further relax operations will successfully decrease the distances of any vertex.

☐ If we relax according to the edge (5 , 3) the distance est. to node 3 is set to infinity as well.

☑ Relaxing according to the edge 2-> 5 will bring down the weight of node 5 from infinity to 1 and set parent pointer of 5 to 2.

> ✅ **Correct**
> Correct.

2. Select all true facts about the Bellman Ford Algorithm.

1 / 1 point

☑ If after n-1 iterations where n is the number of vertices, the distance estimates are such that we can find edges that can successfully decrease them for some vertices, then there must be a negative weight cycle.

> ✅ **Correct**
> Correct – this was argued in the lecture and is formally proved in the book, as well.

☑ The order in which the edges are iterated does not affect the correctness of Bellman-Ford but may affect the performance on some instances

☐ Rather than iterate n-1 times through all the edges, suppose we flipped the order of loops in the algorithm:

For e in Edges:

For l from 1 to n-1:
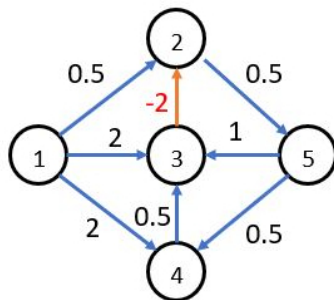
Relax(e)

It continues to work just the same as before.

☑ If after one iteration that goes through and relaxes according to all the edges of the graph, we find that the distance estimates have not changed, then we can stop the algorithm (potentially early), concluding that the final weights have been found.

3. Consider the modified graph from previous question.

Suppose we have the distance estimates and parents computed after the first 4 iterations of Bellman-Ford algorithm for source vertex 1 (under some arbitrary order of relaxing the edges)

Select all the edges that can further relax the distance estimates shown:

Node	d	parent
1	0	NIL
2	-1	3
3	0.5	5
4	0	5
5	-0.5	2

☐ (1,4)

☐ (5,3)

☑ (3,2)

☐ (1,2)