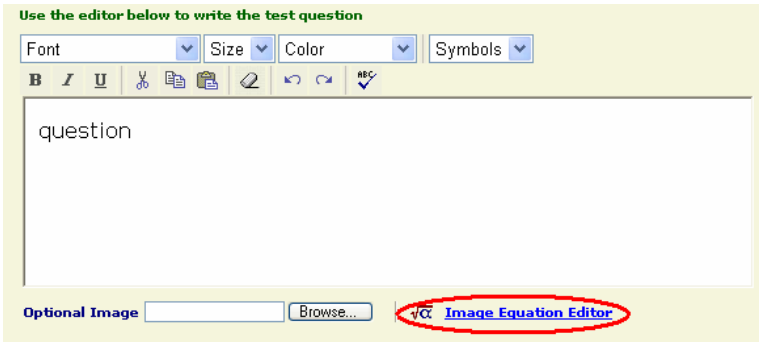
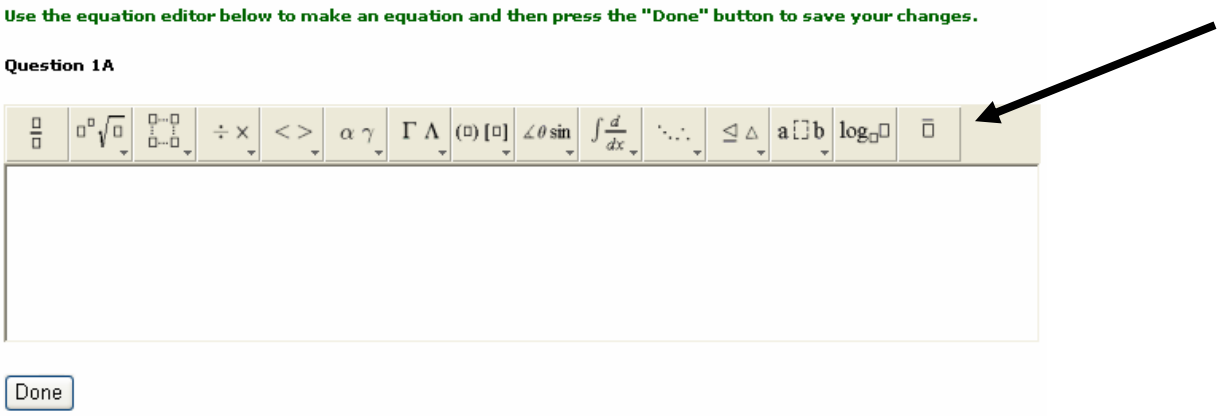
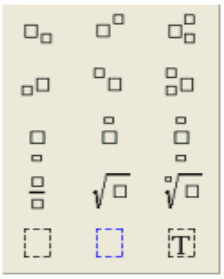
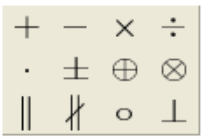
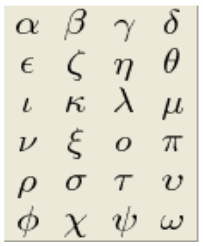
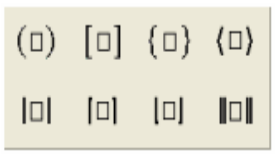
Test Builder Math Tools: Image Equation Editor (available on PCs only)

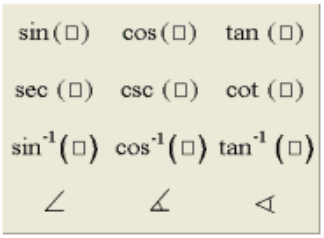
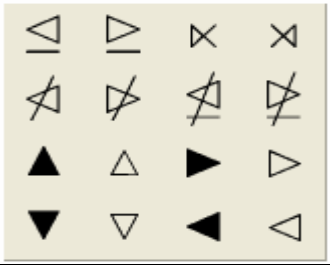
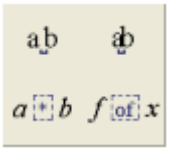
When you are creating math test, you often need special symbols and templates not available in traditional text editors and word processing programs. The Image Equation Editor helps you with these symbols, creating them in the editor and automatically attaching them to the test question as a .gif file. It is found next to the optional image box under the test question box, as well as beneath each of the answer choices.



Galileo provides users with commonly used symbols that may be inserted into the equation editor textboxes. A legend for each of the buttons you see below follows.



Fraction template	Layout palette  Please note: To enter a degree symbol (°), enter a lower-case 'o' in the exponent position.
Matrix palette 	Operator palette 
Relation palette 	Lower-case Greek palette 
Upper-case Greek palette 	Fence palette 

Trigonometry palette 	Calculus palette 
Dot palette 	Triangle palette 
Invisible character palette ** 	Logarithm template
Bar template	

Additional Tips for Using the Image Equation Editor Tool

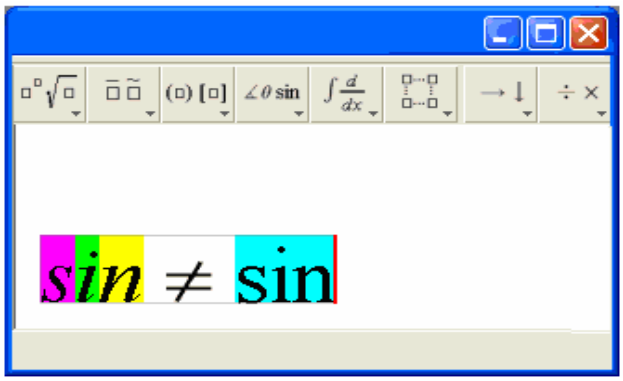
Typing letters, numbers and symbols from the keyboard inserts them into the current equation at the current cursor position. In addition, special "keyboard shortcuts" can be used to cut, paste, insert templates and perform other useful functions. Both kinds of keyboard input are described in more detail below.

Inserting Characters

In Equation Editor equations, all characters are categorized according to type. In Equation Editor, the most important types are text, identifiers, numbers and operators. In Equation Editor, these basic character types are called tokens.

As you enter characters from the keyboard, Equation Editor analyzes the input and automatically inserts the characters into the appropriate Equation Editor token element. Ordinarily, this results in the appropriate Equation Editor markup, and makes authoring Equation Editor equations much easier. As with any automatic algorithm there are cases where problems can arise. However, by understanding how Equation Editor chooses token types for characters, you can easily avoid or correct problem situations.

When two or more characters of the same type are entered in succession, Equation Editor will place the characters into the same Equation Editor token element. Thus, typing 's', 'i', 'n' will result in a single identifier token containing 'sin'. Similarly, if you place two or more characters of the same token type together by some other means, such as cut and paste, backspacing, etc. Equation Editor will merge them together into a single token.



Equation Editor uses the following rules to decide what token type to assign to characters. A run of alphabetic characters is placed in an identifier token. A run consisting of digits, commas and or periods are placed in number token. By default, everything else is placed in an operator token. Whenever you enter a character of a type that doesn't match the preceding characters, the editor starts a new token for it.

When problems arise, they usually result when a run of characters should be broken into several tokens, or when separate tokens merge as a result of editing. Here are the most common issues:

1. Invisible Multiplication

Equation Editor uses an "invisible multiplication" character to make explicit when two variables or expressions are being multiplied. For example, *ab* might mean "a times b", or the two-letter variable "ab". Similarly *a*(b+*c*)

might mean "a times b + c" or it might mean, "apply a function a to the argument b+c".

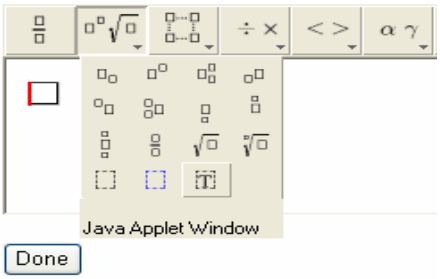
Equation Editor's automatic tokenizing behavior helps remind you code equations properly, since if you just type "a" followed by "b", it will group them both into one token and switch the typeface to upright. This is a visual cue that what you entered was the two-letter variable "ab." To enter "a times b," you need to put an invisible “times” between them.

By default, when you hit the space bar following an identifier, Equation Editor will insert an InvisibleTimes character. By doing so, the "a" and the "b" will each go into identifier tokens of their own, with the InvisibleTimes operator token in between. The "a" and the "b" will remain in the customary italic typeface, giving you a visual cue that you have encoded a multiplication.

If you press the space bar after anything other than an identifier, Equation Editor will insert a space character as usual.

2. Text Tokens vs. Identifiers

Ordinarily Equation Editor assumes alphabetic characters are identifiers. Sometimes, however, you may want to treat a run of alphabetic characters and spaces as text. In particular, if you are entering a bit of descriptive text in an equation, you will want the space bar to insert spaces, not InvisibleTimes characters.



You can tell Equation Editor to treat a run of characters as text by inserting a text template from the toolbar. When you insert a text template, the editor assumes subsequent alphabetic characters and spaces should be treated as text, and won't break them into smaller tokens.

To switch out of a text token to an identifier token, enter a number followed by the identifier. Then delete the number. Entering the number starts a number token, and the following alphabetic character then starts an identifier token as usual.

3. Merging Style Properties

When two token elements with differing style properties merge, the resulting token may or may not have the desired style properties. There is no alternative but to reset style the properties of the new token when this happens.

Keyboard Shortcuts

Though most people prefer to use buttons and a mouse when first learning an application, in the long run it is often more convenient to use keyboard shortcuts for common operations. Equation Editor has a number of useful shortcuts, which are listed below.

Program Shortcuts

One set of keyboard shortcuts handle the main Equation Editor functions. These shortcuts mostly the Control key together with a letter:

Shortcut Key	Action	Supported Platforms
ctrl-n	new equation	all
ctrl-o	open file	all
ctrl-s	save	all
ctrl-q or alt-F4	quit	all
ctrl-a	select all	all
ctrl-c	copy	all
ctrl-v	paste	all
ctrl-x	cut	all
ctrl-z	undo	all
ctrl-,	shrink	*not Mac OSX*
ctrl-.	magnify	*not Mac OSX*
F1	help	all

A feature in Equation Editor is a multi-step undo. Now you can undo the last three editing operations by hitting ctrl-z repeatedly.

Template Shortcuts

A second set of keyboard shortcuts handle the insertion of templates. Basically, these are the entries on the Insert Menu. These shortcuts all use the control key together with a letter:

Shortcut Key	Action	Supported Platforms
ctrl-r	insert row template	all
ctrl-y	insert style change template	all
ctrl-t	insert text template	all
ctrl-f	insert fraction template	all
ctrl-/	insert fraction template	*not Mac OSX*
ctrl-l, ctrl-b or ctrl-_	insert subscript template	all

ctrl-h, ctrl-p or ctrl-^	insert superscript template	all
ctrl-j	insert sub and superscript template	all
ctrl-Q	insert square root template	all
ctrl-R	insert nth root template	all
ctrl-P	insert parenthesized expression template	all
ctrl-0 or ctrl-9	insert parenthesized expression template	*not Mac OSX*
ctrl-i	insert definite integral template	all

One final template shortcut that should be mentioned here doesn't involve the control key at all. Hitting the '^' character (by itself without the CTRL key) adds a superscript to the previous expression so that typing 'x^2' gives x with a superscript as expected.

Navigation and Selection Shortcuts

A final collection of keyboard shortcuts facilitate cursor navigation and selection. These shortcuts don't correspond to menu entries, but rather common mouse operations.

Shortcut Key	Action	Supported Platforms
TAB	TAB cycles the cursor between the open template blanks in an equation. After all the templates have been visited, hitting TAB moves the cursor to the end of the equation. Continuing to hit TAB repeats the cycle.	all
ENTER	When the cursor is at a location in the Equation Editor structure where a newline is valid, ENTER inserts one.	all
End	Moves the cursor to the end of the current line.	all
Home	Move the cursor to the beginning of the current line.	all
ctrl-Home	Move the cursor to the beginning of the equation.	all
ctrl-End	Move the cursor to the end of the equation.	all
SHIFT-right arrow	Extends the selection to the right.	all
SHIFT-left arrow	Extends the selection to the left.	all
ctrl-a	Select all, as mentioned above.	all