

Question 1

(a) True

(b) True

(c) False

(d) False

(e) True

Question 2

(a) Let $\text{dist}(v)$ be the shortest distance from source node o to v

So, the subproblem is get $\text{dist}(v)$ for each node.

(b) Decision for each:

For each parent u of v , we can reach v via u , so we compute:

$$\text{dist}(v) \geq \min(\text{dist}(u) + w(u-v)) \text{ for all edges } (u \rightarrow v)$$

recursion:

$$\text{dist}(v) \geq \min(\text{dist}(u) + w(u-v)) \text{ for all edges } (u \rightarrow v)$$

(c) Number of subproblems = V

Time for per sub: check all incoming edges, average $O(1)$, total is $|E|$

$$\text{Total: } O(|V| + |E|)$$

(d)	$d(\cdot)$	Order	Computations
	$d(0)$	0	Base case, $d(0) = 0$
	$d(1)$	1	$d(1) = d(0) + 2 = 2$
	$d(4)$	2	$d(4) = d(0) + 1 = 1$
	$d(2)$	3	$d(2) = \min(d(1) + 3, d(4) + 2) = 3$
	$d(5)$	4	$d(5) = d(4) + 4 = 5$
	$d(3)$	5	$d(3) = \min(d(2) + 6, d(5) + 1) = 6$

