


Grid Calculator

In the preceding chapters, numerous techniques have been discussed for building, displaying, contouring and getting information from grid files. But the real power in using grids to represent geographic information lies in the ability to apply them in complex (and not so complex) spatial analysis problems.

For example, annual variations of air temperature can be calculated by subtracting one years measurements from those of another year. In *Vertical Mapper* this arithmetic calculation is performed using the *Grid Calculator*, given that each years temperatures are represented as a grid. Or, given a map of elevation covering a large area, how can this map be used to determine the relief along a single line representing a road or trail? Using the *Vertical Mapper Cross Section* tool, the user can draw or select a MapInfo line object that overlies a height grid of the area to construct a vertical profile of elevation along this line.



There are many such tools in *Vertical Mapper* accessible from the  button in the *Grid Manager*. They can be used to solve problems that are virtually impossible to answer using only vector representations of geographic information. These can range from the simple “Can I see that patch of forest from this observation tower?” to the complex “Given this range of land classifications, this distribution of soil types, these distances from major roads, and these county zoning boundaries, show me the most appropriate sites for a new municipal landfill”. Take the time to explore some of the grid analysis features in *Vertical Mapper* – they will open up a whole new world of spatial data analysis.


Mathematical operations on grids are accomplished using a powerful graphical interface tool called the *Grid Calculator*. It provides a familiar interface to the user, allowing the creation of mathematical expressions using an unlimited number of grids. The function provides the ability to perform mathematical operations on gridded data for two purposes.

2. Modify or filter the gridded data in any one file.

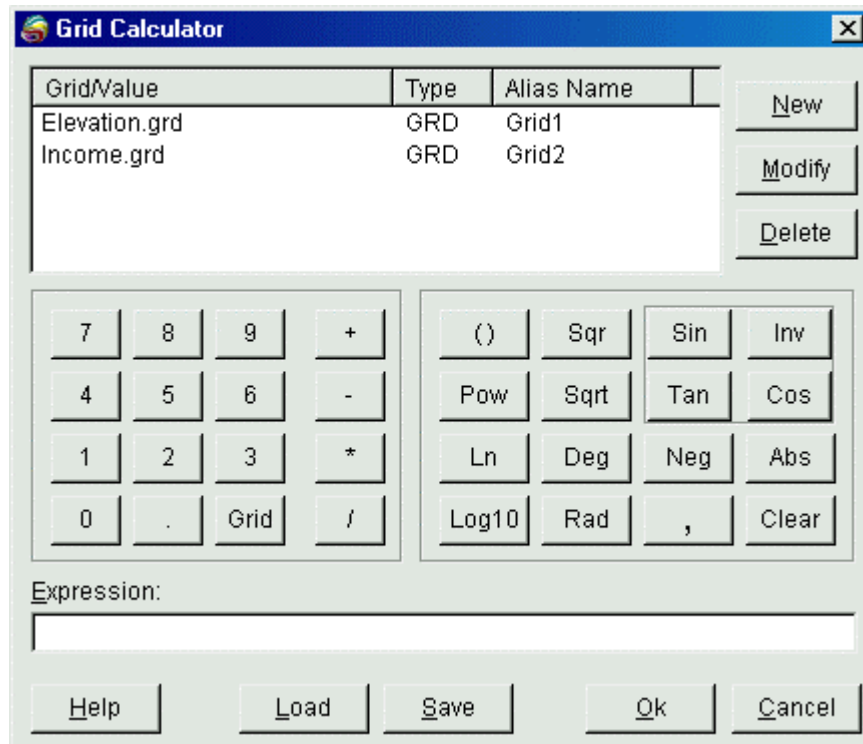
Generate a new derivative surface from two or more existing grids.

The functions available in the *Grid Calculator* module allow a number of mathematical operations to be performed either on a single grid file (for example, $\text{Grid1} * \sin(25) = \text{Grid2}$) or on a combination of grids (for example, $\text{Grid1} / \text{Grid2} * \text{Grid3} = \text{Grid4}$). The new derived grid is the result of applying basic mathematical operations on all of the cell values in an existing numeric grid where each cell is assigned a value satisfying an expression entered by the user. For an instructional lesson on the *Grid Calculator* refer to Lesson 11 of the *Installation and Tutorials* manual.



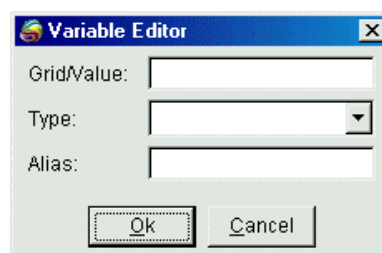
Select the *Calculator* command from the  drop-down menu.

1 The *Grid Calculator* dialogue is used to build mathematical expressions that modify or combine grid files.



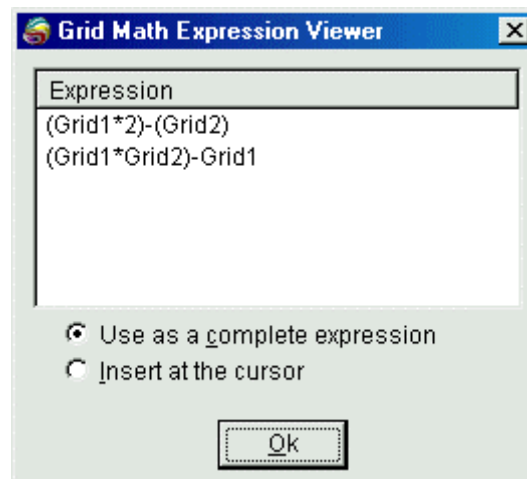
- The window at the top of the dialogue lists all of the numeric grids currently open in the *Grid Manager*. An *Alias* or substitute name is assigned to each *Grid/Value* and is used to identify the item in the *Expression* line. One major advantage in using an alias instead of the actual grid file name lies in the fact that the same expression can be applied using different grids.

- New *Grid/Value* entries are defined in the *Variable Editor* dialogue box accessed by selecting the *New* button. A new *Value* entry could be, for example, a numeric constant such as the value of to 12 decimal places of precision.



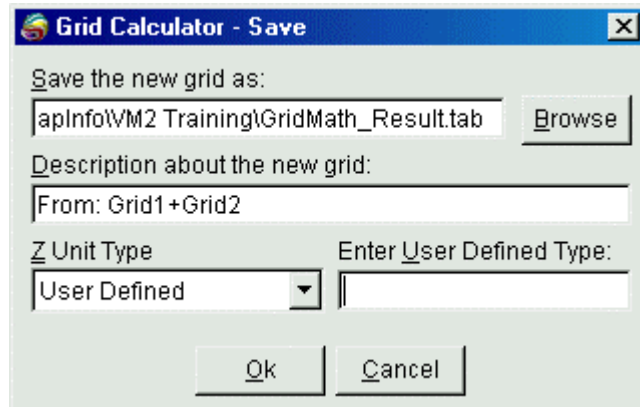
1. The *Grid/Value* field is used to enter a numeric value or a new grid file name.

2. In the **Type** field, select either GRD (numeric grid) or NUM (number) from the drop-down list.
 3. The **Alias** field is used to enter a character string that represents a substitute name for the entry in the **Expression** field.
- The **Modify** button is used to edit the **Alias** name of a list entry while the **Delete** button is used to delete the selected entry.
 - The number and operator keypads in the *Grid Calculator* are designed to function just like a scientific calculator. The operation of each button is described in a “tool tip” which can be made to appear by moving the cursor over any key.
 - The **Expression** field at the bottom of the *Grid Calculator* is used to build the mathematical expression.
1. To enter a *Grid/Value* alias, first select the item in the list then double click it, or choose the **Grid** key in the numeric keypad. Numbers and functions can be entered by clicking the appropriate number and function key. The user can always type aliases, numbers, and functions directly from the keyboard but **expressions are limited to 256 characters in length**.
 2. An expression can be saved to a text file using the **Save** button. The resulting file will have an .EXP extension. By saving another expression to the same file name as an existing one, the new .EXP file will then be modified containing both expressions. A saved expression list file can be opened using the **Load** button.
 3. Selecting the **Load** button will open the **Grid Math Expression Viewer** where all the expressions saved to the same file will be listed. The user may select an expression from the list and enter it into the **Expression** field by either double clicking or selecting the **OK** button.



-
- Once the **Expression** is complete, selecting the **OK** button will bring up the **Grid Calculator – Save** dialogue box. Here the user is prompted to:
 1. Assign a file name to the new derived grid built from the math expression.
 2. Enter a description about the new grid.

3. Select a **Z Unit Type** from the drop-down list. If the type is **User Defined**, a custom entry can be made in the adjacent edit box.



- Select **OK** to proceed with the calculation. Once the grid file is created, it appears in a new MapInfo Map window with a default colour palette applied.