(b) How many functions are there which assign a number 0 or a number 1 to each \( m \times n \) matrix of 0's and 1's?

We want all functions

\[ f : \text{The set of } m \times n \text{ matrices of 0's and 1's} \rightarrow \{0, 1\} \]

There are \( 2^{mn} \) matrices of 0's and 1's.

To describe one of our functions, we must specify where to send each matrix.

\[
\begin{align*}
\frac{2}{\uparrow} & \frac{2}{\uparrow} \\
\text{matrix one} & \text{matrix two} \\
\frac{2}{\uparrow} & \frac{2}{\uparrow} \\
\text{matrix 2} & \text{matrix 2}^{mn}
\end{align*}
\]

\[ \text{Ans: } 2^{mn} \]