Math Minion

Conversion Units
&
Automatic Dimensional Analysis

SI defines 7 fundamental physical properties from which all others are derived.

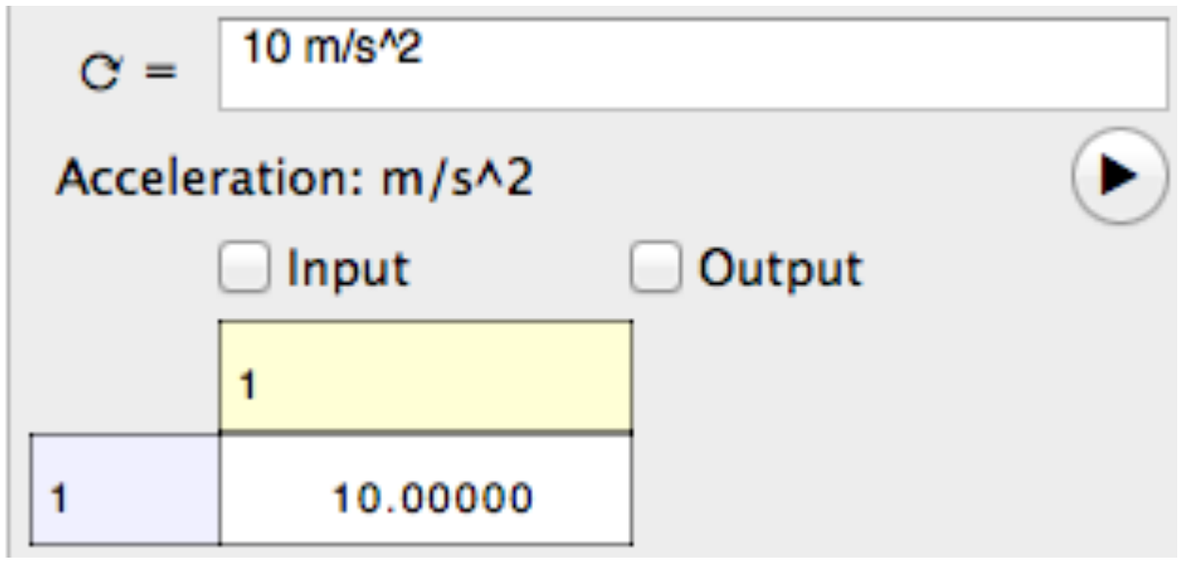
Property	Unit
Length	Metre (m)
Mass	Kilogram (kg)
Time	Second (s)
Electric Current	Ampere (A)
Temperature	Kelvin (K)
Time	Second (s)
Amount of Substance	Mole (mol)
Luminous Intensity	Candela (cd)

For every calculation Math Minion tracks the power of each of the fundamental properties.
Thus:

10 m/s^2

Would have a **length** dimension (power) of **1** and a **time** dimension of **-2**, with all others being **0**.

Math Minion has a defined unit type of **acceleration** for this unit dimension set, but it is only used for labelling.



All arithmetic operations and functions also calculate the unit dimensions of the result.

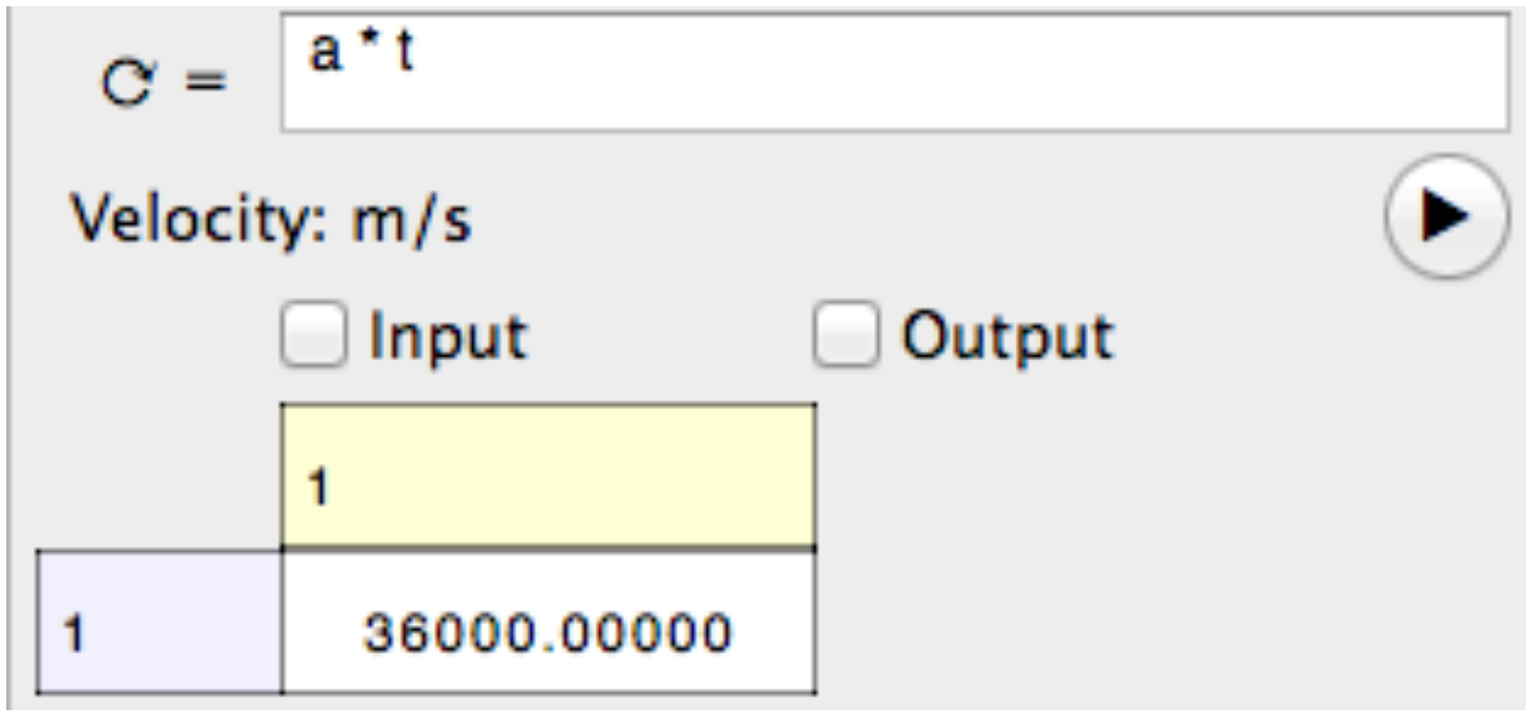
Thus if

a = 10 m/s^2

and

t = 1 h

then **a * t** would have a length dimension of 1 and a time dimension of -1 and will be labelled as a velocity.



The formula

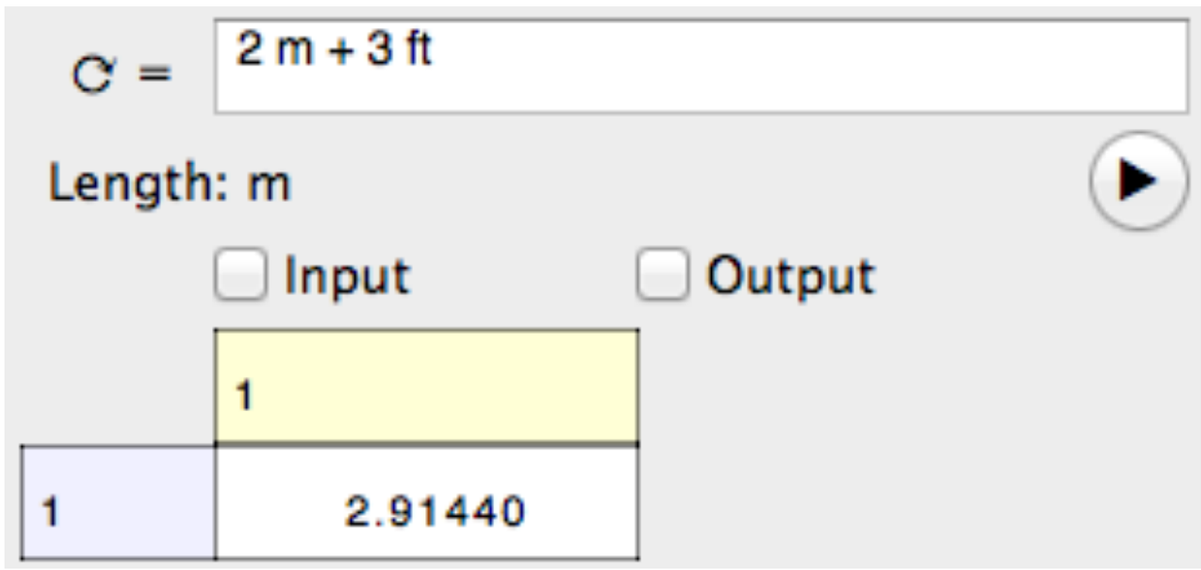
2 m + 3 kg

would result in an **error** message as addition and subtraction of values with different unit dimensions is not valid.

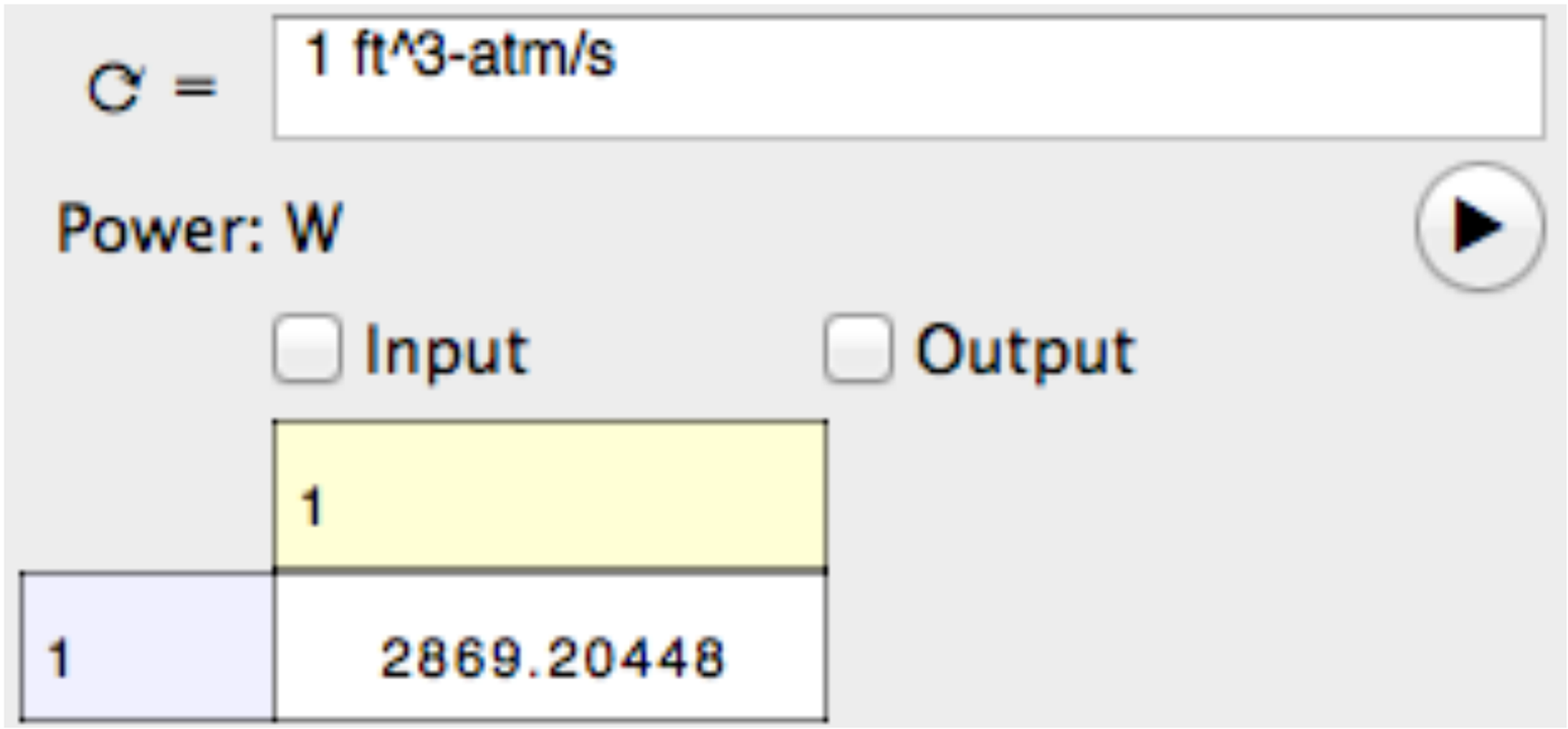
However

2 m + 3 ft

is **valid** since both **m** and **ft** have the same dimension set (length **1** and all others **0)**.



Compound units can be constructed by separating the numerator and denominator with a slash **/** and separating components within each by dashes **-**.
Thus:



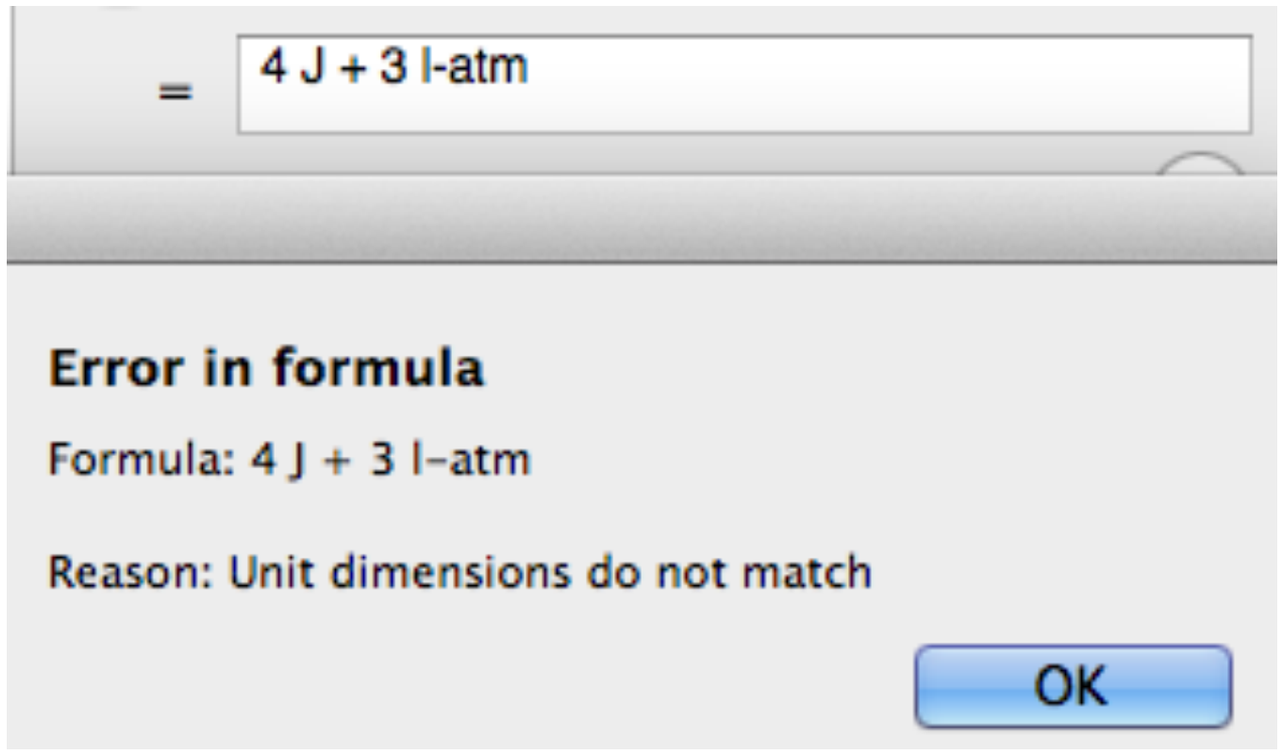
Pressure times volume is energy and that divided by time gives us power.

It is always permissible to enclose units in quotes, but it is necessary when using compound units in formulae that contain math operators.

Thus

4 J + 3 l-atm

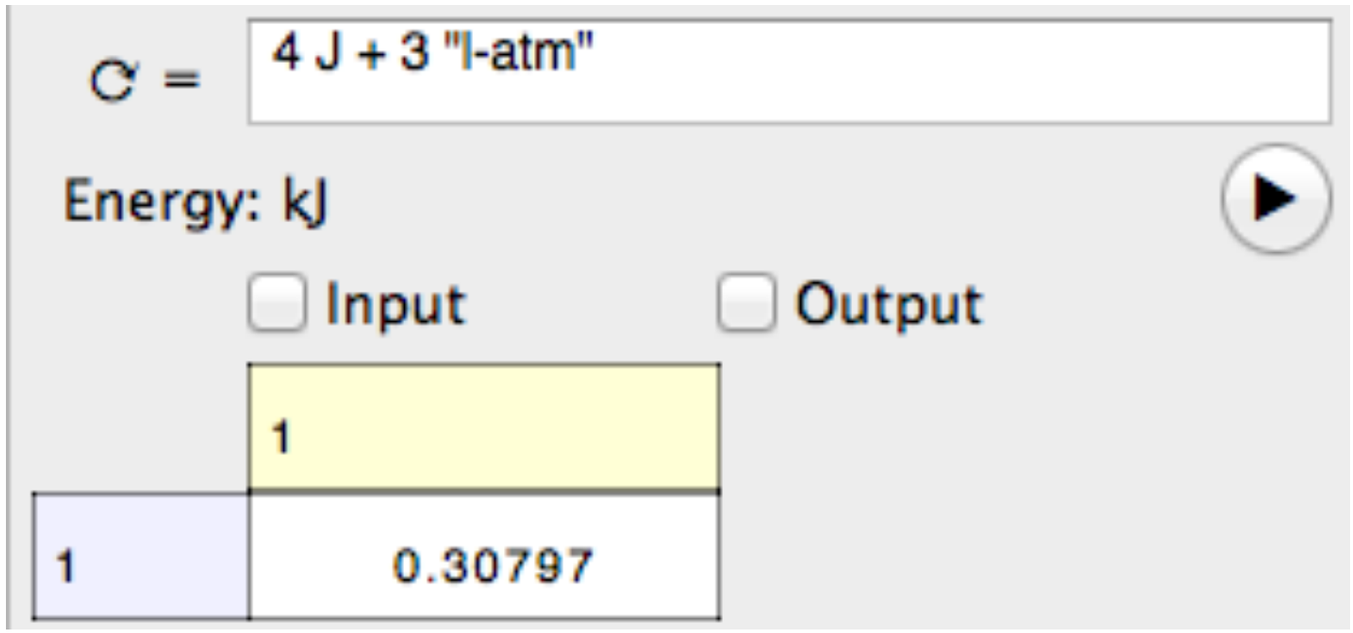
would result in an error as MM sees this as 4 J + 3 l minus a value named atm.



But:

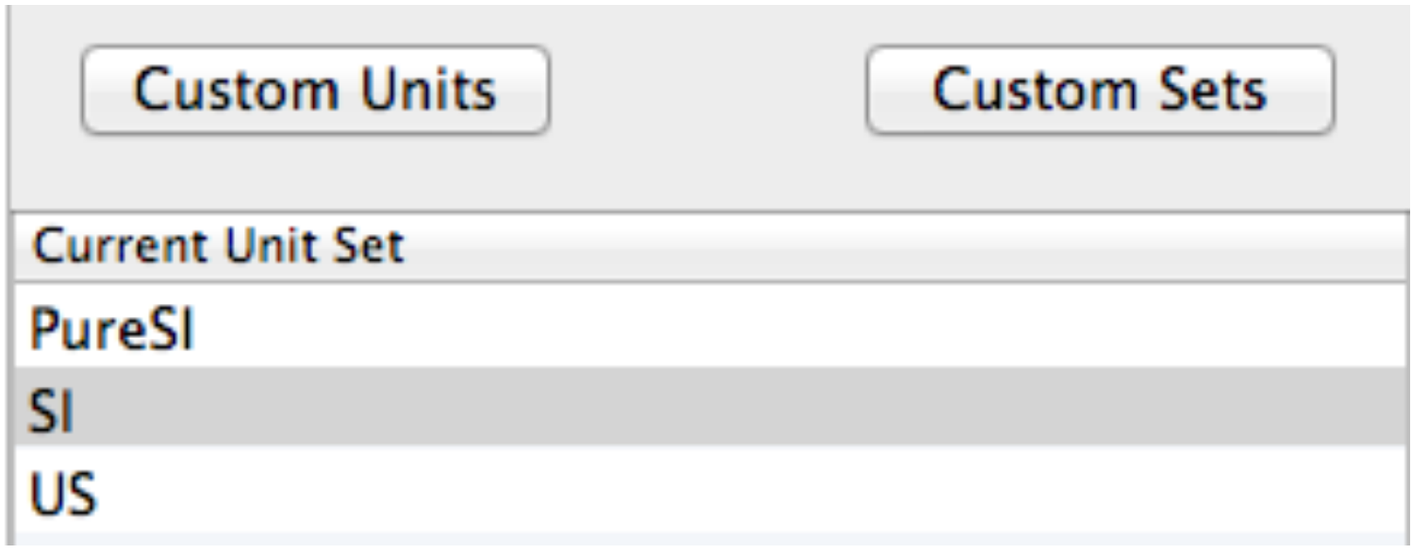
4 J + 3 “l-atm”

is correct



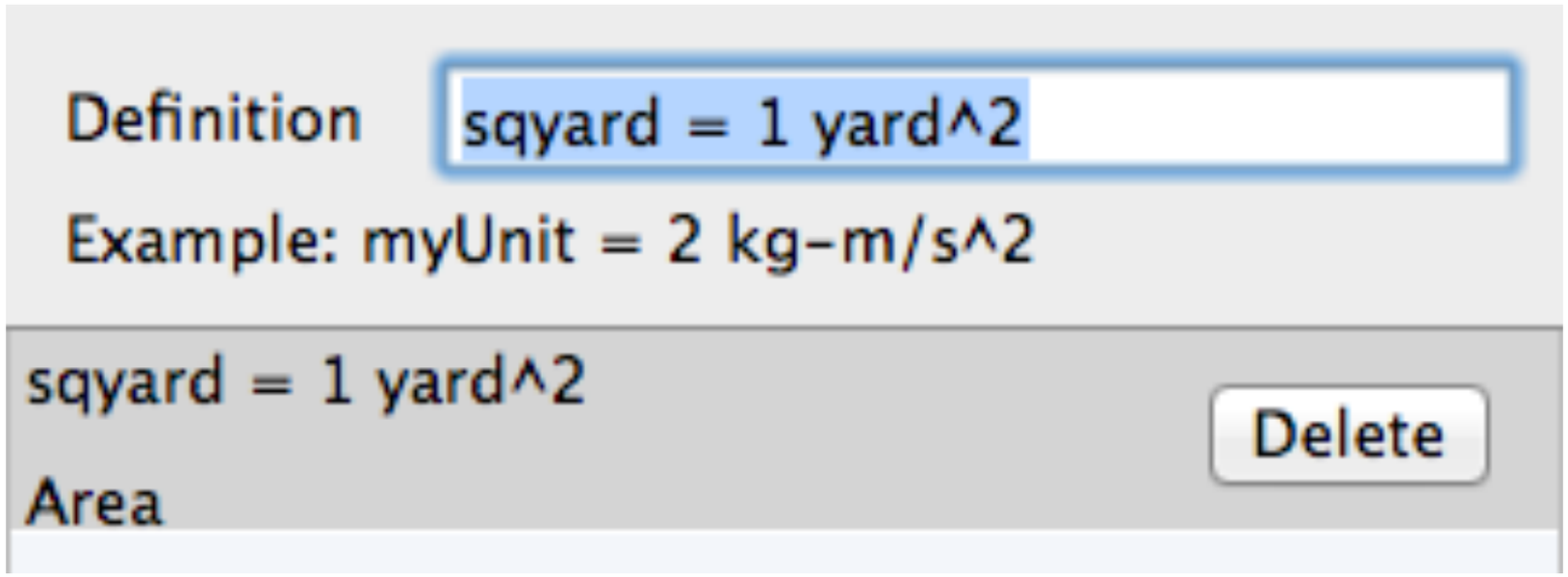
since the quotes allow Math Minion to distinguish the dashes and slashes in the unit from normal arithmetic operators.

You can switch the default set of units used for display and define your own custom units, unit sets and unit types.

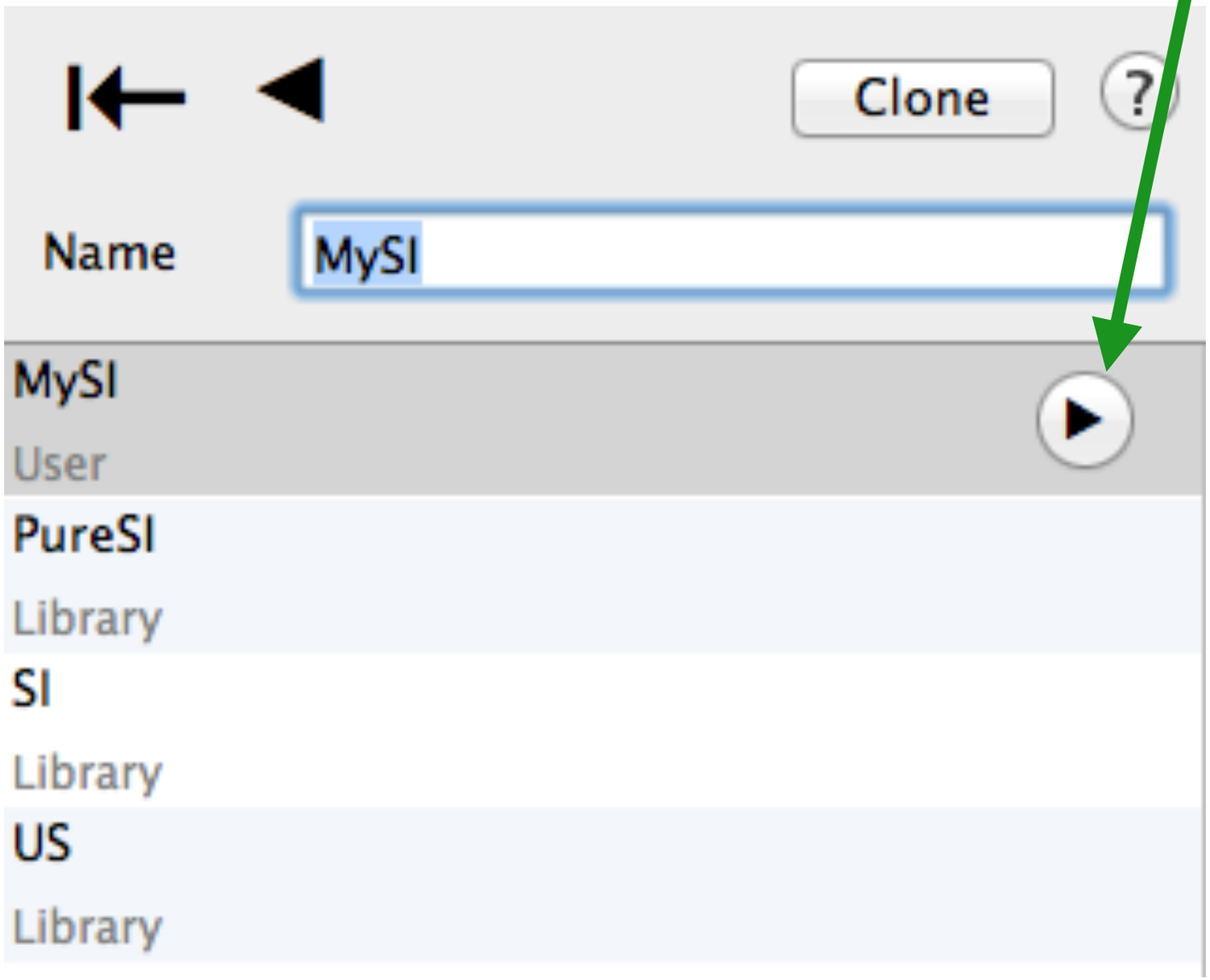


This is the Mac unit set selection view with the 3 default sets. The buttons can be used to create custom units or sets. Custom unit types are created when creating custom sets.

Custom units are created by a simple formula definition in terms of existing units.

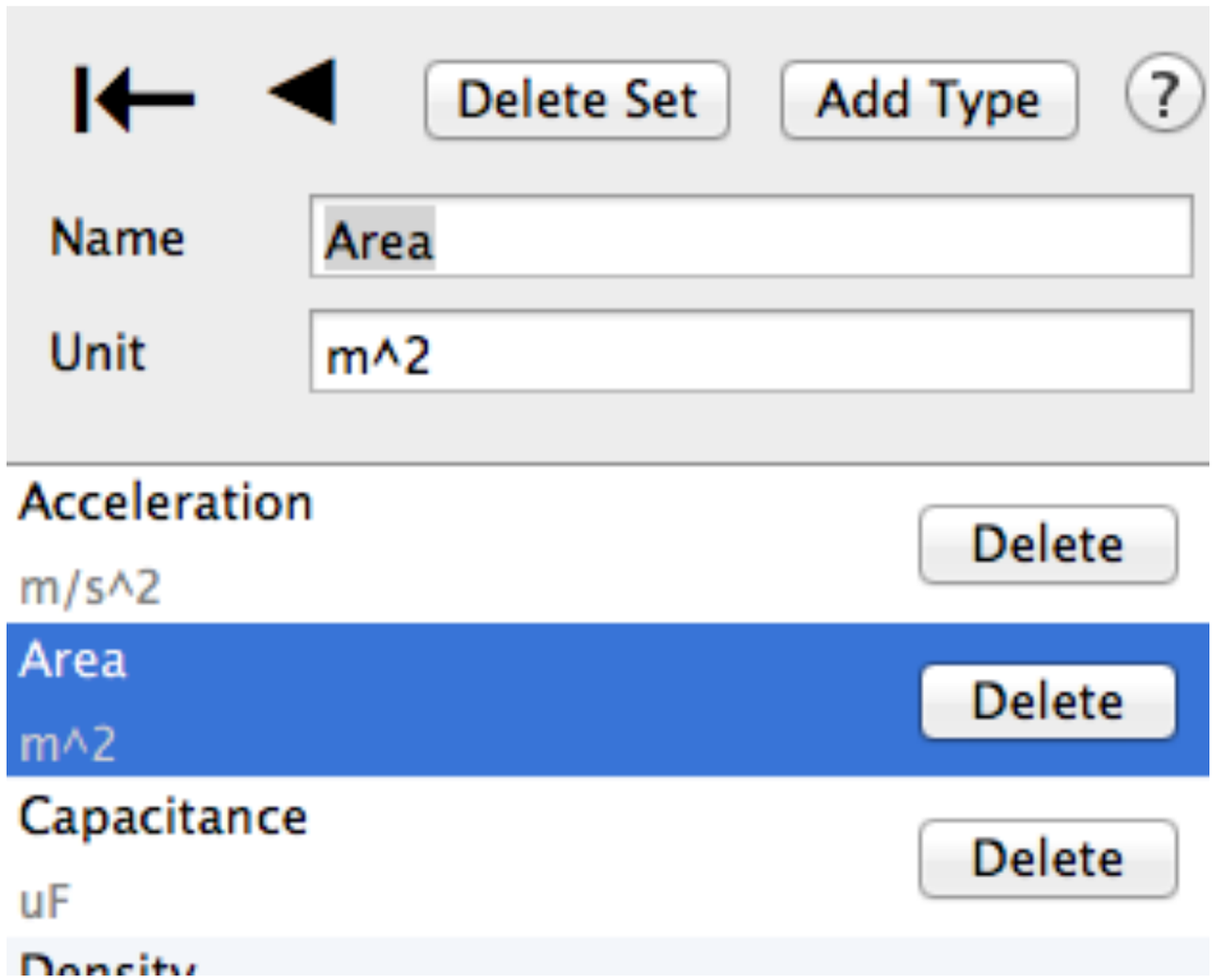


Custom sets are created by cloning an existing set and then tapping the edit icon to the right.

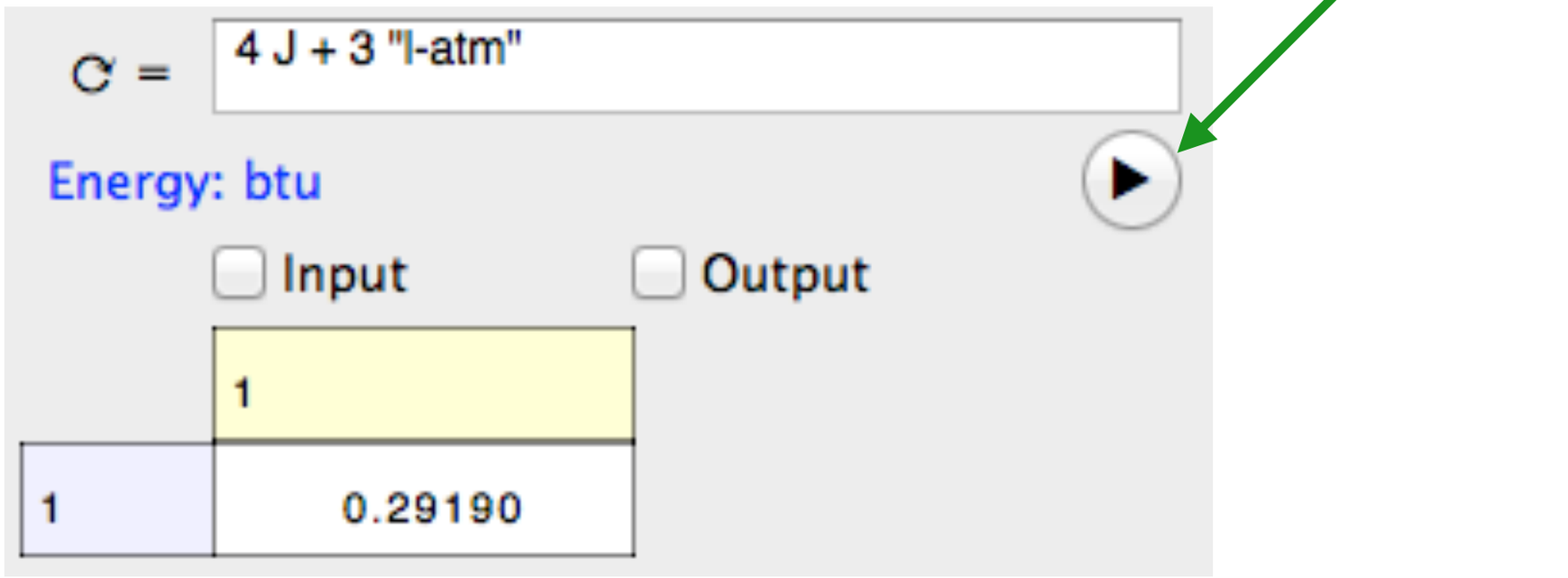


A unit set consists of a series of unit types and associated with the default display units. A unit type is simply a name given to a unique set of fundamental property powers.

A new type is created by associating a name with a default unit.



Regardless of the current unit set, an expression can be instructed to display in any appropriate unit. Below the energy is displayed in Btu, even though the current display set is SI. The icon to the right of the unit accesses the unit browser.



The unit browser can also be accessed when entering a formula by tapping on the “u” keyboard key (iOS) or the “U” toolbar button (Mac).

That’s All Folks.