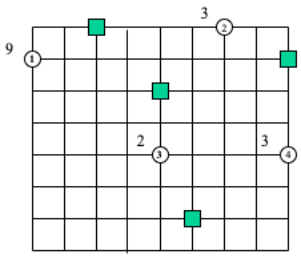
Given an instance of the sensor lifetime maximization problem



- 4 sensors (empty circles): 1,2,3,4 besides each sensor there is the initial number of batteries, e.g. for sensor 1 there are batteries for 9 days
- 4 targets (green squares) that should be covered by sensors in the **rectilinear** (Manhattan) metric (the unit length of grid is 1),
- The sensing radius is 5 (in rectilinear metric), i.e. sensor 1 covers two targets (the topmost and the middle squares), the bottom target is covered by sensors 3 and 4.
- Sensor cover is is the minimal subset of sensors covering all targets; for example {sensor S1, sensor S4} is a sensor cover.

(a) List all sensor covers: SC1 = { S1, S4} SC2= { } SC3= { } SC4 = { }

(b) Write linear program formulation for sensor lifetime maximization problem
variables:

objective:
s.t.

Solution:

a) List of sensor Covers:

SC1 = {S_1, S_4}
SC2 = {S_2, S_3}
SC3 = {S_2, S_4}

b) Linear Program Formulation for sensor lifetime maximization problem:

Maximize $\Sigma_{i = 1 \text{ to } n}\ t_i$ where t_i is the time variable
Such that $\Sigma_{j = 1 \text{ to } m}\ C_{ij}.\ t_j <= b_i$
C_{ij} = {1 if sensor in sensor cover
0 if sensor is not in sensor cover

Maximize $t_1 + t_2 + t_3$
Such that

$t_1 <= 9$
$t_2 + t_3 <= 3$
$t_2 <= 2$
$t_1 + t_3 <= 3$