

Problem Set #3 (Algorithms)

Department: _____

Student ID: _____

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Consider the 0-1 knapsack problem where a thief robbing a store finds n items for some integer n . The i th item is worth v_i dollars and weighs w_i pounds, where v_i and w_i are integers. The thief wants to take as valuable a load as possible, but he can carry at most W pounds in his knapsack, for some integer W . Consider $0 \leq n \leq 5$, $1 \leq v_i \leq 50$, $1 \leq w_i \leq 5$, and $0 \leq W \leq 5$.

1. For a bottom-up dynamic-programming algorithm to compute the value (in dollars) of an optimal solution to the 0-1 knapsack problem for n items in $O(nW)$ time,

(a) Write your program that includes your comments.

(b) When $W = 5$, $v_1 = 12$, $v_2 = 20$, $v_3 = 24$, $v_4 = 30$, and $w_i = i$ for $i = 1, 2, 3, 4$, show the value (in dollars) of an optimal solution to the 0-1 knapsack problem for 4 items by executing your program.

(c) Explain your program and your execution.