(H) Nothing But Net(works) (1/1)

As can be seen pretty quickly from the *a + 2b* example, each new cell in the network is determined by taking the sum across all inputs of each input times the weight on that input's arrow. From the example translations of the translator program, we can learn all the weights. Let's call the four elements of the input *a,b,c,d*. From the examples, we can learn that the four outputs are (from left to right) *(b + c), (a + b + c), (c + d), (a + c)*. (These expressions can be figured out by treating the examples as a system of equations and solving it rigorously, or you can also figure it out just by eyeballing the examples).

More formally, if we treat the Rigelese as a column vector of dimension 4 called *R* and the English as a column vector of dimension 4 called *E*, then we can write *WR = E* Where *W* is a matrix of the weights that can be written as

$$W = \begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

However, it is by no means necessary to know anything about matrices to solve this--you can easily just use the expressions *(b + c), (a + b + c), (c + d), (a + c)*.

Using either the matrix multiplication approach or the expressions *(b + c), (a + b + c), (c + d), (a + c)*, we can fill out the translation steps to get that the final message is **GOOD LUCK WITH THAT**: