Eclipse, Kliezl P. Exercise 8.2 – 1

Q:

a. Apply the bottom-up dynamic programming algorithm to the following instance of the knapsack problem:

item	weight	value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

capacity $W = 6$.

b. How many different optimal subsets does the instance of part (a) have?

c. In general, how can we use the table generated by the dynamic programming algorithm to tell whether there is more than one optimal subset for the knapsack problem's instance?

A:

a.

			capacity *j*						
value	weight	Item *i*	0	1	2	3	4	5	6
		0	0	0	0	0	0	0	0
$25	3	1	0	0	0	25	25	25	25
$20	2	2	0	0	20	25	25	45	45
$15	1	3	0	15	20	35	40	45	60
$40	4	4	0	15	20	35	40	55	60
$50	5	5	0	15	20	35	40	55	65

b. There is only one unique optimal subset in the instance of part (a), which is {item 3, item 5} with a total weight of 6 and total value of $65.

c. There is more than one optimal subset for the knapsack problem's instance if while retracing backward the computation of $V[n, W]$, there is an equality encountered between $V[i-1, j]$ and $v_i + V[i-1, j-w_i]$.