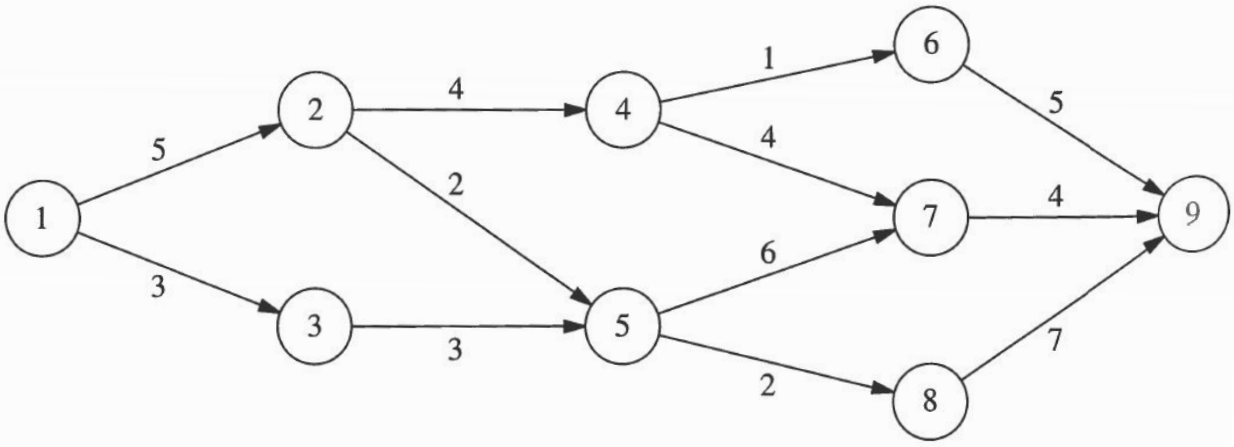
Dynamic Programming Problems from Hillier and Lieberman

10.2-3. Consider the following project network for a PERT-type system as described in Sec. 9.8, where the number next to each arc is the time required for the corresponding activity. Consider the problem of finding the longest path (the largest total time) through this network from event 1 (project start) to event 9 (project completion), since the longest path is the critical path.



(*a*) What are the stages and states for the dynamic programming formulation of this problem?

(*b*) Use dynamic programming to solve this problem. However, instead of using the usual tables, show your work graphically. In particular, fill in the values of the various $f_n^*(s_n)$ next to the corresponding nodes (except node 9), and show the resulting optimal arc to traverse out of each node by drawing an arrowhead near the beginning of the arc. Then identify the optimal path (the longest path) by following these arrowheads from node 1 to node 9. If there is more than one optimal path, identify them all.

(*c*) Use dynamic programming to solve this problem by constructing the usual tables for $n = 4$, $n = 3$, $n = 2$, and $n = 1$.

D, I* **10.3-4.** A political campaign is entering its final stage, and polls indicate a very close election. One of the candidates has enough funds left to purchase TV time for a total of five prime-time commercials on TV stations located in four different areas. Based on polling information, an estimate has been made of the number of additional votes that can be won in the different broadcasting areas depending upon the number of commercials run. These estimates are given in the following table in thousands of votes:

	Area			
Commercials	1	2	3	4
0	0	0	0	0
1	4	6	5	3
2	7	8	9	7
3	9	10	11	12
4	12	11	10	14
5	15	12	9	16

Use dynamic programming to determine how the five commercials should be distributed among the four areas in order to maximize the estimated number of votes won.