First, let us state a special product rule:

$$|X \times Y| = |X| \cdot |Y|.$$

Here $X \times Y$, the *Cartesian product* of X and Y, denotes the set of ordered pairs (x, y) with $x \in X$, $y \in Y$.
The elements of $X \times Y$ can be written in a table whose rows correspond to the elements of X, and the columns correspond to the elements of Y. This justifies the product rule.
Again, there is an extension to several sets:

$$|X_1 \times \cdots X_n| = |X_1| \cdots |X_n|.$$