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A Study on Linear Programming Problem

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ABSTRACT
Green supply chain management (GSCM) is about incorporating the environmental idea in every stage of a supply chain. It has The LPP is the simplest way to calculate the profit and loss of a management. The important application of LPP is cost reduction in various business fields. It is also used to solve many diverse combination problems. LPP is more adaptive and flexible to analyze solution in various problems. Here we have discussed about the revenue and income of a hotel using LPP. The problem is solved using simplex method. The simplex method is easy to find the solution to the problem.

Keywords: *Constraints, Cost, Employees & Hour of work*

INTRODUCTION TO MATHEMATICAL FORMULATION

Companies throughout the entire hospitality industry focus on implementing successful techniques in order to optimize their efficiency and increase profitability. Revenue Management is as an important technique in the hotel operation and therefore to maximize their revenues, hotels are increasingly implementing Revenue Management practices. A typical mathematical problem consist of a single objective function, representing either profits to be maximised or costs to be minimized, and a set of constrains that circumscribe the decision variables .In the case of a linear program (LP), the objective function and constraints are all linear functions of the decision variables .Linear programming is a widely used model type that can solve decision problems with thousands of variables.

Generally, the feasible values of the decision variables are limited by a set of constrains that are described by mathematical function of the decision variables. The feasible decisions are compared using an objective function that depends on the decision variables. For a linear program, the objective function and constrains are required to be linearly related to the variables of the program.

A linear programming problem (LPP) is a special case of a mathematical programming problem where in a mathematical program tries to identify an extreme (i.e. minimum or maximum) point of a function f(x_1,x_2,..........x_n), which furthermore satisfies a set of constraints. Assume that you are a manager of a Rathinam Mess that's sells three types of foods and it is prepared by two batches of employees. First batch prepares idly, chappathi and meals in 9 hours. Second batch prepares idly, chappathi and meals in 9 hours. Idly is prepared for breakfast and dinner by both the batches. Chappathi is prepared for breakfast, lunch and dinner by both the batches. The meals are prepared for lunch. The cost price of idly is Rs.15 per set, the cost price of meals is 40rs, the cost price of chappathi is Rs.20 per set. The profit for idly is Rs.15, the profit for meals is Rs10,the profit of chappathi is Rs5.

The objective function is to maximize the profit,

Max Z =15x_1+10x_2+5x_3.

First batch of workers work for 9 hours

$$x_1+2x_2+3x_3\le 9$$

Second batch of workers work for 9 hours

$$x_1+3x_2+2x_3\le 9$$

Idly is prepared for breakfast and dinner

$$x_1\le 2$$

Meals are prepared only for the lunch.

$$x_2\le 1$$

Chappathi is prepared for breakfast, lunch, and dinner,

$$x_3\le 3$$

Initial Iteration

c_b	y_b	x_b	x_1 (15)	x_2 (10)	x_3 (5)	s_1 (0)	s_2 (0)	s_3 (0)	s_4 (0)	s_5 (0)	Ratio
0	S_1	9	1	2	2	1	0	0	0	0	9
0	S_2	9	1	3	2	0	1	0	0	0_s	9
0	S_3	2	$\boxed{1}$	0	0	0	0	1	0	0	2
0	S_4	1	0	1	0	0	0	0	1	0	0
0	S_5	3	0	0	1	0	0	0	0	1	0
$z_j - c_j$		0	-15	-10	-5	0	0	0	0	0	

Ratio =Minimum {$x_{Bi}/y_{ir}, y_{ir>0}$ }

=Min {9, 9, 2}

=2

1 is a pivot element x_1 is entering bases and s_3 is leaving bases.

1st Iteration:

c_b	y_b	x_b	x_1 (15)	x_2 (10)	x_3 (5)	s_1 (0)	s_2 (0)	s_3 (0)	s_4 (0)	s_5 (0)	Ratio
0	s_1	7	0	2	2	1	0	-1	0	0	3.5
0	S_2	7	0	3	2	0	1	0	0	0	2.3
15	**X_1**	**2**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**
0	S_4	1	0	$\boxed{1}$	0	0	0	0	1	0	1
0	S_5	3	0	0	1	0	0	0	0	1	0
$z_j - c_j$		30	0	-10 $\Uparrow$	-5	0	0	15	0	0	

Ratio = Minimum $\{x_{Bi}/y_{ir},\ y_{ir>0}\}$

= min {3.5, 2.3, 1}

= 1

1 is a pivot element x_2 is entering bases and s_4 is leaving bases.

2nd iteration:

c_b	y_b	x_b	x_1 (15)	x_2 (10)	x_3 (5)	s_1 (0)	s_2 (0)	s_3 (0)	s_4 (0)	s_5 (0)
0	s_1	5	0	0	2	1	0	-1	-2	0
0	S_2	4	0	0	2	0	1	0	-3	0
15	**X_1**	**2**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
10	**X_2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**	**0**
0	S_5	3	0	0	1	0	0	0	0	1
$z_j - c_j$		40	0	0	0	0	0	15	10	0

Here all $z_j - c_j \geq 0$, Then Maximum Z=40 at x_1=2 and x_2=1.

Conclusion:

In this project we studied the linear programming, which is very successfully used in many industries can also be used in food & average department of a hotel. We have discussed about the revenue and income of Rathinam Mess.

The cost of preparing idly, meals and chappathi are Rs.4000, Rs.1500 and Rs.5000 respectively. The cost for preparing idly, meals and chappathi per batch is Rs.1333, Rs.5000 and Rs.1667 respectively.

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