Cartesian Products

Links: Math 3336

Lecture Video 10: Cartesian Products; Textbook Section 1.2

Ordered Pair is a list (x,y) of two things *x* and *y*, enclosed in paranthesis and separated by a comma.

Combining sets is called a *Cartesian Product*
The Cartesian Product of two sets *A* and *B* is another set, denoted as
$A \times B = \{(a, b) \ : \ a \in A, b \in B\}$

> **example**
> $\mathbb{R} \times \mathbb{R} = \{(x, y) : x, y \in \mathbb{R}\}$
> "the set of pairs of real numbers"
>
> $(-e, \sqrt{-1}) \notin \mathbb{R} \times \mathbb{R}$
> *since* $\sqrt{-1}$ *is not a real number*

we can think of $\mathbb{R} \times \mathbb{R}$ as the plane $\mathbb{R}^2$

Definition: given *any* set *A*, we can form the repeated product
$A^n = A \times A \times \ldots \times A \ = \{(x_1, x_2, \ldots, x_n) : \ each \ x_i \in A\}$
(*n-tuple* elements)

If $|A| = n$, $|B| = m$ then $|A \times B| = n * m$