Computer Laboratory Session 3

Aims

1. Be familiar with maximisation and minimisation problems

Objectives

1. To use the Linear Programming solution approach
2. To maximise profit for a production mix
3. To minimise costs in a fertiliser application

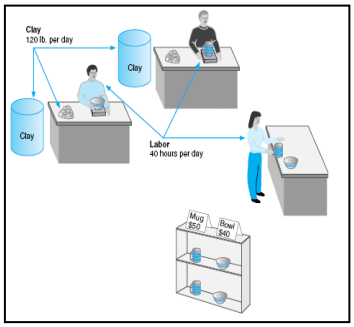
Task 1 – Production mix to maximise profit

How many bowls and mugs should be produced to maximize profits given labour and materials constraints?

Product resource requirements and unit profit are shown in the table below.

Product	Labor (Hr./Unit)	Clay (Lb./Unit)	Profit (£/Unit)
Bowl	1	4	40
Mug	2	3	50

Table 1 Resource requirements and profits.



The total time the people (resources) have available in a day to do this labour is 40 hours. 120 pounds of clay are delivered on a daily basis.

Fundamental tasks

1. Formulate objective function (paper)
2. Formulate constraints (paper)
3. Enter Decision Variables (assume 10 mugs and 5 bowls), determine profit per product
4. Create formula for objective function
5. Enter labour and clay parameters
6. Compute resource consumption
7. Include resource constraints (limits)

Objective	*Maximise revenue*			£1,360.00		
	£1,360.00			2		
				TRUE		
Decision Variables				100		
	Bowls (x1)	Mugs (x2)				
Quantity	24 items	8 items	<< Decision Variables			
Profit per unit	£ 40.00	£ 50.00				
Total profit	£ 960	£ 400				
Constraints						
	Parameters		Parameter x Variable			
Material\for	Bowls (x1)	Mugs (x2)	Bowls (x1)	Mugs (x2)	Sum	Constraint
Labour	1 h	2 h	24 h	16 h	40 h	40 h
Clay	4 lb	3 lb	96 lb	24 lb	120 lb	120 lb

Figure 1 Solution to fundamental tasks.

Intermediate tasks

1. Use Add-In solver to determine optimal solution
   a. Activate solver (Data >> Analysis >> Solver)
   b. Define objective (target cell)
   c. Specify decision variables (cells that change)
   d. Enter constraints
2. Save Solver model (look at contents)
3. Display profit per product in chart

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Advanced tasks

1. Enter additional sales constraint – only a maximum of 20 bowls are sold.
2. Add a new product (Vase), profit £30, labour two hours, 2lbs of clay
3. Solve and display profit product pie diagram

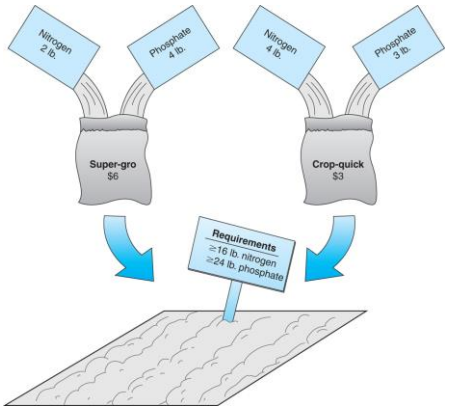
Task 2 – Fertiliser choice

How much of each brand to purchase to minimize total cost of fertilizer given following data?

There are two brands of fertilizer available - Super-gro, Crop-quick. The field requires at least 16 pounds of nitrogen and 24 pounds of phosphate. Super-gro costs £6 per bag, Crop-quick £3 per bag.

Brand	Nitrogen (lb/bag)	Phosphate (lb/bag)
Super-gro	2	4
Crop-quick	4	3

Table 2 Chemical contribution.



Basic tasks

1. Formulate objective function (paper)
2. Formulate constraints (paper)
3. Enter Decision Variables, determine costs per product
4. Create formula for objective function
5. Enter parameters
6. Compute resource consumption
7. Include resource constraints (limits)

Intermediate Tasks

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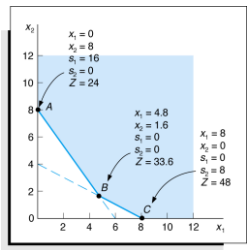

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