

$$\begin{aligned}
IP_i = X \cdot y_i &= (x_{n-1}x_{n-2} \cdots x_1x_0) \cdot y_i \\
&= x_{n-1}y_i, x_{n-2}y_i, \cdots x_1b_i, x_0y_i \\
&= p_{n-1,i}, p_{n-2,i}, \cdots p_{1,i}, p_{0,i}
\end{aligned} \tag{1}$$