Linear programming relates to the use of *several linear inequalities* in variables *x* and *y* to define a *region* of the *x,y* plane.
In a practical problem *x* and *y* might relate to, typically integer, values of quantities that are subject to certain constraints. The goal of linear programming is to work out the valid subset of *x,y* values. Often a 'cost' function of *x* and *y* will also be defined. This can further select 'optimal' *x,y* coordinates if cost is to be minimized, maximized etc.

Example:

$x+y \leq 11$

$y \geq 3$

$y \leq x$

$M = x+4y$

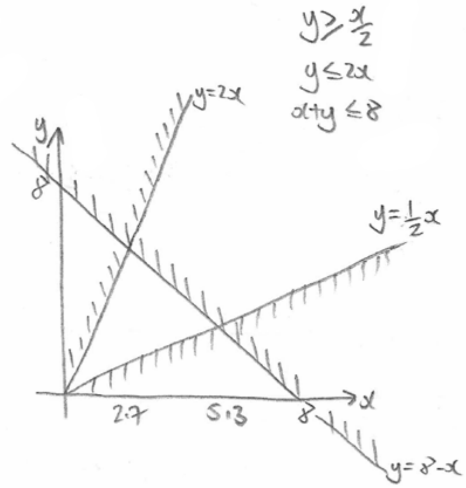
$m = 3x+y$

1. To solve a linear programming problem, firstly turn all the inequalities into *equations* and plot them on an (*x,y*) grid. Take some care to work out an appropriate *scale* to encompass the valid region.

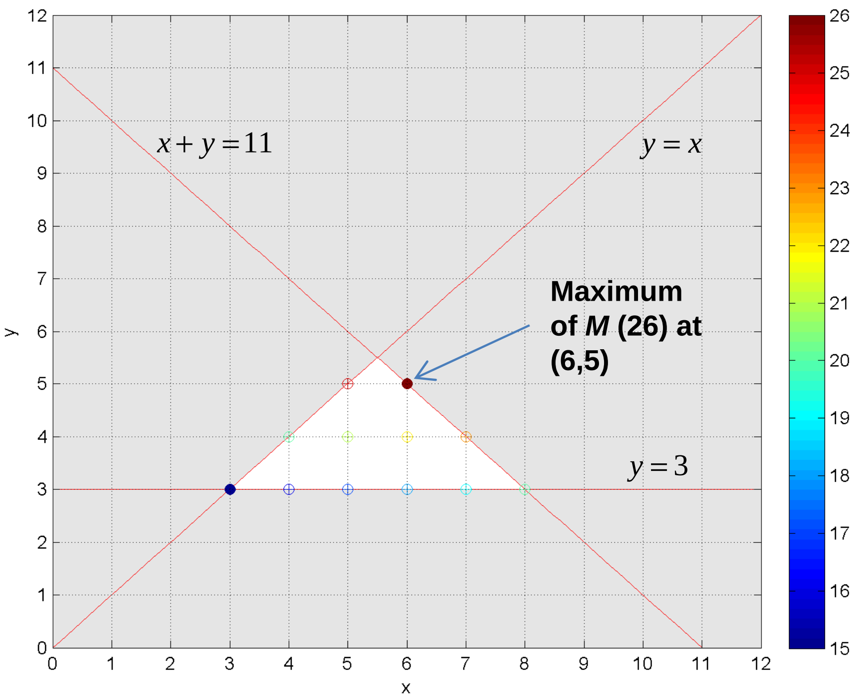
2. Use the *inequalities* to shade above or below the lines to indicate *invalid* regions. This does not have to be the entire space! (See example on the right).

3. If integer values of *x,y* are required, use the graph paper grid to mark the valid coordinates. Only use the boundary lines if the inequality does indeed permit an = as well as > or < .

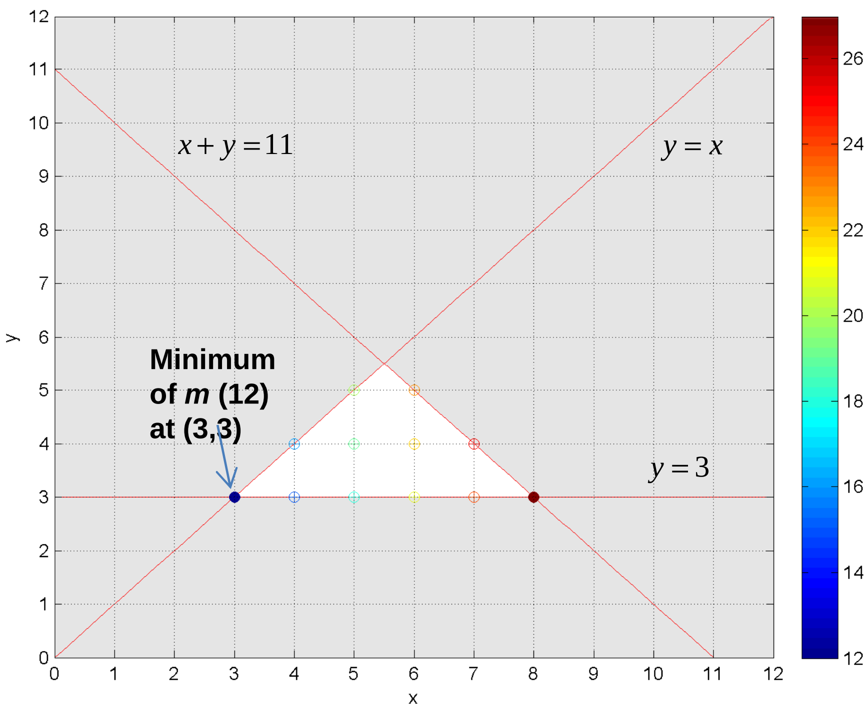
4. Tabulate the cost function, if required, and hence work out the 'optimum' *x,y* pair for the problem.



Colour coding of valid x,y coordinates by $M = x+4y$



Colour coding of valid x,y coordinates by $m = 3x+y$



x	y	x+4y	3x+y
3	3	15	12
4	3	16	15
4	4	20	16
5	3	17	18
5	4	21	19
5	5	25	20
6	3	18	21
6	4	22	22
6	5	**26**	23
7	3	19	24
7	4	23	25
8	3	20	27