

Theorem

If A, B are finite, then

$$|A \times B| = |A| \cdot |B|.$$

Proof.

If

$$A = \{a_1, \dots, a_n\}, \quad B = \{b_1, \dots, b_m\},$$

then

$$\begin{aligned} A \times B = \{ & (a_1, b_1), (a_1, b_2), \dots, (a_1, b_m), \\ & (a_2, b_1), (a_2, b_2), \dots, (a_2, b_m), \\ & \vdots \quad \vdots \\ & (a_n, b_1), (a_n, b_2), \dots, (a_n, b_m) \}. \end{aligned}$$

