### Why

Suppose we are going to make a bunch of measurements. We associate to each element of a finite set a number. If the measurements we make are divided into proportions according to a distribution, if we make all the measurements and then average the results what do we expect to get.

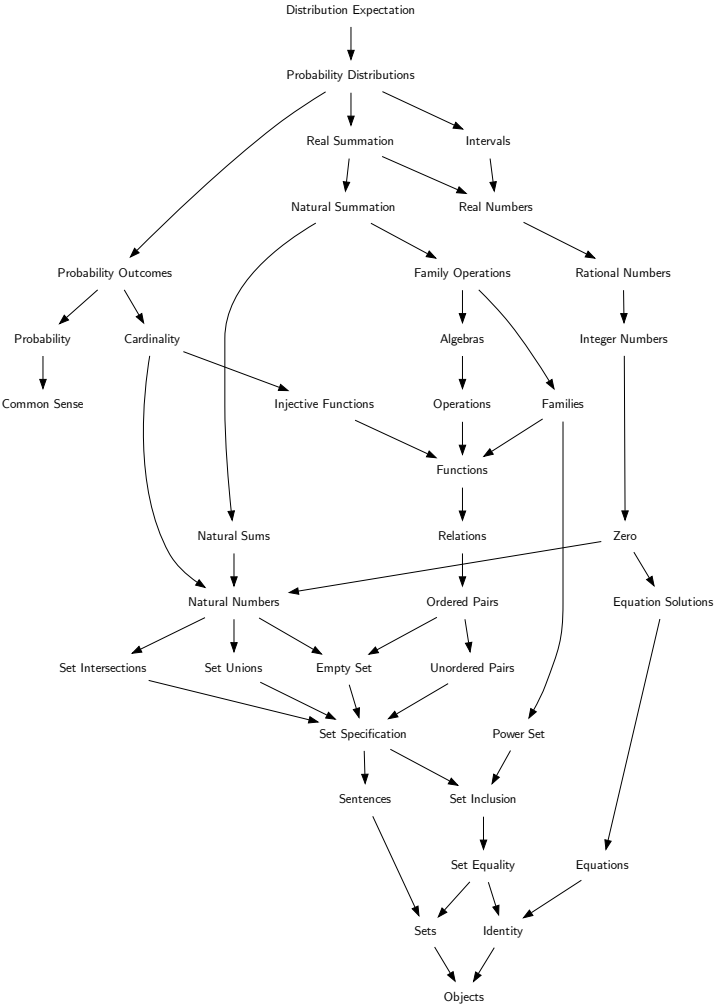
### Definition

Consider a distribution $p$ and a real-valued function $f$. The *distribution expectation*f $f$ *under* $p$ is the sum of the product of the results of $p$ and $f$ on the elements of the set.

### Notation

Let $A$ a finite set. Let $R$ denote the set of real numbers. Let $p : A \to R$. Let $f : A \to R$. The expectation of $f$ under $p$ is

$$\sum_{a \in A} p(a) f(a).$$


Distribution Expectation
Probability Distributions
Real Summation
Intervals
Natural Summation
Real Numbers
Probability Outcomes
Family Operations
Rational Numbers
Probability
Cardinality
Algebras
Integer Numbers
Common Sense
Injective Functions
Operations
Families
Functions
Natural Sums
Relations
Zero
Natural Numbers
Ordered Pairs
Equation Solutions
Set Intersections
Set Unions
Empty Set
Unordered Pairs
Set Specification
Power Set
Sentences
Set Inclusion
Set Equality
Equations
Sets
Identity
Objects