Overview of Math Accommodations

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Counting

Chisenbop Finger Counting

Chisenbop is a method of doing basic arithmetic using your fingers. It is attributed to the Korean tradition, but it is probably extrememly old, as the soroban and abacus use very similar methods. Probably these other devices were derived from finger counting.

For more information on Chisenbop, try one of the following sites:
http://klingon.cs.iupui.edu/~aharris/chis/chis.html
http://www.mathematicsmagazine.com/5-2003/Chisenbop_5_2003.htm
http://mathforum.org/library/view/7129.html

Counting

—The tutorial below is from the following site: http://klingon.cs.iupui.edu/~aharris/chis/chis.html

The key to finger math is understanding how to count. The right hand stands for the values zero through nine. Each digit counts as one, and the thumb counts as five. Here's an illustration:

				
0	1	2	3	4

As you can see, digits 0 through four are pretty self explanatory. The thumb counts as five, so here's how to represent five through nine:

				
5	6	7	8	9

The left hand represents multiples of ten, with the right thumb representing 50. Here's how the left hand works:

				
0	10	20	30	40
				
50	60	70	80	90

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Abacus

The abacus is an ancient calculator and still very useful for persons whose ability to write mathematics may be limited.

The PBS site below is a good source for more information and teaching ideas about the abacus, as is the Texas School for the Blind and Visually Impaired site (http://www.tsbvi.edu/Education/abacus.htm). The TSBVI is also a very good general resource for teaching math to blind students.

Displaying Numbers on the Japanese Abacus

—The following is taken from the PBS Teacher Source Web site:
http://www.pbs.org/teachersource/mathline/concepts/asia/activity1.shtm

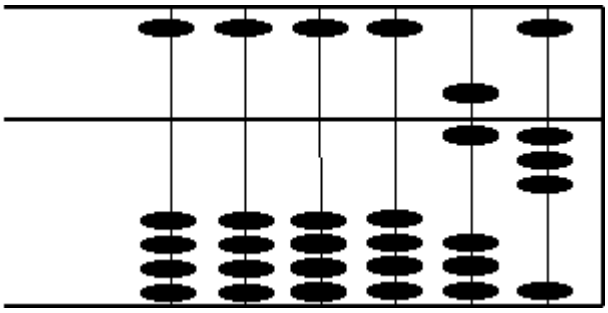
When you show a number on the abacus, you move beads to the crossbar. When beads are moved away from the crossbar, they are canceled. For example, when a lower bead is canceled, it is lowered from the crossbar and an upper bead is canceled when it is raised from the crossbar. Remember the upper bead represents five units and each lower bead equals one unit.

Try the following activities with the abacus.

Let’s show 63 on the abacus.

* Go to the ten's place. Lower an upper bead to the cross bar. This represents 50. Move one lower bead up to the crossbar. This shows 60.

* Move to the one's column and move 3 lower beads up to the cross bar. This shows 63 (60 + 3 = 63).



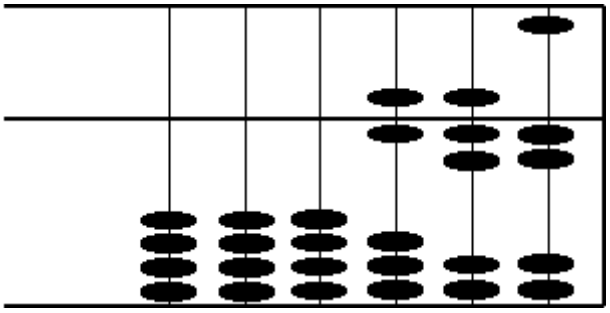
Let's show 672 on the abacus.

* Move to the hundred's column. How many beads should you lower and/or raise to represent 600?

* Move to the ten's column. How many beads should you lower and/or raise to represent 70?

* Move to the one's column. How beads should you lower and/or raise to represent 2?

Your abacus should look like this picture.



Manipulatives

Publisher:

The American Printing House for the Blind, Inc.
www.aph.org

1839 Frankfort Avenue
P.O. Box 6085
Louisville, Kentucky 40206-0085

Phone: 800-223-1839
Fax: 502-899-2274

For customer service:
info@aph.org

Retail Costs:

Braille Print Protractor

Catalog #: 1-04115-00
Price: $9.50

Brannan Cubarithm Slate and Cubes Rubber frame only

Catalog #: 1-00320-00
Price: $19.00

Brannan Cubarithm Slate and Cubes Plastic cubes only

Catalog #: 1-00330-00
Price: $17.00

Cranmer Abacus

Catalog #: 1-03150-00
Price: $19.50

Cranmer Abacus: Optional Coupler

Catalog #: 1-03160-00
Price: $6.00

Metric-English Measurement Ruler with Caliper Slide

Catalog #: 1-03100-00
Price: $7.00

Orion TI-34 Talking Calculator

Catalog #: 1-07335-00
Price: $199.00

Description:
APH carries many products to assist persons who are blind or visually impaired. Check also for such products as TalkingTyper (to teach keyboarding) and APHont (a free font designed for low vision users).

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Publisher:
Maxi-Aids, Inc.
www.maxiaids.com

42 Executive Blvd.
Farmingdale, NY 11735

Phone: 800-223-1839
Fax: 1-631-752-0689

For customer service:
on-line form

Retail Costs:

Magnetic Alphaboard
Item#: 17825
Price: $15.95

Raised Line Drawing Kit (Sewell)
Item#: 2053406
Price: $28.95

Replacement Sheets (about 70 sheets)
Item#: 2022801
Price: $5.99

Description:
Maxi Aids carries a wide range of products of interest to persons with various disabilities. You can order on-line.

Math Window

Publisher:

Wolf Products
www.mathwindow.com

106 Purvis Road
Butler, PA 16001

Phone: 724-285-5428

For customer service:
wolfproducts@mathwindow.com

Retail Cost:

Price for basic kit: $75.00

Price for algebra add-on: $38.00

Description:

Math Window consists of a magnetic board and tiles that allow blind students to build and solve math problems. The tiles combine printed numerals and symbols for the sighted instructor, along with Nemeth Code for the blind student. Math problems can be configured in the same linear or vertical forms that sighted students are taught.

The Math Window Algebra Add-On Kit contains all the letters, symbols, and operations needed for students to understand and progress through high school algebra.

Sighted tutors can use Math Window with very little instruction, and Braille-readers can construct their own math equations.

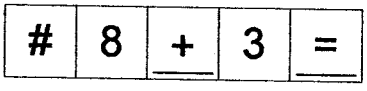
How to construct a problem

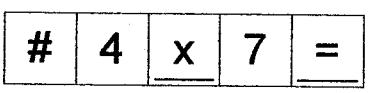
Math Window is designed for ease in locating and moving the pieces so the student can quickly construct and solve a problem. Rather than picking up each piece and placing it in the desired location, we recommend sliding the pieces from place to place.

Linear Arrangement

Addition, Subtraction, Multiplication, and Division:

Slide the first numeral of the problem into an empty section of the Window. Next, slide the *operation sign* into position, followed by the second numeral in the problem. Place the *equal sign* after the last numeral, and the problem is ready to solve.

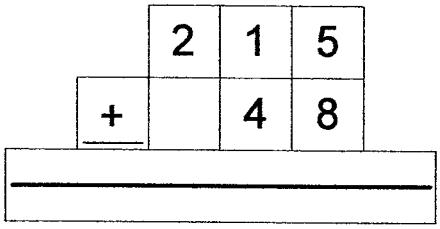




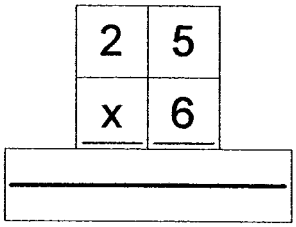
Spatial Arrangement

Addition and Subtraction:

Slide the first numeral into an empty section of the Window. Next, slide the second numeral under the first. The *addition sign* or *subtraction sign* is located in front of the last numeral, in the next space to the left of the outermost column. *A separation line* is then slid in place under the problem. (The *separation lines* vary in length to accommodate the variety in problems being solved.)

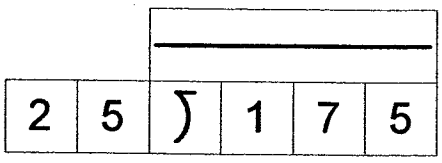


Multiplication:
Similar to addition and subtraction, except the *multiplication sign* is located directly in front of the multiplier.



Division:

The *division symbol* is placed between the divisor and the dividend. *A separation line is slid* above the dividend and begins in the same column the *division symbol* is located.



When solving a division problem, we recommend teaching the student to "bring numerals down" within the problem by sliding numerals from the outside perimeter of the window and placing them directly below their respective numerals in the dividend. Do not slide numerals from the dividend. This can lead to confusion when working larger problems.

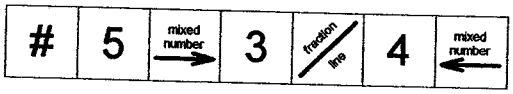
How to construct fractions

Simple Fractions

$\frac{5}{8}$

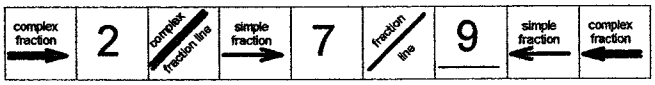
Mixed Numbers

$5\frac{3}{4}$



Complex fractions

$$\frac{\frac{2}{7}}{9}$$



$$\frac{\frac{5}{8}}{4}$$

The Magnets and Their Meanings

(Basic Math Kit)

+	addition	,	comma
-	subtraction	.	decimal point
x . mult	multiplication	( )	parentheses
÷) /	division	>	is greater than
=	equal	<	is less than
simple fraction → simple fraction ←	simple-fraction indicators	?	omission symbol
complex fraction → complex fraction ←	complex-fraction indicators	fraction line	fraction line
mixed number → mixed number ←	mixed-number indicators	complex fraction line	complex-fraction line
———	separation line	r	remainder
$	dollars	¢	cents
%	percent	of	of
cancel L ind. cancel R ind.	cancellation indicators		

The Magnets and Their Meanings
(Algebra Add-on Kit)

addition 

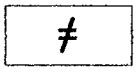
subtraction 

plus or minus 

multiplication 

division 

equal 

is not equal to 

is approximately equal to 

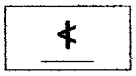
congruence (is related to) 

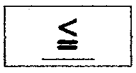
parentheses 

brackets 

braces 

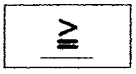
is less than 

is not less than 

is less than or equal to 

is greater than 

is not greater than 

is greater than or equal to 

radical symbol 

proportion (as) 

termination indicator 

superscript 

subscript 

decimal point 

Math Braille

Nemeth

The primary system of math Braille in the United States is Nemeth. Nemeth Braille was developed by Dr. Abraham Nemeth in the 1940s, originally for his personal use, and was adopted officially into the Braille code in 1952 by the Braille Authority of North America (BANA).

Nemeth Braille uses the standard Braille symbols to convey mathematics and can be used from the most basic to the highest levels of math. Because it uses the same 63 cells that make up literary Braille, it can be used with refreshable Braille displays.

The downside with Nemeth is that it is extremely complex, expensive to produce, and difficult to read. Braille users who did not learn Nemeth as part of their K–12 education rarely become proficient in its use.

DotsPlus

In the 1990s, Dr. John Gardner developed the DotsPlus system for rendering math into a combination of Braille and graphical symbols.

Dr. Gardner, who lost his vision later in life, found Nemeth cumbersome and difficult to learn. As a working physicist who had spent much of his life doing math visually, he also wanted to maintain the spatial information inherent in standard print mathematics.

DotsPlus looks much like print math and is not hard for a Braille reader or a sighted teacher/tutor to learn to read.

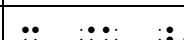
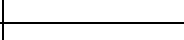
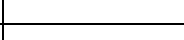
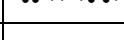
The combination of symbols and Braille makes printing DotsPlus somewhat challenging. To solve this problem, Dr. Gardner developed the Tiger embosser, which remains the only way to emboss DotsPlus math.

Number Systems Compared

System	1	2	3	4	5	6	7	8	9	0
literary	⠼⠁	⠼⠃	⠼⠉	⠼⠙	⠼⠑	⠼⠋	⠼⠛	⠼⠓	⠼⠊	⠼⠚
Nemeth	⠼⠁	⠼⠃	⠼⠉	⠼⠙	⠼⠑	⠼⠋	⠼⠛	⠼⠓	⠼⠊	⠼⠚
DotsPlus	⠁	⠃	⠉	⠙	⠑	⠋	⠛	⠓	⠊	⠚

Nemeth Code Cheat Sheet

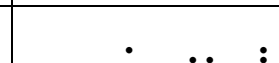
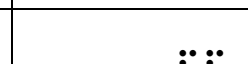
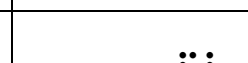
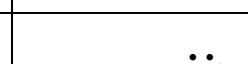
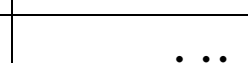
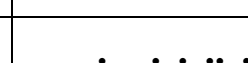
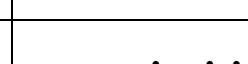
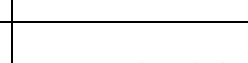
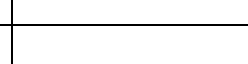
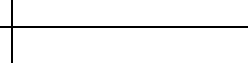
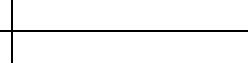
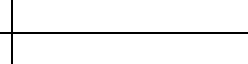
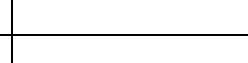
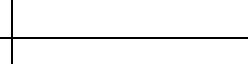
Meaning	Braille Sign	Braille Example	Print Meaning
0			0
1			1
2			2
3			3
4			4
5			5
6			6
7			7
8			8
9			9
baseline indicator			$2x^2y$
brackets closing			[0]
brackets opening			[0]
Capital sign			Algebra
cent sign			50¢
comma			1,897
curly brackets closing			{0}
curly brackets opening			{0}
decimal point			98.6
divided by			8 ÷ 2
dollar sign			$10
dot (multiplication)			5 * 6
English-letter indicator (lower case)			A

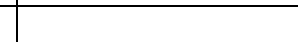
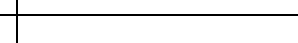
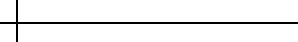
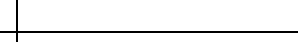
Meaning	Braille Sign	Braille Example	Print Meaning
English-letter indicator (upper case)			A
equals			x = 4
fraction indicator closing			$\frac{1}{10}$
fraction indicator opening			$\frac{5}{8}$
fraction line			$\frac{1}{3}$
fraction: bi-level diagonal-slash			¼
fraction: closing mixed-number fraction indicator			$1\frac{1}{2}$
fraction: complex fraction modifier			$\frac{\frac{1}{2}}{\frac{3}{4}}$
fraction: diagonal-slash fraction bar			1/4
fraction: horizontal fraction bar			$\frac{1}{4}$
fraction: opening mixed-number fraction indicator			1 1/2
greater than			7 > 4
Greek-letter indicator (lower case)			δ
Greek-letter indicator (upper case)			Δ
grouping symbols			
less than			2 < 6
long division		 	$16\sqrt{448}$
minus			6 – 2

Meaning	Braille Sign	Braille Example	Print Meaning
mixed number indicator closing			2 3/4
mixed number indicator opening			3 2/5
not equal to			8 - 1 ≠ 9
numeric indicator			3456
parenthesis closing			(0)
parenthesis opening			(0)
percent			50%
plus			7 + 9
punctuation indicator			5:45
separation line			55 + 6
subscript indicator			x_e
superscript indicator			c^2 v^{a^2}
times sign (cross)			1 x 3

Nemeth Algebra

Symbol	Nemeth	Description
+	⠬	plus or positive
-	⠤	minus or negative
·	⠐⠄	times dot
x	⠭	times cross
÷	⠸⠌	divided by
±	⠬⠤	positive or negative (plus or minus)
=	⠶	is equal to
≠	⠨⠅	is not equal to
<	⠣	is less than
>	⠜	is greater than
≤	⠣⠇	is less than or equal to
≥	⠜⠇	is greater than or equal to
≈	⠈⠡⠇	is approximately equal to
%	⠨⠴	percent
{ }	⠸⠣ ⠸⠜	set braces

Symbol	Nemeth	Description
$a:b$		the ratio of *a* to *b*, or
$\cong$		is congruent to
$\perp$		is perpendicular to
$\measuredangle$		is parallel to
$\sim$		is similar to
$\circ$		degree(s)
$\overleftrightarrow{AB}$		line containing points *A* and *B*
$\overline{AB}$		line segment with endpoints *A* and *B*
$\overrightarrow{AB}$		ray with endpoint *A* and containing *B*
AB		length of , distance between *A* and *B*
ΔABC		triangle with vertices, *A*, *B*, and *C*
$\angle \mathrm{ABC}$		angle with sides and
$\angle B$		angle with vertex *B*
$m\angle ABC$		measure of $\angle ABC$
$\longleftrightarrow$		corresponds to

Symbol	Nemeth	Description
$p \rightarrow q$		*p* implies *q*
$log_a b$		the logarithm, base *a*, of *b*
a		the *n*th power of *a*
$\lvert x \rvert$		absolute value of *x*
$\sqrt{x}$		principal square root of *x*
$\bar{x}$		the mean of data values of *x*
x_1, x_2, etc.		specific values of the variable *x*
y_1, y_2, etc.		specific values of the variable *y*
$f(x)$		*f* of *x*, the value of the function *f* at *x*
π		pi (approximately 3.1416)
(a, b)		ordered pair with *x*-coordinate *a* and *y*-coordinate *b*
$P(A)$		the probability of event *A*
$\sin A$		sine of $\angle A$
$\cos A$		cosine of $\angle A$
$\tan A$		tangent of $\angle A$

Prepared by Gloria Bennett and Susan Osterhaus, Texas School for the Blind and Visually Impaired, Austin, TX—July 2000

Nemeth Code for Sets

Roster method of representing a set: A = {-1, 0, 1, 2}

Set builder notation: B = {x | x is an integer and x > 1}

The empty set (two versions):

{ }

Ø

Subset:

A ⊆ B (subset) or

A ⊂ B (proper subset)

Union:

A ∪ B

Intersection:

A ∩ B

Greek Letters in Braille, Math Context

Letter Name	Upper Case	Lower Case	Braille Upper Case	Braille Lower Case
alpha	Α	α		
beta	Β	β		
gamma	Γ	γ		
delta	Δ	δ		
epsilon	Ε	ε		
zeta	Ζ	ζ		
eta	Η	η		
theta	Θ	θ		
iota	Ι	ι		
kappa	Κ	κ		
lambda	Λ	λ		
mu	Μ	μ		
nu	Ν	ν		
xi	Ξ	ξ		
omicron	Ο	ο		
pi	Π	π		
rho	Ρ	ρ		
sigma	Σ	σ		
tau	Τ	τ		
upsilon	Υ	υ		
phi	Φ	φ		
chi	Χ	χ		
psi	Ψ	ψ		
omega	Ω	ω		

Greek-letter indicator

Capital sign

DotsPlus Symbols

Print	Dots Plus
1	⠁
2	⠃
3	⠉
4	⠙
5	⠑
6	⠋
7	⠛
8	⠓
9	⠊
0	⠚
apostrophe	⠄
colon	⠒
comma	⠂
period	⠲
question mark	⠦
quotes	⠶
semicolon	⠆
single quote	`
parentheses	( )
square brackets	[ ]

Print	Dots Plus
curly braces	{ }
angle brackets	⟨ ⟩
and sign	&
asterisk	*
at sign	@
backslash	\
bullet	●
caret	^
divide	÷
dollar sign	$
equals	=
not equal	≠
approximately equal	≈
greater than	>
less than	<

Print	Dots Plus
minus	—
multiply	×
number sign	#
percent	%
plus	+
slash	/
tilde	~
underline	_____
sin	sin
cosine	cos
tangent	tan
pi	π
union	∪
intersection	∩

Print	Dots Plus
null	∅
integral	∫
long division	√‾
square root	√‾
x squared	x^2
angle	∠
ray AB	$\overrightarrow{AB}$
right angle	⊥

Accessible Graphing Calculator

Publisher:

ViewPlus Technology
www.viewplus.com

1853 SW Airport Ave
Corvallis, OR 97333

Phone: 541-736-1659
FAX: 541-738-6505

For customer service:
info@viewplus.com

Retail Cost:

Price for CD: $149.00

Price for download: $99.00

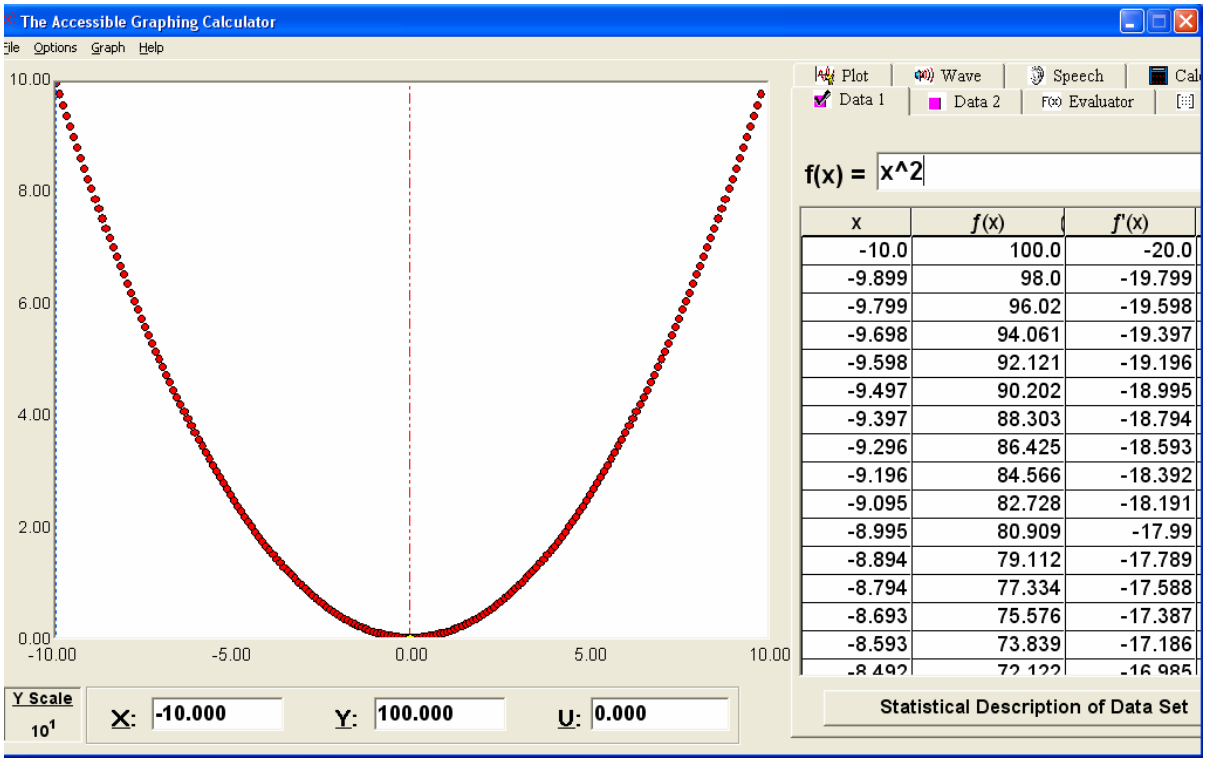
System Requirements:

- Windows® 95/98/ME/2000/NT/XP
- Sound card & 32 MB of RAM
- 20 MB hard disk space
- 200 MHz processor or faster
- CD-ROM drive or network/Internet connection for download

Description

AGC is a scientific calculator that provides voiced feedback for computations, as well as audio representations of graphs. The versatile AGC can import data from Excel® or a host of other applications. Quickly and easily create tactile copies of your AGC graphs by printing directly to any ViewPlus Embosser (Tiger).

The AGC is accessible to anyone who can use a computer, regardless of ability, allowing the user to concentrate on math, not on learning the tools to access it.



Example: Computing and Plotting the expression y = x

You should select the Expression 1 edit box. You may reach it by moving to the Data Set 1 Tab Page and going to the first item - which is the expression box. There are a number of ways to do this. You may always press ALT-o to open the Options menu. Then arrow down to find the "Data Set 1" option and press ENTER. Focus goes to the Expression 1 edit box.

Delete any characters in this box and type a single x. You can read the box with CTRL-r, but the box is also voiced if you press HOME to go to the first character. You may right arrow to move through and hear each character, or you may go to the end and left arrow backwards, also hearing each character. DEL deletes the character just voiced (which is just behind the insertion cursor). Backspace deletes the previous character (which is just before the insertion cursor).

If focus is in this expression box, which should now have x in it, you may calculate the data set by pressing ENTER. You will hear a short tone when the computation is finished. Note that you may also do this computation by pressing function key F4 or by going to the "Graph" menu with ALT-g and pressing ENTER on the first item - "Evaluate Expression 1". Note that the last two options require that the source be set to Data Set 1.

You have previously set the number of points parameter at 500, and it usually takes only a fraction of a second to compute such a simple function as y=x, so you should hear the tone rather quickly after pressing any of the options that cause the function in Expression 1 to be calculated.

You may display the graph on screen with function key F3 or by going to the "Graph" menu with ALT-g and arrowing down to "Display graph" and pressing ENTER.

Finally you may play an audio tone plot of this graph by pressing function key F5 or by going to the "Graph" menu with ALT-g, arrowing down to "Play data set" and pressing ENTER.

Sighted people will see a graph on screen showing a straight line from the bottom left to upper right of the graph, which is correct for the expression y=x. The audio tone plot is a tone representing the y value when x is swept from its minimum to its maximum value as you hear the tone graph. Since y rises linearly, the tone of y rises linearly on a harmonic scale also. If you have set all parameters as we suggested, you should also hear some static (technically known as "white noise") for the first half of the tone graph. You hear this because you have set the tone graph to "Play noise below y threshold" and set that threshold to zero. So you hear noise when y is less than zero and do not hear that noise when y is greater than 0. Press F5 to listen again so you can hear that there is noise for half the graph but not for the last half of the graph.

We note that the tone graph is often accompanied by an unintentional quiet high-pitched chirping sound on some computers and sound cards. It is usually minor and should just be ignored.

MathType 5.2

Publisher:

Design Science, Inc.
4028 Broadway Ave.
Long Beach, CA 90803

http://www.dessci.com/en/

Phone: 562-433-0685
FAX: 562-433-6969

General Information:
info@dessci.com

Retail Cost:

Full Price (Academic): $99.00

Upgrade Price (Academic): $49.95

System Requirements:

- Microsoft Windows XP, 2000, Me, 98 SE or Apple Macintosh OS 9 or OS X
- 10 to 20 MB hard disk space
- CD-ROM drive (can also download from Internet)

Description

Design Science MathType™ for Windows and Macintosh is a powerful interactive tool that will revolutionize the way you create print and web-based documents that contain math. MathType works with any word processor, presentation program, page layout program, HTML-authoring tool, plus other types of software, to create equations for research papers, class materials, web pages, slide presentations, journal articles and books.

If you are familiar with our Equation Editor included in Microsoft Office, AppleWorks and other products, then you will really appreciate MathType's extra features. It will let you create a wider range of equations for a wider range of documents, and help you work much more efficiently. We've added an enormous amount of functionality that effectively transforms Microsoft Word into a state-of-the-art math word processor and web page editor.

MathType provides several options for creating accessible math content. MathType can export mathematical expressions as images (GIF, PNG, etc.) or as MathML content. Additionally, MathType can be used to create web content from MS Word using the MathPage export function.

Creating Math Equations for the Web

To create mathematical equations for the Web, it is first necessary to input the equations using MathType (in MS Word). Once the mathematical expressions have been entered into MS Word, there are several options for exporting the content in a Web-ready format.

Exporting a Web page for Internet Explorer:

1. Choose MathType from the menu bar and choose **Export to MathPage**.

2. In the **Title** field, enter a title for the Web page. You can also select where the resulting file will be placed.

3. Select the radio button marked **MathML using:** and choose the MathPlayer (IE behavior) option from the drop-down list.

4. Select **OK**. MathType will then export the file and open the Web page within the Internet Explorer browser.

NOTE—You may receive an error message in IE that says Internet Explorer has restricted this file from showing active content. Click in the message and choose the option **Allow Blocked Content** and then select **Yes**. This will allow the math content to be displayed with the MathPlayer.

Exporting a Web page for multi-browser functionality:

1. Choose MathType from the menu bar and choose **Export to MathPage**.

2. In the **Title** field, enter a title for the Web page. You can also select where the resulting file will be placed. Change the file extension from **.XHT** to .**XML** . This extension change needs to occur until Internet Explorer is capable of recognizing **.XHT** files.

3. Uncheck the checkbox **Display in default browser**.

4. Select the radio button marked **MathML using:** and choose the Multi-browser (UMSS) option from the drop-down list.

5. Select **OK**.

MathType will create a file that contains all the page information with mathematical content. You will need to create a hyperlink to this file in order to view the relevant mathematical expressions using a Web browser.

NOTE – It is recommended to choose the "Exporting a Web page for multi-browser functionality:" option in order to best serve the widest audience possible. This will allow

individuals using specialized assistive computer technology to access the necessary math content as well as provide options to individuals using non-IE Web browsers (e.g., FireFox, Mozilla).

Things to remember

When creating mathematical expressions for the Web, it is important to remember a few guidelines:

If you are exporting MathType content using MathPlayer (IE behavior), then individuals will only be able to view the content with the Internet Explorer browser.

If you are exporting MathType content using Multi-browser (UMSS), then individuals will be able to view the content using either Internet Explorer, Netscape 7, or Mozilla/FireFox.

It may be necessary to download the appropriate MathML fonts for Netscape 7and Mozilla/FireFox. You can download the appropriate MathML fonts at: http://www.mozilla.org/projects/mathml/fonts and downloading the "Font Installer".

Creating Math Equations for Scientific Notebook

Scientific Notebook now allows the importing of RTF documents containing mathematical expressions created using MathType. This process is useful if the final content is to be embossed as Nemeth Braille. To import math equations into Scientific Notebook, it is necessary for content to originally be created in MS Word using MathType and saved in a **.RTF** format. From within Scientific Notebook, it is possible to import the **.RTF** document and prepare the information for embossing.

MathType also provides an option to copy an equation from the MathType authoring tool directly into Scientific Notebook. It is necessary to choose the translation type before moving a MathType expression into Scientific Notebook.

1. Open the MathType equation editor and compose a mathematical equation.

2. Select **Preferences** from the menu bar and choose **Translators**.

3. Choose the radio button marked **Translation to other language (text)**. Choose the translator in the drop-down list that corresponds to the output of your choice. For Scientific Notebook, you may choose any one of the "Tex" translators.

4. Select **OK**.

5. Select the equation you wish to copy into Scientific Notebook and choose **Copy** (under Edit on the menu bar).

6. Switch to Scientific Notebook and select **Edit** from the menu bar. Choose **Paste Special**. You will need to select the **Text** format and the radio button marked **Internal Format**.

7. Select **OK**. You may need to clean up part of the equation in order to ensure the entire equation is recognized as "math", however, your equation should now be usable from within Scientific Notebook.

MathType and DotsPlus

In order to print mathematical content in the Dots Plus format, it is necessary to use the Tiger font (from View Plus Technologies), and the MathType editor. Math equations can be created in MS Word from MathType. When the document is ready to be printed to the Tiger embosser (from MS Word), the user needs to select the Tiger font. This will allow for content to be properly embossed in the Dots Plus format. For more information on the Tiger embosser, visit: http://www.viewplus.com/

Scientific Notebook 5.0

Publisher:

MacKichan Software
http://www.mackichan.com/

19307 8th Avenue
Suite C
Poulsbo, WA 98370-7370

Phone: 360-394-6033
FAX: 360-394-6039

For customer service:
info@mackichan.com

Retail Cost:

Full Price (Academic): $139.00

Upgrade Price (Academic): $49.00

System Requirements:

- Microsoft Windows® XP, 2000, Me, 98, or NT 4.0 or Apple Macintosh® running an emulator program such as Virtual PC™
- 64 MB of RAM
- 70 to 250 MB hard disk space, depending on the type of hard drive and the installation options selected
- CD-ROM drive

Description

Scientific Notebook is a math "word-processor" allowing authors to integrate mathematical expressions, text content, and graphics into one document. Using the computer algebra engine MuPad® 2.5, Scientific Notebook provides the flexibility to not only create mathematical expressions, but also solve equations within the document itself. Scientific Notebook also provides the capability to compute symbolically or numerically, integrate, differentiate, and solve algebraic and differential equations. With menu commands, you can create 2-D and 3-D plots in many styles and coordinate systems; import data from graphing calculators; and compute with over 150 units of physical measure.

Scientific Notebook now allows exporting in RTF, MathML, and HTML as well as reading MathType mathematics by importing RTF documents. Previous features including LaTex and PDF support are also included in Scientific Notebook.

Scientific Notebook Shortcut Keys

Note: When working in Scientific Notebook, go to View > Toolbars and turn on the Standard, Math Templates, Symbol Panes, and Tag toolbars.

Hint: Scientific Notebook does not normally allow you to use the space bar in equations. You can use keyboard shortcuts to enter spaces:
CTRL + spacebar = required space
SHIFT + spacebar = nonbreaking space
CTRL + SHIFT + spacebar = thick space

To enter	Press
Toggle math/text	Ctrl+m or Ctrl+t
Fraction	Ctrl+f or Ctrl+/ or Ctrl+1
Radical	Ctrl+r or Ctrl+2
Superscript	Ctrl+h or Ctrl+ up arrow or Ctrl+3
Subscript	Ctrl+l or Ctrl+down arrow or Ctrl+4
Integral	Ctrl+i or Ctrl+8
Summation	Ctrl+7
Brackets	Ctrl+9 or Ctrl+0 or Ctrl+(or Ctrl+)
Square brackets	Ctrl+[or Ctrl+] or Ctrl+6
Angle brackets	Ctrl+<
Braces	Ctrl+{ or Ctrl+}
Display	Ctrl+d
Product	Ctrl+p
Absolute value	Ctrl+\
Norm	Ctrl+| (Ctrl+Shift+\)
Required space	Ctrl+spacebar
Nonbreaking space	Shift+spacebar
Thin space	Ctrl+,
Thick space	Ctrl+Shift+spacebar
" (double open quote)	Single open quote (`) twice
" (double close quote)	Single close quote (`) twice
- (intraword dash or hyphen)	Hyphen (-)
-- (en dash)	Hyphen (-) two times
--- (em dash)	Hyphen (-) three times

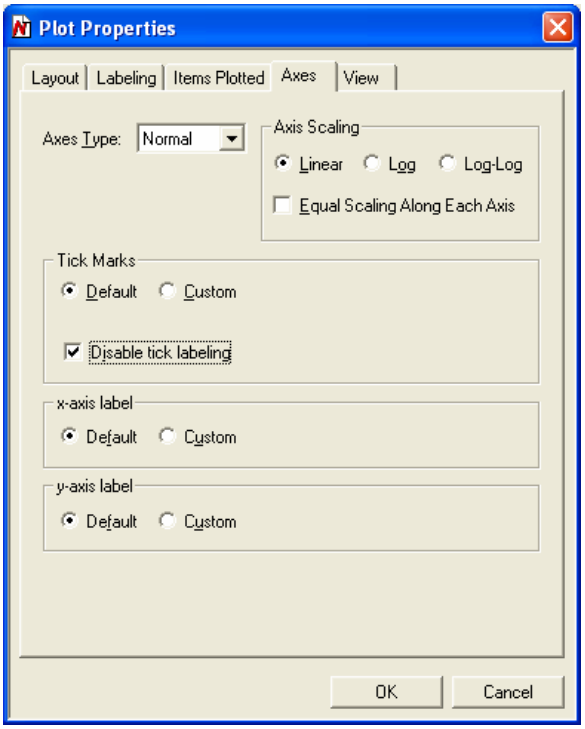
To enter	Press
- (discretionary hyphen)	Ctrl+ -- (Ctrl + hyphen two times)
¿	? followed by ` (open single quote)
¡	! followed by ` (open single quote)

Exporting Graphs to Word

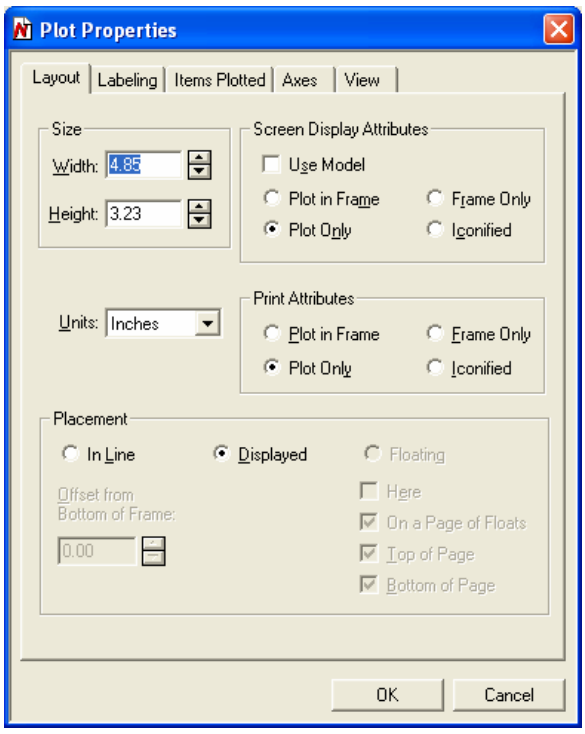
We need to adjust the settings so that the graph does not have a frame, axes are not labeled, and tick marks are not numbered. We will add numbers and labels in the Braille font in Word.

(Note: If you do not have the Braille font, you can download it for free from Duxbury: http://www.duxburysystems.com/.)

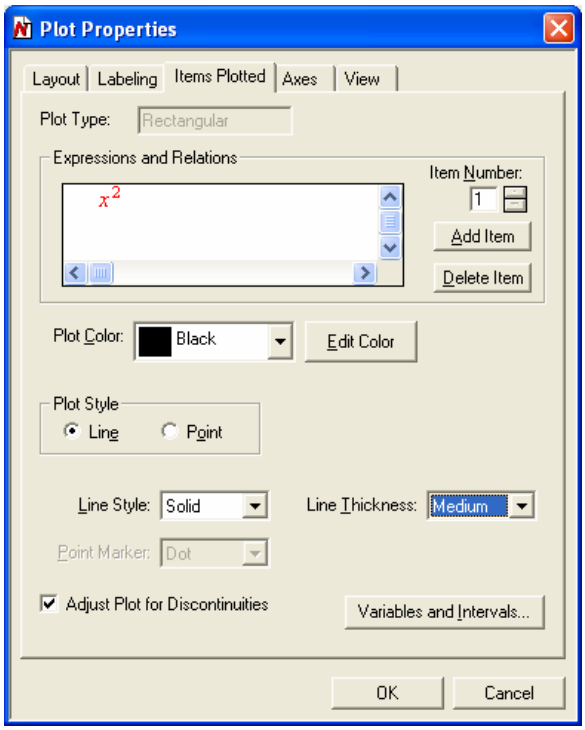
Once you have created your graph, right click on it and choose Properties. Set the Axes so that tick labeling is disabled (check the disable tick labeling option).



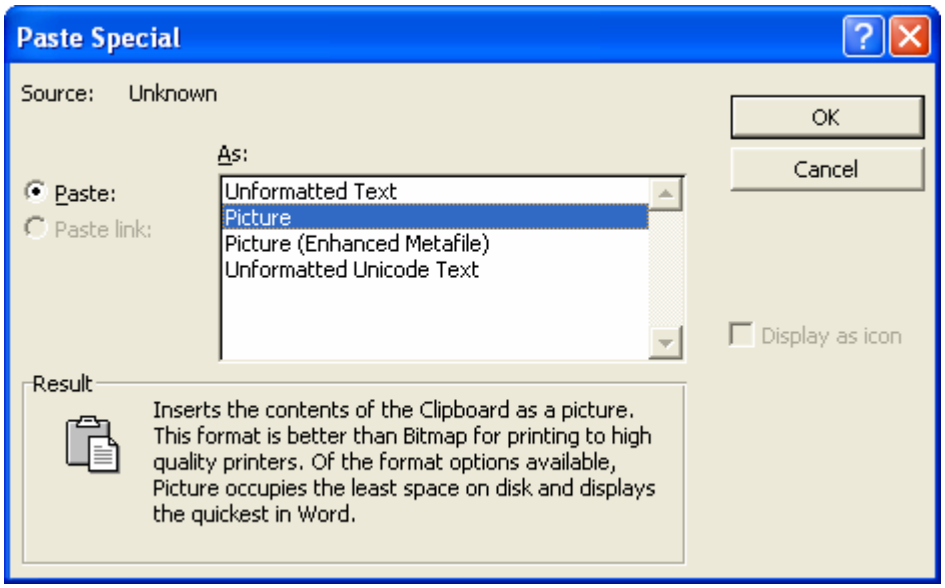
Set the layout to "plot only" so that there is no bounding frame around the graph.



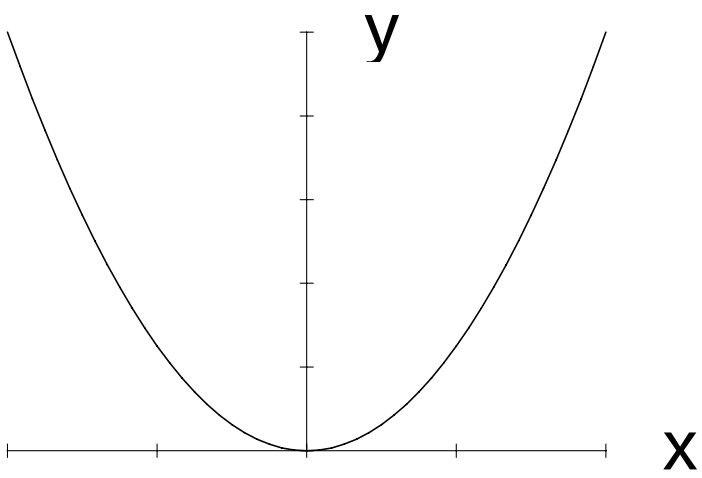
Under Item Plotted, set line thickness to medium.



Select and copy the graphic and copy it. Open Microsoft Word and paste the graphic by going to Edit > Paste Special > Picture.



With the graphic in Word, enter the Braille labels in text boxes (26 point Braille font, no line around the boxes).



PIAF (Pictures in a Flash)

Publisher:

Pulse Data HumanWare
http://www.pulsedata.com/

175 Mason Circle
Concord, CA 94520

Phone: 800-722-3393
Phone 925-680-7100
FAX: 925-681-4630

For customer service:
usa@pulsedata.com

Retail Cost:

Machine: $1299.00

Swelltouch capsule paper, 8.5" x 11", 100/box: $120
Swelltouch capsule paper, 11" x 11.5", 100/box: $150
Swelltouch capsule paper, 11" x 17", 100/box: $260

Description

The PIAF machine produces high quality tactile graphics by using heat sensitive capsule paper. The raised images are easy to produce and ideal for communicating graphics and Braille to blind people. PIAF provides quick and easy access to geography, mathematics, orientation and mobility training, all science subjects, and more.

What Is Capsule Paper?

—The following discussion is taken from the Quantum Technology Website: http://www.quantech.com.au/

The Name? Capsule paper has many names. Sometimes it is known as swell paper, puff paper, pop-up paper, or even Minolta paper. It is basically all the same material with a few variations.

How's it Made? To manufacture capsule paper, a suspension of very tiny polypropylene beads is painted onto a sheet of paper. These beads are measured in microns, so don't try looking for them.

How's it Work? Capsule paper works on the principal that the color black absorbs more heat. Hence, when a black line or image or dot is on a piece of capsule paper, it gets hotter than the area around it. At a certain temperature, these little beads explode, and increase their volume

rather dramatically (just like making popcorn!). The result is that any black area on the paper is raised—and hey presto, you have a tactile image. Always feed the capsule paper into the photocopier in the "pass through" or "single copy" mode to avoid the capsule paper becoming stuck in the photocopier.

Please Note: The black ink used on capsule paper, must be carbon-based ink. Toner in photocopiers is carbon, many felt tip pens use carbon ink (try one and keep it with your PIAF).

WinTriangle

Publisher:
Cooperative effort by Oregon State University's:

Technology Access Program - http://tap.oregonstate.edu/

Science Access Project - http://dots.physics.orst.edu/

WinTriangle Listserv - http://lists.oregonstate.edu/mailman/listinfo/wintriangle

Retail Cost:
Open Source Effort. Development provided by Oregon State Universities Technology Access Program.
Download available at: http://tap.oregonstate.edu/WinTriangle/WinTriangle.htm

System Requirements:
- Microsoft Windows XP or 2000
- Sound Card

Description
WinTriangle is a specialized RTF word processor capable of displaying and voicing conventional text and the symbols commonly used in math and scientific expressions. WinTriangle has menus and hot keys permitting access to and voicing of a number of Windows screen fonts including the Triangle.ttf font containing markup symbols permitting virtually any math or scientific expression to be expressed in a linear form.

One of the goals of WinTriangle is to provide a common format usable by sighted and blind people. WinTriangle completes the loop permitting essentially total written communication of scientific information between sighted and blind people. The remainder of this communication loop is provided by the Tiger tactile graphics embosser and the Accessible Graphing Calculator which are now commercially available.

Please recognize that WinTriangle is currently in development and not all features are available.

Installation

The following process will guide you through the installation and setup of the WinTriangle program.

1. Download the WinTriangle zip file from http://tap.oregonstate.edu/WinTriangle/WinTriangle.htm

2. After unzipping the file, you will have three folders, **Fonts**, **WinTriangle**, and **sapi51**.

3. In the **Fonts** folder, move the font, Triangle.ttf, to the Fonts folder on your system (typically located in C:\WINDOWS\Fonts).

4. Move the folder **WinTriangle** to a location in your program files (e.g., C:\Program Files).

5. Create a new shortcut on your desktop and point this shortcut towards the file named **Triangle1.exe** (located in the WinTriangle folder).

NOTE – Only run the SAPI51.exe file (located in the sapi51 folder) if you do not have a SAPI engine installed or if the program crashes upon launch. If you run this file, you will overwrite any SAPI engines on your machine.

Using WinTriangle

WinTriangle is designed to read the scientific notation common to various disciplines (e.g., mathematics, chemistry, physics, etc.). Document authors can either create mathematical notation within a word processing application or create the content from within the WinTriangle application. This training manual is going to focus on the creation of math notation using WinTriangle. For information regarding how to input the correct math notation into other word processor such that the content can be read by WinTriangle, please visit http://tap.oregonstate.edu/WinTriangle/WinTriangle.htm .

Reading Content

Reading content in WinTriangle is possible with the arrow keys. You can also have the equation be read to you with the command **Ctrl+R**. To read the entire equation, move to the beginning of the row and press **Ctrl+R**.

Entering Content

When using WinTriangle, it is important to use the correct input mechanisms in order to have equations voiced correctly. Avoid using symbols from the keyboard when entering notation into WinTriangle. You can enter text or numbers from the keyboard, but avoid symbols like the parentheses, division, addition, etc. These symbols can be entered using either the hot-keys (listed below) or by navigating to **Insert** on the menu bar and choosing **Character**.

Hot-Key Expressions
Hot-key expressions can also be found by selecting **Insert** on the menu bar and choosing **Hot-keyed expression**. This will provide the same expressions and keystrokes listed in the table below.

Expression	**Keystroke**
Fraction and Denominator	Alt+,
Denominator	Ctrl+/
Fraction	Ctrl+,
End Fraction	Ctrl+.
Open Parenthesis	Ctrl+[
Close Parenthesis	Ctrl+]
Begin Equation	Alt+[
End Equation	Alt+]
Over	Alt+/
Left Superscript (open, close)	Ctrl+7
Overscript (open, close)	Ctrl+9
Underscript	Ctrl+Shift+-
Subscript	Ctrl+-
Superscript	Ctrl+6
Root (open, close)	Ctrl+8

Fractions

For **all fractions**, use the hot-keyed expression from triangle: . This can be found by opening triangle, select **"Insert", "hot-keyed expression"**, and select **"fraction and denominator"**. You can also use the shortcut key, **Alt+,** to create the fraction symbol.

The numerator goes between the first two symbols while the denominator goes between the second and third symbol.

For Example, $\frac{a}{b}$ is represented as a b .

Do not use brackets before and after the fraction markers and .

Also note that fractions in the units are not done using triangle fraction symbol. They should be edited normally with a slash. For example, **10 m/s** is the correct way of displaying units, instead of 10 m s .

Don't use any extra parenthesis around the numerator or denominator while using fractions. The fraction mark up will serve as implicit parenthesis for the numerator and denominator. For example, it is sufficient to write a + b c + d instead of writing (a + b) (c + d) .

Mathematical Symbols

The following chart contains a list of different mathematical symbols that may appear in math, science, or other scientific books. For instance, if dealing with "vectors", you will need to use the vector symbol: ' '. To enter these symbols:

1. Select **Insert** from the menu bar.

2. Choose the **Character** sub-menu. Select the **Insert Math markup** combo box and choose the appropriate symbol.

For the vector variables, use the **vector** symbol. For Example $\vec{B}$ can be written as B. Similar symbols are script ( ), Roman( ), overbar( ), tilde( ) and hat above( ).

Name	How looks in Text	How it should be represented
Vector	$\vec{B}$	B
Overbar	$\overline{B}$	B
Tilde	$\widetilde{B}$	B
Hat Above	$\hat{B}$	B
Bold	**B**	B
Script	𝖡	B
Roman	III	3

Limits and Integrals

When writing definite integrals, the **limits** should be listed **BEFORE** the integral symbol like $_{a}{}^{b}\int$. Also type the limits in "normal" position with a space (this must be in normal position) between the two limits. The lower limit is always before the upper limit.

For all other cases like ∑,], etc, limits should be placed after the symbol like $\sum_{a}^{b}$.

While editing limits, one should put **lim** and then put the limits in subscript. Don't use under script markup from triangle to write the same.

Example:

$$\lim_{x\to\infty}\frac{x+2}{2}$$

The above equation should be edited as follows:

Lim x→∞ x+2 2

Equations should be written as → **Equation n:** where n is the number of equation. (make sure you have the **colon** after the equation number). The equation, the intermediate part, and final part should all be listed on separate lines.

Example:

This is how it looks in the textbook:

$$\Delta E = h\nu = \frac{hc}{\lambda} = \frac{ehcR_{\infty}}{4}(z-1)^2 \qquad \text{(equation 1)}$$

This is how it should look after editing:

Equation 1:

ΔE = hν

= hc λ

= ehcR∞ 4 (z –1)2

Adapted from Oregon State Universities Technology Access Program "WinTriangle Editing Procedures" documentation. Please visit http://tap.oregonstate.edu/WinTriangle/WinTriangle.htm for additional information.