

Calculators are one of the most commonly required tools at home, school and work, however, people with disabilities may have difficulty using standard calculators. Buttons on most calculators are smooth, and offer few or no tactile clues to allow a person with a visual impairment to orient him or herself to the keypad. People with visual impairments may not be able to see the appropriate buttons. Modern calculators generally have an LCD output screen, but these are often difficult to see as character size is generally small, and the contrast between the numerals and background is low. People with mobility impairments or tremor are often unable to touch individual buttons accurately on compact calculators with small buttons.

Calculators may perform basic calculations or be suitable for statistical, scientific, or financial calculations. Scientific calculators compute logarithms, sine, cosine, tangent, pi, square root, and exponents. Algebraic calculators and graphing calculators can simplify algebraic expressions; differentiate, integrate, and plot functions; solve equations; and manipulate matrices. Statistical calculators compute statistical equations, including means, variances, covariance, and correlation and regression coefficients. Financial calculators compute present value and internal-rate-of-return, depreciation, and schedules such as amortization and future value.

Use requirements vary from simple direct keystroke calculation to complex multi-keystroke combinations. Calculators are available with features that range from simple to complex, and which are offered in a variety of combinations. Features include adjustable angle display, large numbers, large buttons, printing capability in black or color and speech output in a range of voices.

The products described in this article are only a few of the many calculators available on the market today. The companies listed may also make or distribute other calculators that could not be included due to space limitations. Contact individual companies for more information.

FREQUENTLY ASKED QUESTIONS

Where can I find a standard function calculator that also ...

... has large keys and/or display?

People have had success finding these products in local toy stores, drug stores and office supply stores. Other options include:

- Four function calculator with oversize keys from ABC School Supply.
- Dino II Large Number Calculator, from Independent Living Aids, with bold, large numbers on the keypad (white on black keys, or black on white keys) and 5/8 inch high numbers on the readout.
- Large Key Calculator, by Aids for Arthritis, Inc., with 1/2 to 1-1/2 inch keys on the keypad and 5/8 inch high numbers on the tiltable display.
- Calcu-Scan is computer software. Unlike standard calculator programs (e.g., MS Windows Calculator), this one can be controlled by a person with the hit of a switch. It also provides auditory feedback. It is available from Mayer-Johnson for \$89.

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... talks?

These calculators read the display and may announce each key as it is pressed. Several companies offer this product. One simple talking calculator has large, 8-digit, LCD readout. The calculator performs the four basic functions, and includes percent, memory, audio repeat, time, and volume control. It is available from several companies, including The Lighthouse, LS&S Group, and Independent Living Aids. Radio Shack makes a similar calculator. Spanish versions are available. Calculators are available for as little as \$13.

Where can I find a scientific / statistical calculator that also ...

... has large keys and/or display?

Sci-Pod (formerly the VisAble Scientific Calculator) offers a high contrast LCD display with enlarged numbers; enlarged keys with large, high contrast labels (white print on black keys); and color differentiated keys (dark blue). This calculator has scientific, statistical and trigonometric functions. It is manufactured by Sight Enhancement Systems, but is also available from Independent Living Aids and LS&S Group.

... talks?

These calculators read the display and may announce each key as it is pressed. Look for a calculator that has a headphone jack so that work can be done privately. There are several options on the market, ranging from \$200-500, including:

- Talking Texas Instruments Scientific Calculator, from Independent Living Aids, offers all of the functions of a Texas Instruments scientific calculator, but with voice output. It has a learning mode for key identification that does not affect calculations; tactile, large, functionally zoned keys; and an earphone.
- Audiocalc, from Blazie Engineering, performs 15 scientific functions and includes a built-in stopwatch, calendar and alarm clock.
- The Orion Talking Scientific Calculator, from Orbit Research, has identical operation as the TI-34 from Texas Instruments and performs general math to trigonometry calculations, statistics, and physical sciences.
- The RNIB (Royal National Institute for the Blind) Talking Scientific Calculator incorporates a large 7.5 x 5.5 inch spill-resistant high contrast tactile membrane keypad. A "learn" key allows audible key identification without altering or erasing entries that have already been made. The unit has no visual display, only auditory output. It is available from Independent Living Aids.
- The Aria is a palm-top computer that has a braille keyboard and speech output. It includes a calculator with scientific and financial functions. It is available from Technologies for the Visually Impaired, Inc.
- TCalc is talking/large print scientific/statistical calculator software for computers that use Windows 95 or higher. It is available from Independent Living Aids.
- Calc-Talk is talking/large print scientific calculator software for Apple computers. It has 24 functions including trigonometry, logarithm, exponents and roots. It is available from LS&S Group.

... provides braille output?

The LEO Braille Scientific Calculator provides a refreshable 8 dot, 8 cell braille display. The calculator can compute standard arithmetic functions, plus square root, trigonometry functions, logarithm, conversions, and financial functions. It is available from LS&S Group for \$999.

Where can I find an accessible calculator with fraction capability?

Unfortunately, these types of products do not yet exist, however some of the scientific calculators described above have a "convert fraction to decimal" feature.

The ORION TI-34 is an accessible calculator with fraction capability. In fact the fraction key is one of its most beloved keys.

Where can I find a graphing calculator (such as the TI-83) that also ...

... has large keys?

This is a highly sought product that, unfortunately, is not yet available. The only current option is to use a computer-based program that emulates the calculator, along with an appropriate keyboard. Computer software options include:

- TI InterActive! is a software version of the TI-83 graphing calculator. It is available from Texas Instruments for about \$50.
- The Larsen Interactive Pre-calculus CD ROM series includes tutorials for algebra, college algebra, trigonometry and pre-calculus. All CD-ROM's have a built-in graphing calculator with TI82 or TI83 functions as part of the package. It is available from Houghton Mifflin Company.

... has a large display?

There are several options for people with low vision:

- Both Texas Instruments and Casio have classroom tools that were designed to project a graphing calculator display on an overhead projector or on a television screen. These tools may also work for students with low vision. For example, the LCD panel for the projection unit can be backlit to create a larger display. Note, however, that these solutions may not provide a bright enough display for all users.
- TI-GRAPH LINK is software that allows information to be transferred back and forth between a computer and a Texas Instruments graphing calculator (models TI-73, TI-82, TI-83, TI-83 Plus, TI-85, TI-86, TI-89, TI-92, or TI-92). Although a screen shot can be displayed on a computer, the graphs are created by using the calculator. A "cheat sheet" may be needed to locate the desired buttons.
- Perhaps the best option is to use a computer-based program that emulates a graphing calculator, such as TI InterActive! These programs are described further in the section on graphing calculators with large keys. A computer magnification program can further increase the display size.

... provides auditory output?

There are two software options for students who are blind and need an auditory representation of a graph.

- Accessible Graphing Calculator (AGC) is a Windows program that features a graphing calculator capable of displaying graphs or other sets of y vs. x data both visually and audibly as a tone graph. Other features of the program (such as menus) are entirely accessible in audio through a variety of speech and non-speech sound cues. ViewPlusSoftware, Inc. sells it for about \$100.
- Graph-It software can be loaded on notetaker products from Blazie Engineering. The tactile graphing calculator program presents an audio representation of the graph display through a speech synthesizer. This program supports algebraic, trigonometric, exponential and logarithmic equations.

Can I enlarge the calculator display using my CCTV?

People who have tried this have found that this does not transfer well. Instead, try using one of the classroom projection tools described above.

What can I do if I can see the display and only have trouble reading the labels on the buttons?

Try adding tactile cues (e.g., drop of nail polish) to the "5" key (center of the number group) and a few other keys. Make a large print representation of the layout on the calculator. Find the position of a function on the "cheat sheet", then count over the correct number of buttons on the calculator to locate it.

I can't see the display on the new LCD calculators. Can I buy one with an LED display?

LED displays, which emit light, were found on older technology calculators, but Canon GLOView printing calculators are still available (Independent Living Aids, LS&S Group). You may also find the older technology calculators on sale at flea markets or garage sales, and there are calculator collectors who may be willing to part with some of their stock. Expect to pay \$20 or more for these devices.

Is there a way that I could feel a graph?

Products exist that convert mathematical data and forms to tactile form. The following are a few examples.

- Geometry Tactile Graphics Kit is a set of raised line drawings depicting concepts, figures, and relationships covered in geometry texts. The drawings are embossed in thermoform plastic, and are available from American Printing House for the Blind.
- Generate a graph on a scientific graphing calculator program such as Graph-It, then emboss an image of the graph using a braille embosser.

PRODUCT LINKS:

Company	City, State, Phone	Web Site	Products
ABC School Supply	Duluth, GA 800-669-4222	http://www.abcschoolsupply.com	4-Function with Oversize Keys
Aids for Arthritis	Medford, NJ 800-654-0707	http://www.aidsforarthritis.com	Large Key Calculator
American Printing House for the Blind	Louisville, KY 800-223-1839	http://sun1.aph.org/aph1.htm	Geometry Tactile Graphics Kit
Blazie Engineering (Freedom Scientific)	Forest Hill, MD 410-893-9333	http://www.blazie.com	Graph-It AudioCalc
Houghton Mifflin Co.	Wilmington, MA 800-225-1464	http://www.hmco.com	PreCalculus CD ROM Series
Independent Living Aids	Plainview, NY 800-537-2118; 516-752-8080	www.independentliving.com	Variety of large display and talking calculators
The Lighthouse	New York, NY 212-821-9200	http://www.lighthouse.org	Basic talking calculator
LS&S Group	Northbrook, IL 800-468-4789	http://www.lssgroup.com	Large display and talking calculators
Mayer-Johnson	La Jolla, CA 800-588-4548	http://www.mayer-johnson.com	Calcu-Scan
Orbit Research	Wilmington, DE 888-60-ORBIT	http://www.orbitresearch.com	Orion Talking Scientific Calculator
Radio Shack	Ft. Worth, TX 800-843-7422	http://www.radioshack.com	Basic talking calculator
Sight Enhancement Systems	Ontario 519-221-0310	www.sightenhancement.com	Sci-Pod
Technologies for the Visually Impaired	Hauppauge, NY 516-724-4479	http://www.tvi-web.com	Aria
Texas Instruments	Dallas, TX 800-336-5236	http://education.ti.com	TI Interactive! TI Graph Link
ViewPlus Software	Corvallis, OR 541-754 4002	www.ViewPlusSoft.com/agc/	Accessible Graphing Calculator

For information about specific products and models, contact: <http://www.assistivetech.net>