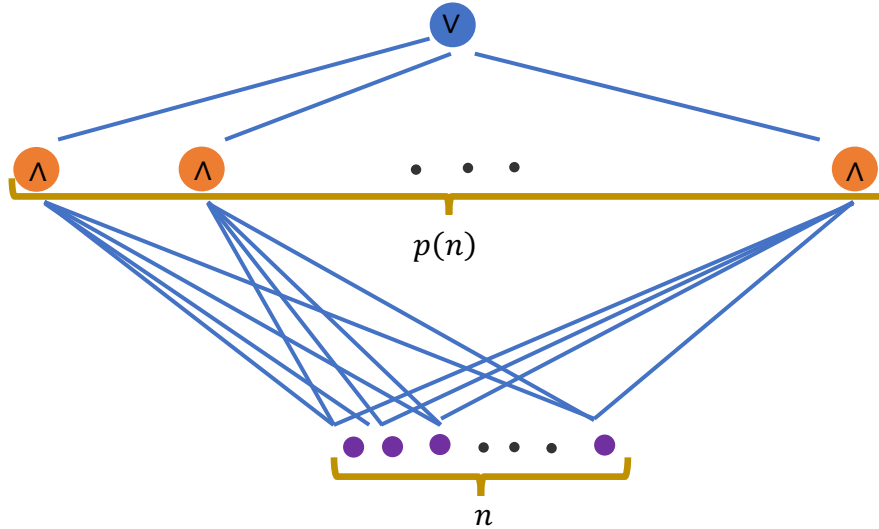


The circuit for each n would look like this:



The blue gate at the top is an OR gate, all the orange gates are AND gates. The in-degree of each AND gate is n , as we can see by the group of n purple nodes (inputs to the circuit), and there are $p(n)$ orange AND gates, and the top blue node tells us whether the input belongs to $L \cap \{0,1\}^n$ – it is the output. The n purple nodes is the n -length input.

This circuit is correct because if the input $x \in L \cap \{0,1\}^n$, then it equals one of the $p(n)$ accepted inputs, i.e. it's the first one OR the second one OR ... OR the n th one, and for x to equal $y \in \{p(n) \text{ accepted inputs}\}$, it has to be that $(x_1 = y_1) \text{ AND } (x_2 = y_2) \text{ AND } \dots \text{ AND } (x_n = y_n)$.

This circuit is polynomial size because the number of edges is $p(n) + (p(n) \cdot n)$. QED.