

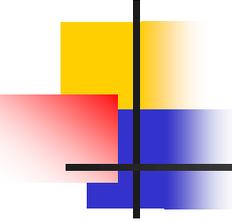
Iowa Statewide Vision Services

“Using the Audio Graphing Calculator”

<http://www.viewplus.com/>

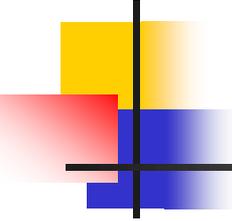
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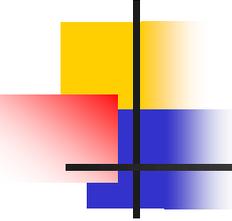
Why?

- Evolution and use of the Texas Instruments and Casio graphing calculators in the math classroom.
- The use of a graphing calculator is now an integral part of advanced mathematics classrooms across the U.S.
- More and more middle school classrooms are beginning to use the graphing calculator also.



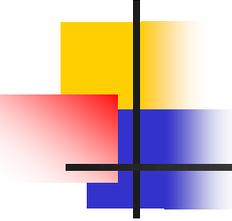
Background of AGC

- A computer software program developed by the esteemed Science Access Project at Oregon State University, directed by John Gardner
- This group is dedicated to the development of methods for making science, math, and engineering information accessible to people with print disabilities including low vision, blindness, and dyslexia.
- Beta tested by Susan Osterhaus at TSBVI in 2001-2002
- ViewPlus Software, the exclusive distributor of AGC, made it available to the general public on March 7, 2001



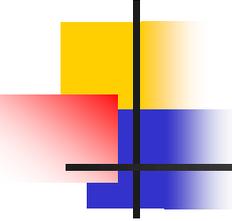
Software

- Download a free 30-day fully functional copy from the web at <http://www.viewplus.com/products/braille-math/AGC/download>
- Cost: \$295 after 30 days
- Download online or purchase CD
- Uses Windows XP/2000/NT and a Windows compatible sound card
- This is self-voicing, so screen readers like Jaws or Window Eyes should be put to sleep



Features

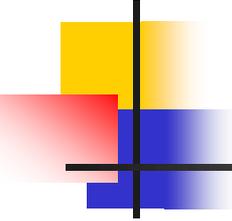
- Scientific keypad calculator
- Expression evaluator with the ability to define or import constants and expressions
- Two data set pages that permit the user to compute expressions, import and edit data tables, and compute a number of standard statistical properties
- Ability to plot either data set, their sum or difference, or their first derivative
- Matrices



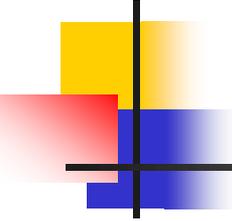
Useful Beginning Keystrokes

- F7→Decrease the size of the screen
- F8→Increase the size of the screen
- Alt+S →Toggles speech on and off
- Alt+O →Opens options menu
- Ctrl+R →Reads the item that has focus in buttons and edit boxes
- Esc →stops the audio playback
- Ctrl →stops the voice

Speech Screen Recommended Settings

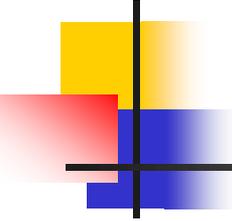


- Tab →move forward Shift+Tab →move backward
- Sound Effects →checked
- Allow Self-Voicing →checked
- Arrow among voices very slowly. Mary, Mike, or Sam suggested.
- Speech rate slider—adjust with arrows (start slow)
- Speech pitch slider—adjust with arrows (start w/ 65)
- Speech volume slider
- Number of decimal places to voice – see math teacher
- Tab to return to the Speech Screen heading



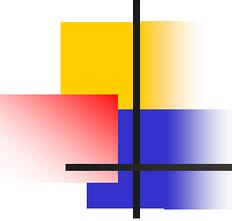
Wave Screen Recommended Settings (Part 1)

- Left arrow from Speech Screen
- Tab →move forward Shift+Tab →move backward
- Data Set Volume →50
- Play Y axis tick marks →unchecked
- Tick Mark Volume slider →50
- Play noise below Y threshold →checked
- Y threshold value →0 (causes static below 0)



Wave Screen Recommended Settings (Part 2)

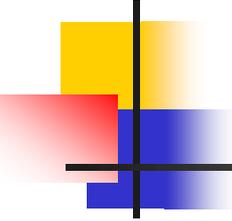
- Wave file length slider →10
- Wave Type →stereo
- Minimum Frequency Slider →200
- Maximum Frequency Slider →2500
- Auto-Speak Coordinates →check if you like hearing coordinates at each step
- Tab to return to the Wave Screen heading



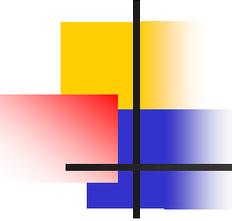
Plot Screen Recommended Settings (Part 1)

- Left arrow from Wave Screen
- Tab →move forward Shift+Tab →move backward
- Source →arrow to Data Set 1
- Choose Plot Function (we won't be doing Calculus today)
- Start →-10
- Finish →10
- Number of Points to Plot →501 (not higher than 1000)
- X min →ignore
- X max →ignore
- Autoscale x-axis ✓ (otherwise you must set X min and X max)
 - This produces a better sound

Plot Screen Recommended Settings (Part 2)



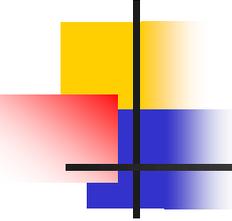
- Y min →ignore
- Y max →ignore
- Autoscale Y-axis ✓ (otherwise you must set Y min and Y max above)
 - This produces a better sound
- Draw data points →personal preference
- Draw line through data ✓
- Draw error bars →unchecked
- Show x-axis ✓
- Show y-axis ✓
- Show x-axis labels ✓
- Show y-axis labels ✓
- Plot frame →tick marks or grid lines



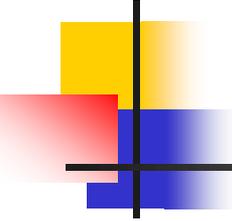
Example 1

- Arrow up from Plot Screen
- Tab to Expression 1 edit box
- Type x
- Press enter or F4 to calculate your data table
 - Enter is better because you will hear a short tone when the computation is finished.
- Display the graph on the screen →F3
- Play the audio graph →F5
- Play the audio graph and hear beeps at the tick marks →F6

What you should hear in Example 1

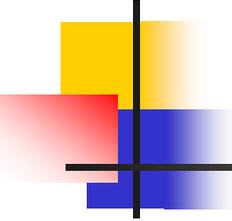


- A straight line starting in quadrant 3, passing through $(0,0)$, and ending in quadrant 1.
- Static below the x-axis. None above the x-axis, after the line passes through $(0,0)$
- The pitch should rise from left to right since the line is rising from left to right.
- With stereo speakers, left ear while left of the y-axis and right ear while right of the y-axis.



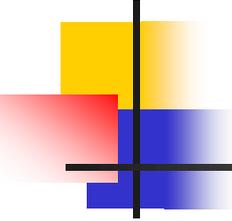
Example 2

- Hide the previous graph →Ctrl+F3
- Get to the Data Set 1 Screen Heading →Shift+Tab
- Arrow to the right to find the Data Set 2 screen
- Tab to the Expression 2 edit box
- Enter x^2
- Press enter or F4 to calculate your data table
- Display the graph on screen →F3
- Play the audio graph →F5



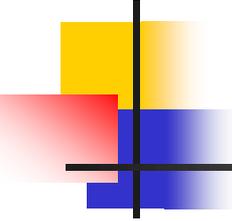
Example 3

- Move to the end of the expression $x^2 \rightarrow$ End
- Type -10
- Press enter
- Display the graph on the screen \rightarrow F3
- Play the audio graph \rightarrow F5
- Note the differences and similarities to x^2
- Display the minimum \rightarrow Alt+PgDn
- Read the values of x and $y \rightarrow$ Alt+X and Alt+Y



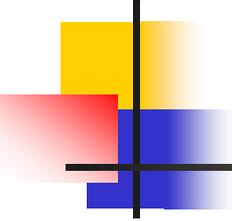
Example 4

- Hide the graph →Ctrl+F3
- Make sure you are still in the Expression 2 edit box
- Enter $x*\sin(x)$
- Press enter
- Display the graph →F3
- Play the audio graph →F5
- Display all the relative minimums →Alt+PgDn several times
- Display all the relative maximums →Alt+PgUp several times
- Find all the zeros (x-intercepts) → Alt+0
- Find all the intersection points of the two functions →Alt+I
- Go to the beginning of the graph →Alt+Home



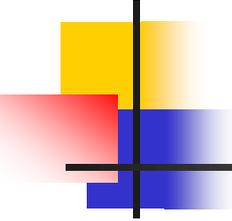
Printing Graphs

- Print Graph →Ctrl+P
- Compose a print graph with print font.
Change all settings to your requirements.
- Compose a print graph with a braille font.
Change all settings to your requirements.
- Compose a TIGER braille graph with
braille font.



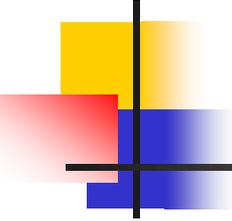
Example 5 – Matrices (Part 1)

- Go to the Matrix Screen
- Enter the following two matrices into the Matrix Expression edit box.
 - $[1,1,1;2,2,2]*[2,3;2,3;2,3]$
- Press Enter and it will display $[6,9;12,18]$
- Matrices may be added, subtracted, and multiplied.
- A square matrix may be inverted with the INV function. Enter the following into the edit box.
 - $INV[1,2;3,4]$
- Press Enter and it will display $[-2,1;1.5,-0.5]$



Example 5 – Matrices (Part 2)

- The determinant of a square matrix may be obtained with the DET function. Enter the following into the edit box.
 - $\text{DET}[1,2;3,4]$
- Press Enter and it will display -2
- The transpose of a matrix may be obtained with the T function. Enter the following into the edit box.
 - $\text{T}[1,2,3;4,5,6]$
- Press Enter and it will display $[1,4;2,5;3,6]$
- If you get an error such as Invalid Matrix → up arrow to step back and correct mistake
 - This really saves time.



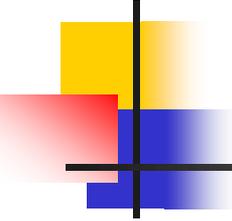
Plotting Individual Points

- Go to Data Set 1 Expression Box
 - It is not available in Data Set 2
- Clear the Data Table → Delete, then Enter
- Type POINTS=N where N equals the number of points you wish to enter.
- Press Enter. The word USER displays in the expression box.
- Tab and select rectangular or polar coordinates.
- Tab to enter the table.
- Type the x and y values, pressing TAB after each coordinate.
- Enter SHIFT+TAB to return to the Expression Box. Press Enter to set the database.
- Press F4 (This time F4 is a lot faster. You will not hear a short tone since you created the data table yourself.)

Example 6 – Plotting a Linear Function (Part 1)

X	Y
1	3
2	5
3	7
4	9

- Enter the following data table
- Display the graph→F3
- Tab to Statistical Description of Data Set button and press Enter
- Tab to the Mode box.
- Select Basic Statistical Information using the arrow keys, if it is not already displayed.
- Tab to Evaluate Statistics and press Enter



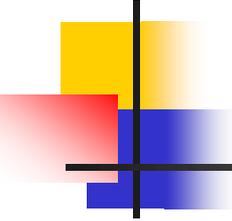
Example 6 – Plotting a Linear Function (Part 2)

- In the text box, arrow up and down for the number of data points, sum, mean, and standard deviations for both X and Y data values
- Tab to the Mode box and arrow up or down to find Linear: $y=ax+b$
- Tab to Evaluate Statistics and press Enter
- Tab once again to return to the text box. By using the up and down arrow keys to find the equation fitting the data points: $y=2x+1$, where a is the slope and b is the y-intercept
- Tab to the Plot Data Set 2 button and press Enter. You have just placed the regression equation into the Data Set 2 expression box and filled in the data table

Example 7 – Plotting a Quadratic Function (Part 1)

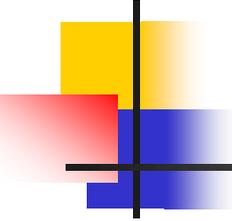
X	Y
1	10
2	19
3	32
4	49

- Enter the following data table
- Display the graph→F3
- Tab to Statistical Description of Data Set and press Enter
- You are now in the Mode box. Select Basic Statistical Information
- Tab to Evaluate Statistics and press Enter
- In the text box, arrow up and down for the number of data points, sum, mean, and standard deviations for both X and Y data values



Example 7 – Plotting a Quadratic Function (Part 2)

- Tab to the Mode box and arrow up or down to find Quadratic: $y=ax^2+bx+c$
- Tab to Evaluate Statistics and press Enter
- Tab once again to return to the text box. By using the up and down arrow keys to find the equation fitting the data points: $y=2x^2+3x+5$, where a is the coefficient of x^2 , b is the coefficient of x , and c is the constant.
- Tab to the Plot Data Set 2 button and press Enter. You have just placed the regression equation into the Data Set 2 expression box and filled in the data table



Other Types of Regression Equations

- In the mode box, you can select
 - Linear
 - Quadratic
 - Cubic
 - Quartic
 - Exponential
 - Logarithmic
 - Power
 - Hyperbolic
 - Rational
 - Logistic
 - Sinusoidal