MATH3202/7232 Operations Research & Mathematical Planning 2020

Week 8 – Dynamic Programming

Inventory Problem

A company knows that the demand for its product during each of the next four months will be as follows:

Month	1	2	3	4
Demand	2	3	2	4

At the beginning of each month, the company must determine how many units should be produced during the current month. During a month in which units are produced, a setup cost of $3 is incurred. In addition, there is a variable cost of $1 for every unit produced. At the end of each month, a holding cost of 50 cents per unit on hand is incurred. Capacity limitations allow a maximum of 5 units to be produced during each month. The size of the company's warehouse restricts the ending inventory of each month to at most 4 units.

How many units should the company produce each month to satisfy demand and minimise total cost?

Nonlinear Objective

Maximize $(x_1+5)(x_2+1)(x_3+2)$ subject to $3x_1 + 2x_2 + x_3 \leq 6$, with x_1, x_2, x_3 all nonnegative integers.

Minimal Studying

In order to graduate from State University, Angie Warner needs to pass at least one of the three subjects she is taking this semester. She is now enrolled in Algebra, Calculus, and Statistics. Angie's busy schedule of extra-curricular activities allows her to spend only 4 hours per week on studying. Angie's probability of passing each course depends on the number of hours she spends studying for the course, as follows:

Hours of study per week	Probability of Passing		
	Algebra	Calculus	Statistics
0	.20	.25	.10
1	.30	.30	.30
2	.35	.33	.40
3	.38	.35	.45
4	.40	.38	.50

How many hours per week Angie should spend studying each subject.

Chess Strategy

Vladimir is playing Keith in a two-game chess match. Winning a game scores one match point and drawing a game scores a half match point. After the two games are played, the player with more match points is declared the champion. If the two players are tied after two games, they continue playing until somebody wins a game (the winner of that game will be the champion).

During each game, Vladimir can play one of two ways: boldly or conservatively. If he plays boldly, he has a 45% chance of winning the game and a 55% chance of losing the game. If he plays conservatively, he has a 90% chance of drawing the game and a 10% chance of losing the game.

What strategy should Vladimir follow to maximize his probability of winning the match?