Avoiding Errors in Defining Arrays with Mathcad

How to minimize problems when including text into arrays:

Case 1: What happens when things go bad due to a logic error.

\[
\begin{align*}
A_0 &:= "text" \quad \text{Place the text string "text" in location 0} \\
A_1 &:= 2 \quad \text{Define location 1 to have the value 2} \\
A &= \begin{bmatrix} 0 \\
0 & "text" \\
1 & 2 \\
\end{bmatrix} \\
A_3 &:= A_0 - 1 \\
&= \begin{bmatrix} 0 \\
0 & 0 \\
1 & 2 \\
\end{bmatrix} - \begin{bmatrix} 0 \\
0 & 0 \\
1 & 2 \\
\end{bmatrix} \\
&= \begin{bmatrix} 0 \\
0 & 0 \\
1 & 0 \\
\end{bmatrix} \\
\end{align*}
\]

Try to define location 3 to be the what is in location 0 less 1 (illogical, as this is text)

Note that this fails because A(0) is defined as a text string. The error message generated is: "This value must be a scaler or a matrix"... not very helpful.

Mathcad cannot subtract a numeric from a text string.

Case 2: How to minimize the impact of a logic error

\[
\begin{align*}
B_1 &:= 2 \quad \text{Put 2 in location 1} \\
B &= \begin{bmatrix} 0 \\
0 & 0 \\
1 & 2 \\
\end{bmatrix} \quad \text{By default, location 0 has a 0 value in it} \\
B_3 &:= B_0 - 1 \quad \text{Define location 3 to have what is currently is stored in location 0 less 1} \\
B &= \begin{bmatrix} 0 \\
0 & 0 \\
1 & 2 \\
2 & 0 \\
3 & -1 \\
\end{bmatrix} \quad \text{In this case location 3 is now 0-1 or -1} \\
B_0 &:= "text" \quad \text{Redefine location 0 to have "text"} \\
B &= \begin{bmatrix} 0 \\
0 & "text" \\
1 & 2 \\
2 & 0 \\
3 & -1 \\
\end{bmatrix} \quad \text{Note that by defining the text string last, the user has a chance to see and understand the logic error that was introduced due to incorrectly addressing locations}
\end{align*}
\]
How to minimize errors due to incorrect units while dealing with arrays:

Case 1: What happens when things go bad due to unit issues

\[ a := 2 \text{in} \quad \text{Define } a \text{ as having a length of 2 inches} \]

\[ B_1 := 10 \quad \text{Define the first element of the array (but forgetting the units)} \]

\[ k := 2, 3 .. 5 \]

\[ B_k := B_{k-1} + a \quad \text{Attempt to define an array element that essentially adds a unit less constant to a value that has units.} \]

The error message is related to \( a \) having units.

Case 2: How to minimize this condition

\[ c := 2 \]

\[ D_1 := 10 \]

\[ j := 2, 3 .. 5 \]

\[ D_j := D_{j-1} + c \quad \text{Write equations (if possible) with out units} \]

\[
\begin{array}{c|c}
0 & 0 \\
0 & 10 \\
1 & 12 \\
2 & 14 \\
3 & 16 \\
4 & 18 \\
5 & \hline
\end{array}
\]

Now add in the units. You have a fighting chance in determining how to do this at this point as the array has already been defined and you have minimized any logic errors in the definition.

\[ f := 2 \text{in} \]

\[ G_1 := 10 \text{in} \]

\[ j := 2, 3 .. 5 \]

\[ G_j := G_{j-1} + f \]

\[
\begin{array}{c|c}
0 & 0 \\
0 & 10 \\
1 & 12 \\
2 & 14 \\
3 & 16 \\
4 & 18 \\
5 & \hline
\end{array}
\]