University of Nevada, Las Vegas Computer Science 477/677 Spring 2023

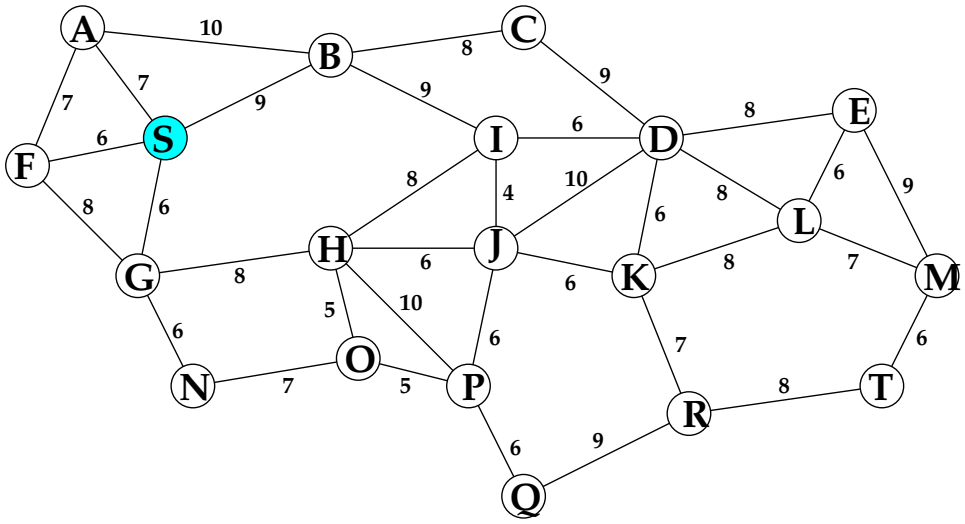
Assignment 6: Due Saturday April 8, 2023, 11:59 PM

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. You will receive a message from the graduage assistant, Sepideh Farivar, telling you how to turn in the assignment.

1. Walk through Dijkstra's algorithm for the single source minpath problem for the directed graph illustrated on the next page. Instead of numbering the vertices 0 through 19, I have assigned them letters from A to T. The source vertex is S.

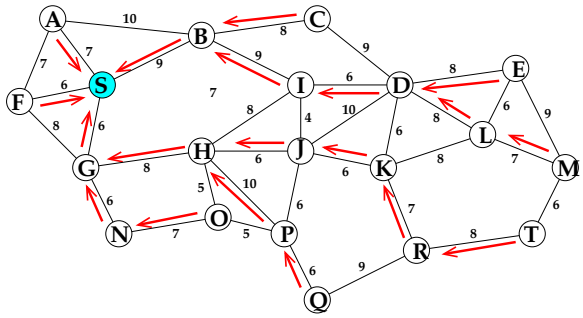
   After each iteration of the main loop, show
   1. The array dist, where dist[x] is the smallest length of any path found so far from S to x. (Initially, dist[x] = ∞ for most x.)
   2. The array back, where back[x] is the next-to-the last vertex on the path of smallest weight found so far from S to x.
   3 The contents of heap. Do not try to show the structure of the heap, simply list its members.



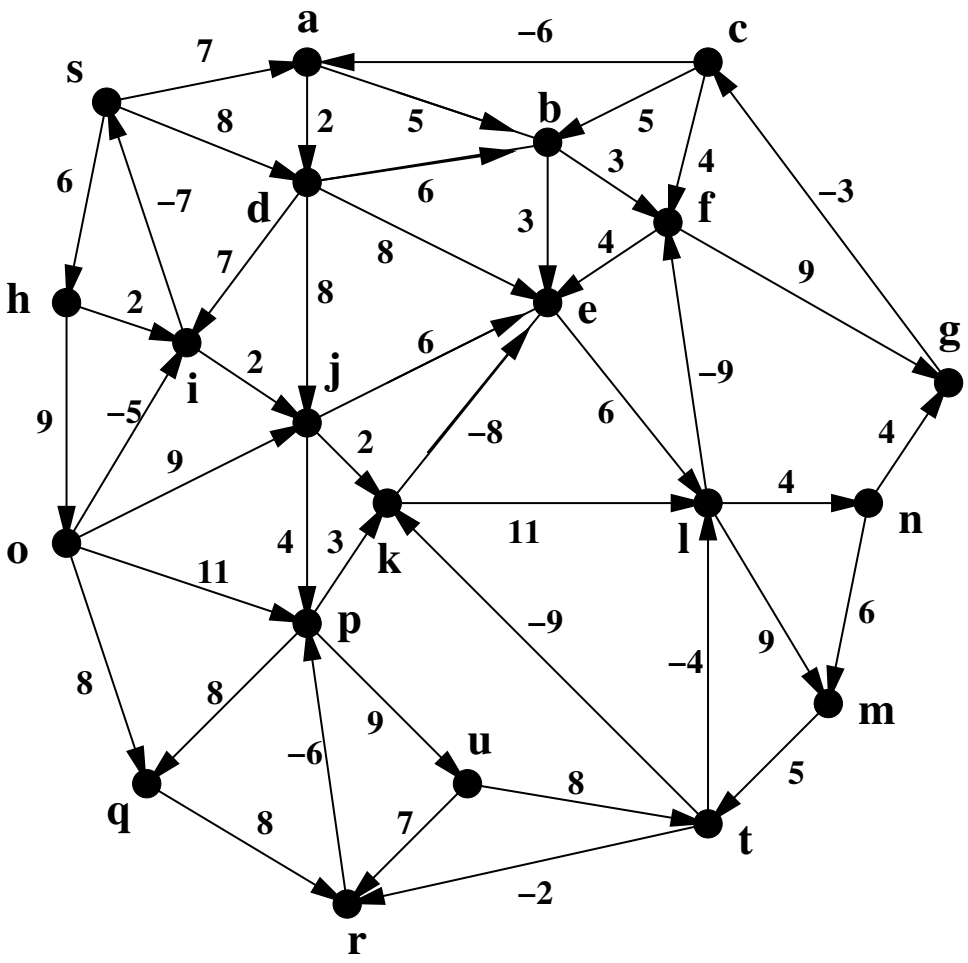
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	heap
dist																			0		S
back																			*		
dist	7	10				6	6												0		FGAB
back	S	S				S	S												*		
dist	7	10				6	6												0		GAB
back	S	S				S	S												*		
dist	7	10				6	6	14						12					0		ABNH
back	S	S				S	S	G						G					*		
dist	7	10				6	6	14						12					0		BNH
back	S	S				S	S	G						G					*		

Continue your work on Problem 1 on this page.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	heap
dist	7	10				6	6	14						12					0		BNH
back	S	S				S	S	G						G					*		
dist	7	10	17			6	6	14	18					12					0		NHCI
back	S	S	B			S	S	G	B					G					*		
dist	7	10	17			6	6	14	18					12	19				0		HCIO
back	S	S	B			S	S	G	B					G	N				*		
dist	7	10	17			6	6	14	18	20				12	19	24			0		CIOJP
back	S	S	B			S	S	G	B	H				G	N	H			*		
dist	7	10	17	26		6	6	14	18	20				12	19	24			0		IOJPD
back	S	S	B	C		S	S	G	B	H				G	N	H			*		
dist	7	10	17	26		6	6	14	18	20				12	19	24			0		OJPD
back	S	S	B	C		S	S	G	B	H				G	N	H			*		
dist	7	10	17	26		6	6	14	18	20				12	19	24			0		JPD
back	S	S	B	C		S	S	G	B	H				G	N	H			*		
dist	7	10	17	26		6	6	14	18	20	26			12	19	24			0		PDK
back	S	S	B	C		S	S	G	B	H	J			G	N	H			*		
dist	7	10	17	26		6	6	14	18	20	26			12	19	24	30		0		DKQ
back	S	S	B	C		S	S	G	B	H	J			G	N	H	P		*		
dist	7	10	17	26	34	6	6	14	18	20	26	34		12	19	24	30		0		KQEL
back	S	S	B	C	D	S	S	G	B	H	J	D		G	N	H	P		*		
dist	7	10	17	26	34	6	6	14	18	20	26	34		12	19	24	30	33	0		QREL
back	S	S	B	C	D	S	S	G	B	H	J	D		G	N	H	P	K	*		
dist	7	10	17	26	34	6	6	14	18	20	26	34		12	19	24	30	33	0		REL
back	S	S	B	C	D	S	S	G	B	H	J	D		G	N	H	P	K	*		
dist	7	10	17	26	34	6	6	14	18	20	26	34		12	19	24	30	33	0	41	ELT
back	S	S	B	C	D	S	S	G	B	H	J	D		G	N	H	P	K	*	R	
dist	7	10	17	26	34	6	6	14	18	20	26	34	41	12	19	24	30	33	0	41	TM
back	S	S	B	C	D	S	S	G	B	H	J	D	L	G	N	H	P	K	*	R	
dist	7	10	17	26	34	6	6	14	18	20	26	34	41	12	19	24	30	33	0	41	M
back	S	S	B	C	D	S	S	G	B	H	J	D	L	G	N	H	P	K	*	R	
dist	7	10	17	26	34	6	6	14	18	20	26	34	41	12	19	24	30	33	0	41	
back	S	S	B	C	D	S	S	G	B	H	J	D	L	G	N	H	P	K	*	R	

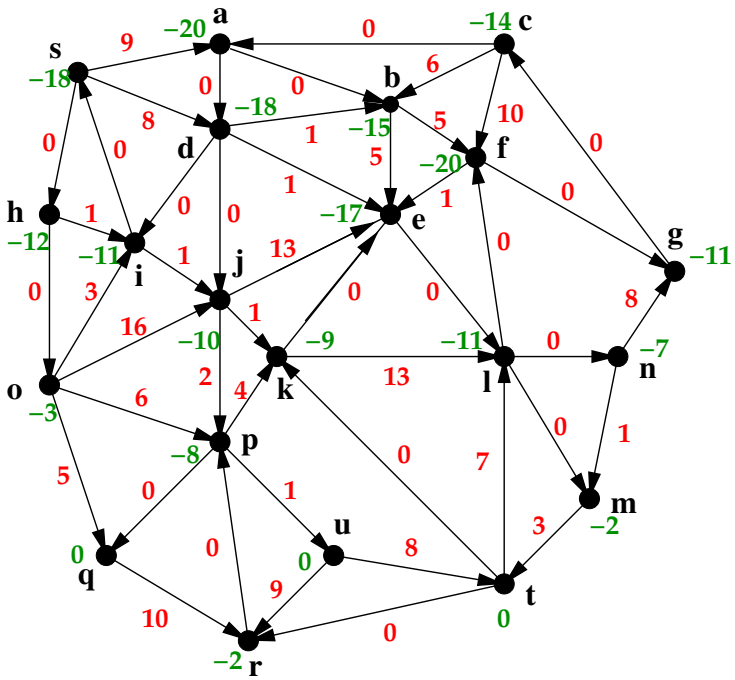


2. Figure (a) shows a weighted directed graph. Your task is to partially work Johnson's algorithm on that graph.



(a)

On Figure (b), Show the results of the Bellman-Ford computation as zeros or negative numbers at each vertex, and show the non-negative adjusted weight on each arc. Do not complete the computation of Johnson's algorithm.



(b)

3. Walk throuth the A^* algorithm for the following weighted graph, finding the least cost path from S to T. The edge weights are in black and the heuristics are in red. The heuristics are both admissible and consistent. Your answer should label each fully processed vertex with both f and g values. not all vertices will be processed.