Exercise 7.1

Question

7.1. *Engulf and Devour*
The safety engineer for Engulf and Devour's Lakeside factory has estimated the number of employee disabilities (measured in sick days/year) that can be avoided by various measures: covering dangerous machinery (CDM), providing protective clothing (PPC), improving ventilation (IV), and/or lowering noise levels (LNL). The information is summarized in the following table.

	Measures			
Investment (10^3\$)	**CDM**	**PPC**	**IV**	**LNL**
0	0	0	0	0
10	5	15	2	5
20	10	22	12	7
30	15	25	15	15
40	20	25	17	25
50	22	30	25	26

(*a*) Use dynamic programming to determine how a \$70,000 budget could be most effectively employed to reduce disabilities.
(*b*) How much of a difference would it make if management cut back the safety budget to \$60,000? How much money would be saved for each additional sick day the budget cut would cause?
(*c*) Could this problem be solved by linear programming? Why or why not?

Solution from Manual

Chapter 7

7.1 Engulf and Devour

a) Best investment gives a savings of 52 days via two possible investment schemes: (0,10,20,40) or (10,20,0,40). See Table:

Budget $000	$f_1(K)$	$f_2(K)$	$f_3(K)$	$f_4(K)$
0	0	0	0	0
10	5	15	15	
20	10	22	22	
30	15	27	27	
40	20	32	34	
50	22	37	39	
60	22	42	44	47
70	22	45	49	52

b) Five less days would be saved (52 - 47 = 5) at a savings of $10,000 which is $2,000 per sick day.

c) This problem could not be solved by LP since the return functions for PPC, IV, Z LNL all present non-convex feasible regions.

Additional Notes