Math 315 Homework 1

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Problem 1

(a) The variables I defined were: $x_1, x_2, x_3, \ldots, x_{37} \in \{0, 1\}$, $x_n = 0$ if there is no team in county n, and $x_n = 1$ if there is a team in county n. $y_1, y_2, y_3, \ldots y_{37} \in \{0, 1, 2, 3, \ldots\}$, $y_n = 0$ if there is no team in or adjacent to county n, and $y_n \geq 1$ if there is at least one team in or adjacent to county n. Finally $k = \sum_{n=1}^{37} x_n$ is the total number of teams, which we seek to minimize.

(b) 37! points need to be considered, as for every county, you have the option of putting a team there or not.

(c)

$$\min(k)$$

Such that,

$$\begin{aligned} y_1 &\geq 1 \\ y_2 &\geq 1 \\ y_3 &\geq 1 \\ &\vdots \\ y_{37} &\geq 1 \end{aligned}$$

$k = 8$, if you put teams in the following counties,

$$\#2, \#10, \#14, \#17, \#21, \#27, \#33, \#36$$

(Side note) Couldn't you also think of this problem in a graph theoretical context, you have 37 vertices, and the connections between vertices represent if they are neighbors. Each of the vertices can be turned on or off, and when you turn it on, all the lines coming from that vertex light up. Then the object is to find the least number of vertices to turn on in order to light up every line.