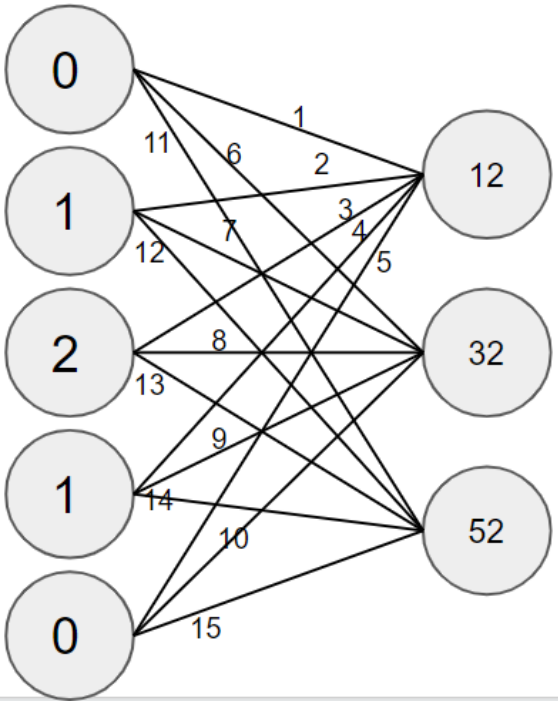
# Neural Network Notation for matrix-vector

## Popular right now but perhaps cumbersome

$$\begin{bmatrix} 12 \\ 32 \\ 52 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}$$

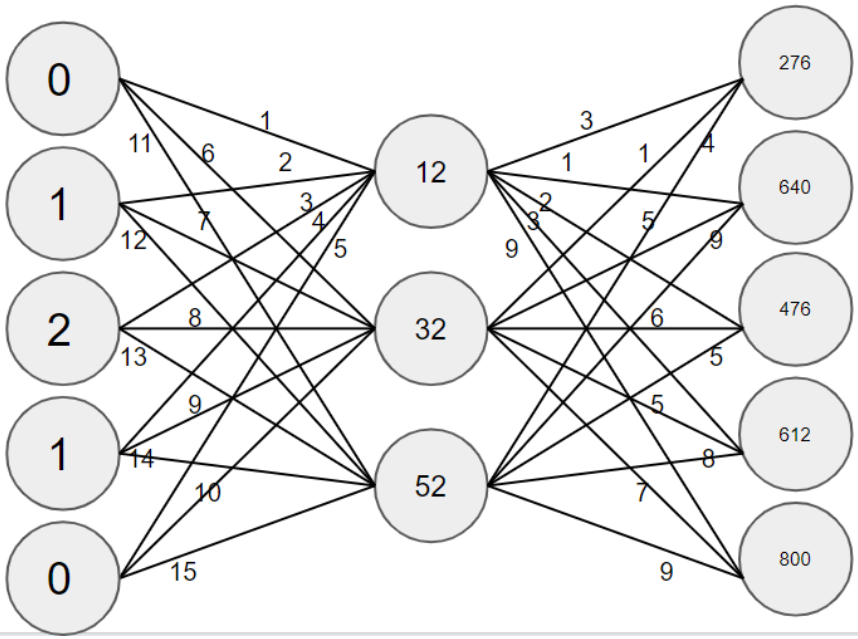



This is called a “linear neural network”
Matrix elements are called weights.

While a bit cumbersome to draw, it does illustrate nicely how every element of the output depends on every element of the input. Sometimes this picture is called a “complete bipartite graph”

# Matrix times Matrix times vector denoted with a neural net

$$\begin{bmatrix} 276 \\ 640 \\ 476 \\ 612 \\ 800 \end{bmatrix} = \begin{bmatrix} 3 & 1 & 4 \\ 1 & 5 & 9 \\ 2 & 6 & 5 \\ 3 & 5 & 8 \\ 9 & 7 & 9 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 6 & 7 & 8 & 9 & 10 \\ 11 & 12 & 13 & 14 & 15 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 2 \\ 1 \\ 0 \end{bmatrix}$$




Where do the rows of A connect?
Where do the columns of A connect?
Same questions for B?