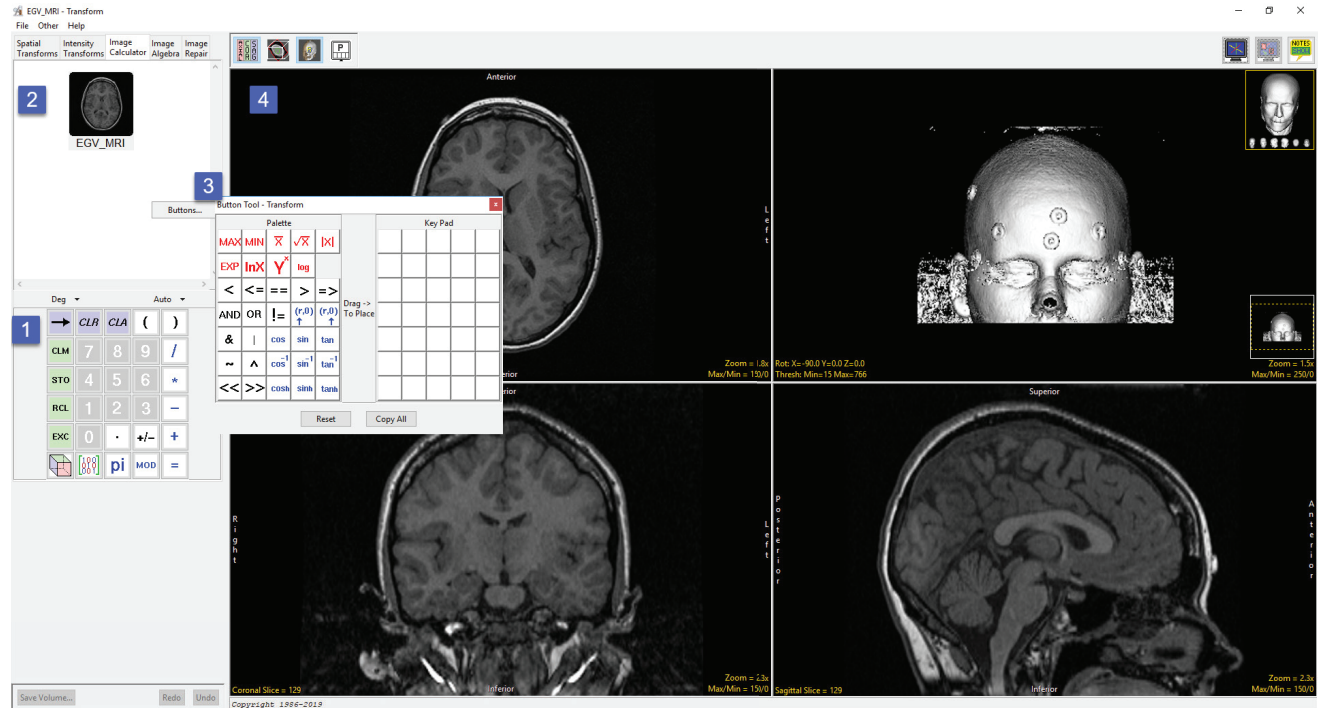


# Image Calculator

The Image Calculator tool allows many mathematical functions to be applied to volumes, matrices and constant numerical values, including basic arithmetic operations, trigonometric functions and logic operators.































The Image Calculator interface provides a keypad [1] allowing users to input functions to the calculator's scrollable canvas [2]. The canvas displaying input data, applied functions, and results. Users can also right click on the canvas to access the Buttons Tool to add additional functions to the keypad [3]. Image Calculator also provides the standard image display area [4] for data review.





## Calculator Keypad

By default, the keypad provides access to the following functions:

	- Clear entry		- Clear current operand		- Clear all		- Left parentheses		- Right parentheses
	- Clear Memory		- 7		- 8		- 9		- Divide
	- Memory store		- 4		- 5		- 6		- Multiply
	- Memory Recall		- 1		- 2		- 2		- Subtract
	- Memory Exchange		- 0		- Decimal point		- Change sign		- Add
	- Volume Tool		- Matrix Tool		- Pi (3.1415927)		- Arithmetic operator: modulo division*		- Computes equation

\*The modulo operation finds the remainder after division of one number by another.

There are also two drop-down menus available above the keys; Deg and Auto.

**Deg:** Sets the trigonometric input to Degrees, Radians, or Gradians.

**Auto:** The Auto drop-down menu specifies how volume data will be handled during operations that may cause data overflow, for example the multiplication of two signed 16-bit data sets. The default setting, Auto, ensures that the volume data will be automatically promoted up to the next appropriate data type. In the case of the multiplication of two signed 16-bit data sets the resulting data set would have a data type of signed 32-bit. All other options will fix the calculator to work only in that data type. This means that overflow and wrapping may occur. In some instances, the data type of the volume generated may not be the type selected due to the operation and may require a specific output datatype, for example the extraction of a red channel from an RGB data set. The following data types options are available:

Unsigned 8-bit

Signed 8-bit

Unsigned 16-bit

Signed 16-bit.

Unsigned 32-bit.

Signed 32-bit.

Float

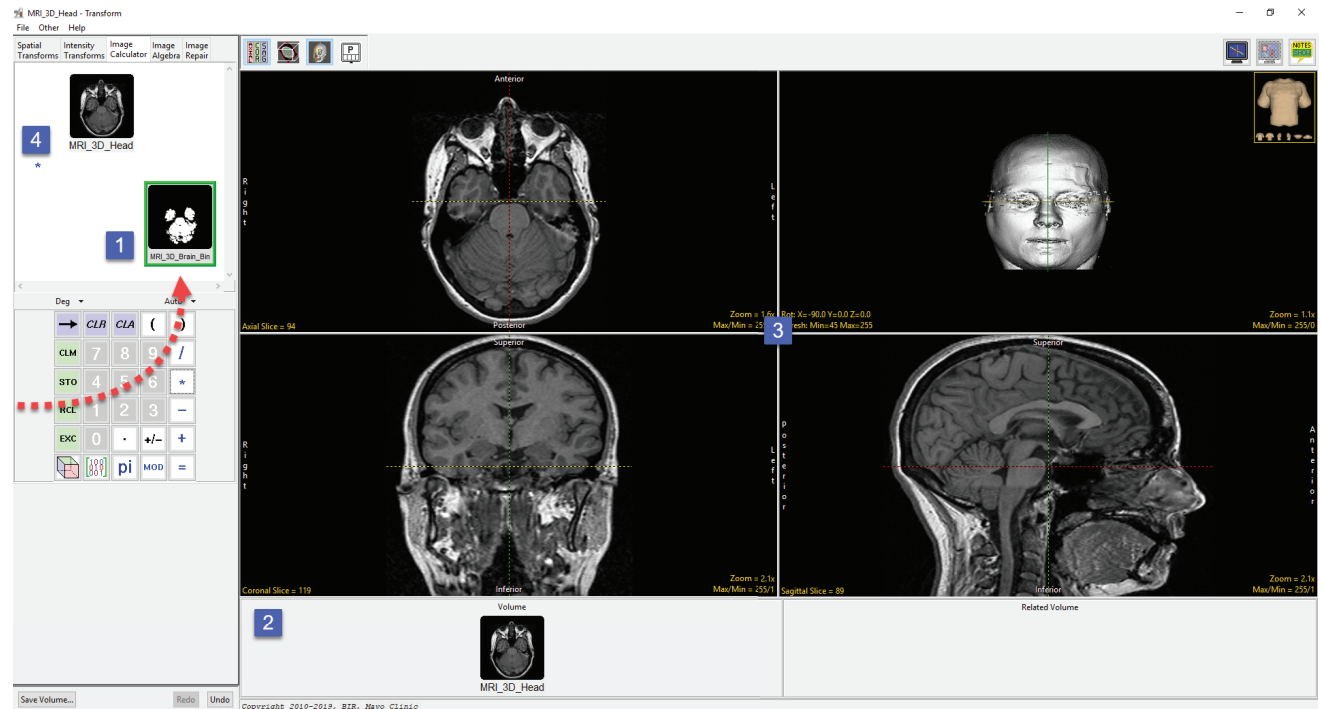
RGB

Complex

## Calculator Canvas

Data is loaded into the Image Calculator interface if a data set is selected when Transform is opened. Image Calculator also accepts image data via drag-and-drop from the workspace onto the calculator canvas [1], onto the Volume input port [2] when File > Input/Output Ports is enabled, or onto any of the display windows [3].

The calculator canvas also accepts matrix files loaded from disk and functions from the keypad [4].

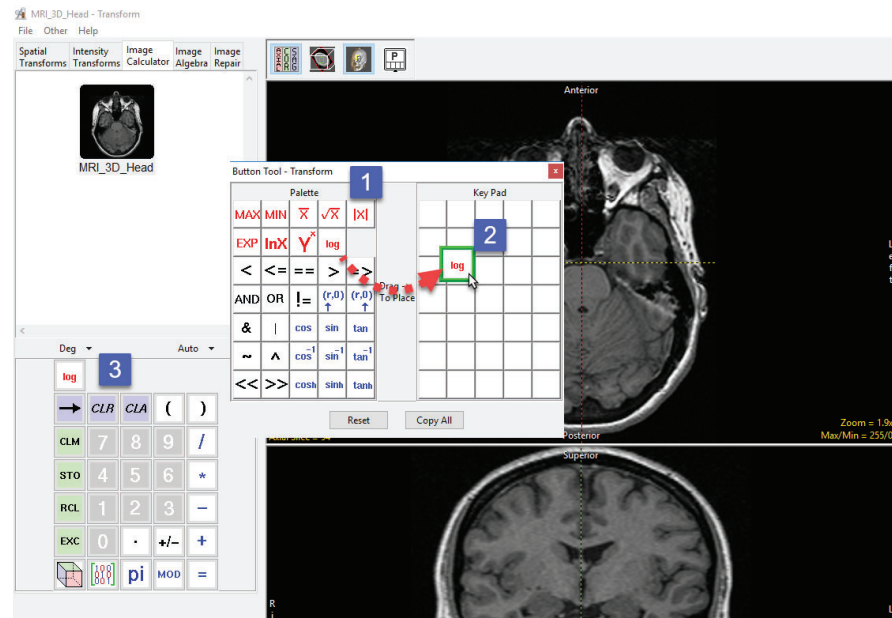




## Button Tool

Additional functions can be added to the calculator keypad. To add more functions to the keypad right click in the calculator canvas and select Buttons to open the Button Tool [1].

To add a function drag the function button from the Palette to the Key Pad [2]. The function will be automatically added to the calculator keypad [3].



The following additional functions are available:

<b>MAX</b>	- Maximum: returns the maximum voxel value of a volume	<b>MIN</b>	- Minimum: returns the minimum voxel value of a volume	<b><math>\bar{x}</math></b>	- Average Volume: Returns the average value of the volume voxels	<b><math>\sqrt{x}</math></b>	- Square Root: returns volumes with all voxels set to their square root.	<b> x </b>	- Absolute Value: Returns volumes with all voxels set to their absolute value.
<b>EXP</b>	- Exponential: returns volume with all voxels set to their exponential value.	<b>lnX</b>	- Natural Log: returns volume with all voxels set to their natural log	<b><math>Y^x</math></b>	- Raise to power	<b>log</b>	- log 10	<b>=&gt;</b>	- Greater than or equal to
<b>&lt;</b>	- Less than	<b>&lt;=</b>	- Less than or equal to	<b>==</b>	- Equality operator	<b>&gt;</b>	- Greater Than	<b>(r,0)</b>	- Atan2 ***
<b>AND</b>	- And	<b>OR</b>	- OR	<b>!=</b>	- Not equal to	<b>(r,0)</b>	- Hypotenuse **	<b>tan</b>	- Tangent
<b>&amp;</b>	- Bitwise AND	<b> </b>	- Bitwise OR	<b>cos</b>	- Cosine	<b>sin</b>	- Sine	<b>tan<sup>-1</sup></b>	- Inverse tangent
<b>~</b>	- Bitwise NOT	<b>^</b>	- Bitwise exclusive OR	<b>cos<sup>-1</sup></b>	- Inverse cosine	<b>sin<sup>-1</sup></b>	- Inverse sine	<b>tanh</b>	- Hyperbolic tangent
<b>&lt;&lt;</b>	- Bitwise left shift	<b>&gt;&gt;</b>	- Bitwise right shift	<b>cosh</b>	- Hyperbolic cosine	<b>sinh</b>	- Hyperbolic sine		

\*\* Convert rectangular coordinates (x,y) to polar (r,0), computes magnitude r

\*\*\* Convert rectangular coordinates (x,y) to polar (r,0), computes phase 0