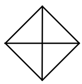


Why

We have considered the number of ways we can arrange 52 cards into a deck. What of n cards? A moment's reflection indicates this will also be the number of ways to arrange n objects in order (where the objects need not be cards).

Definition

By the fundamental principle of counting, there are n ways to select the first card, $n-1$ ways to select the second, and so on. Thus, the number of ways of stacking n cards in a deck is

$$n(n-1)(n-2)\cdots 1$$

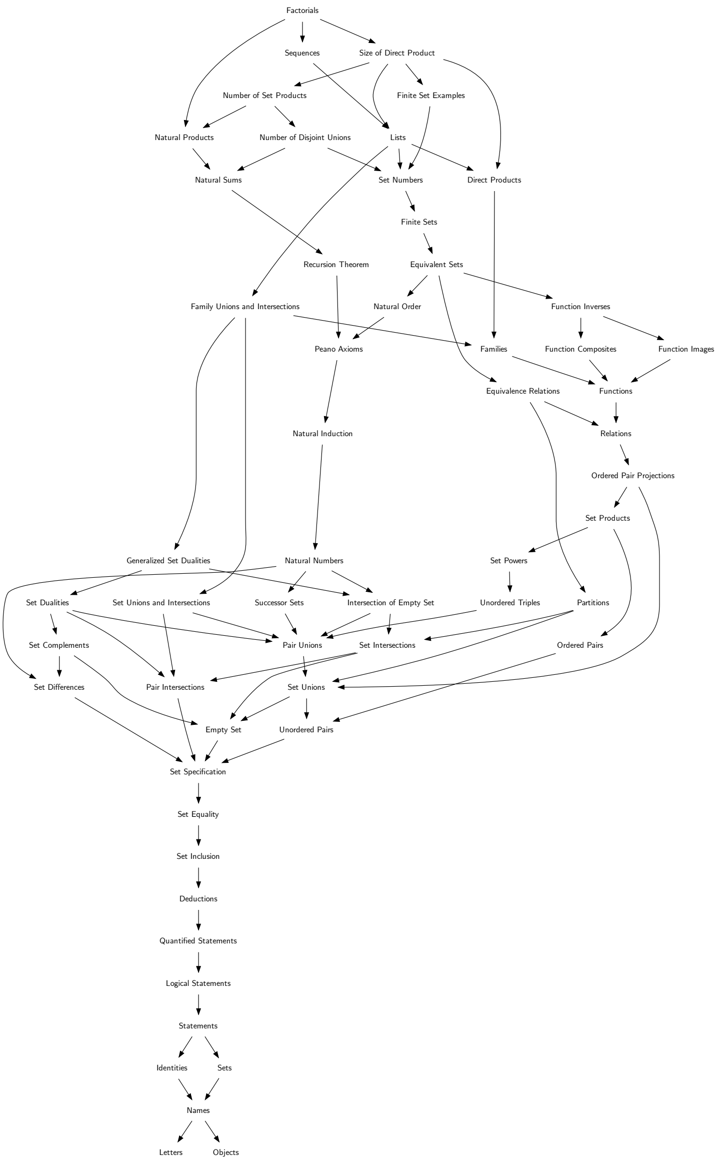
We call this number the *factorial* of n, or *n-factorial.*

Factorial function. Define $f : \mathbf{N} \to \mathbf{N}$ recursively by $f(1) = 1$ and $f(2) = 2f(1)$, and $f(n) = nf(n-1)$ for $n \in \mathbf{N}$ (f exists by the the recursion theorem—see Recursion Theorem). f is defined such that $f(n)$ is n factorial, for which reason we call f the *factorial function.* For convenience, we extend f to ω[1] by defining $f(0) = 1$.

Notation

We denote the factorial of n by $n!$, read aloud "n factorial". So for example, $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ and $0! = 1$.

[1]See Natural Numbers.


Factorials
Sequences
Size of Direct Product
Number of Set Products
Finite Set Examples
Natural Products
Number of Disjoint Unions
Lists
Natural Sums
Set Numbers
Direct Products
Finite Sets
Recursion Theorem
Equivalent Sets
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Set Unions and Intersections
Successor Sets
Intersection of Empty Set
Unordered Triples
Partitions
Set Complements
Pair Unions
Set Intersections
Ordered Pairs
Set Differences
Pair Intersections
Set Unions
Empty Set
Unordered Pairs
Set Specification
Set Equality
Set Inclusion
Deductions
Quantified Statements
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Statements
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Objects