5CCS2FC2: Foundations of Computing II

Tutorial Sheet 8

8.1 A carpenter produces tables and chairs.

- Each table takes 6 hours of labour, and takes up 2m^2 of storage space, and can be sold for a profit of £30,
- Each chair takes only 3 hours of labour, takes up 0.5m^2 of storage space, and can be sold for a profit of £10.

Customer demand requires that they produce at least three times as many chairs as tables, but there is a maximum storage space for at most four tables (8m^2). Given that the carpenter wishes not to spend more than 40 hours per week, how much of time should be taken up producing tables, and how much should be taken up producing chairs, in order to maximise profits.

Express this problem as a Linear Program, and find a solution using the online LP tool.

`http://www.zweigmedia.com/utilities/lpg/`

8.2 Use the Simplex Algorithm to find the optimal solutions to the following Linear Programs:

(i)

Maximise:	$x + 3y$		
Subject to:	$3y - x$	$\leq$	9
	$4x + 6y$	$\leq$	27
	$5x - 6y$	$\leq$	1
	x, y	$\geq$	0

(ii)

Minimise:	$y - x$		
Subject to:	$x + y$	$\geq$	3
	$x + 3y$	$\leq$	6
	$x - 3y$	$\leq$	3
	x, y	$\geq$	0

8.3 Apply the Branch-and-Bound method to solve the following Integer Program:

$$
\begin{array}{rrcl}
\text{Maximise:} & x + 2y & & \\
\text{Subject to:} & 2y - x & \leq & 4 \\
& 3x + 2y & \geq & 6 \\
& 4x + 5y & \leq & 20 \\
& x, y & \geq & 0 \\
& x, y & \in & \mathbb{Z}
\end{array}
$$

You should use the online tool to provide the solutions to the linear relaxations given at each stage:

`http://www.zweigmedia.com/utilities/lpg/`