Cartesian product

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For any sets A and B, the *Cartesian product* $A \times B$ is the set consisting of all ordered pairs (a, b) where $a \in A$ and $b \in B$.

The Cartesian product satisfies the following properties, for all sets A, B, C, and D:

- $A \times \emptyset = \emptyset$

- $(A \times B) \cap (C \times D) = (A \cap C) \times (B \cap D)$

- $(A \times B)^{\mathsf{C}} = (A^{\mathsf{C}} \times B^{\mathsf{C}}) \cup (A^{\mathsf{C}} \times B) \cup (A \times B^{\mathsf{C}})$

Here $\emptyset$ denotes the empty set, $\cap$ denotes intersection, $\cup$ denotes union, and $^{\mathsf{C}}$ denotes complement with respect to some universal set U containing A and B.