This domain chart identifies some of the mathematical relationships between different Quantity and Unit classes identified in the VIM & SI.

The Dim(), Unit(), and Num() mappings are system specific. Num() and Unit() are defined by 1.20 and 1.23 in the VIM, where they are represented using square and curly braces, respectively. Dim() maps a quantity to its Quantity Dimension. A Quantity is represented within a system of units by Q -> Num(Q)*Unit(Q).

The Quantity Dimensions form an instance of a group with the Base Quantities as the generating set.
Similarly, the Coherent Derived Units form an instance of the same group, with the Base Units as the generating set.
The allowed operations are pairwise multiplication, inverse, and raising to powers.
Closure under the allowed operations requires the Dimensionless Quantity Dimension and the Coherent Derived Unit "One".
There is a 1:1 mapping between the CDU and QD domains.

When a Derived Quantity, DQ, is defined, it shall require definition by specifying the values of Unit(DQ) and Dim(DQ).
When a Derived Unit, DU, is defined, it shall require definition by specifying the values of Unit(DU), Dim(DU), and Num(DU).
Num(DU) gives a conversion factor for the Derived Unit in terms of Unit(DU), i.e., DU -> Num(DU)*Unit(DU).