QUICK Reference Guide

ClassPad II

Press these keys for numbers, basic operations, and the most common variables

Tap any icon to select the application.

Tap Menu at any time to return to the menu screen.

Tap Main $\sqrt{\alpha}$ at any time to return to the **Main menu**.

Tap to advance to the next page.

In any menu application, press [Keyboard] for the onscreen keyboard.

Press [⏻ Clear] to power on. Then press [⏻ Clear] to clear commands. Press [Shift] [⏻ Clear] to power off.

Press these keys for numbers, basic operations, and the most common variables

Press [EXE] to execute commands.

CASIO®

Press these keys for numbers, basic operations, and the most common variables

Quick Reference Guide

ClassPad II

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Main Menu

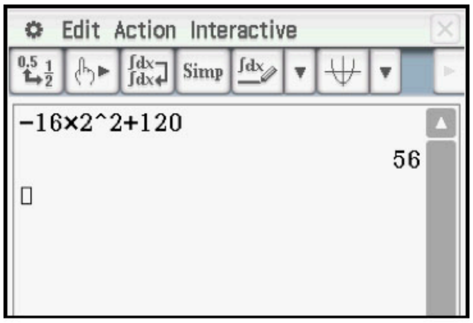
If an object, such as a ball, is dropped from a initial height, *c*, the height, *h*, in feet, as a function of time, *t*, in seconds, can be modeled by $h = -16t^2 + c$.

If the object is tossed upwards with an initial velocity, v, then the model becomes $h = -16t^2 + vt + c$. These models ignore air resistance.

1. If a ball is dropped from a height of 120 feet, compute the height after 2 seconds.

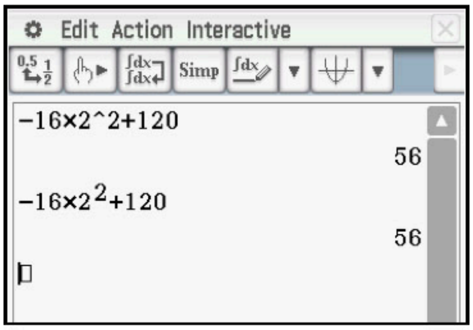
Tap Main $\sqrt{\alpha}$ for the **Main** menu.

Press:
(–) 1 6 × 2 ^ 2 + 1 2 0 EXE.



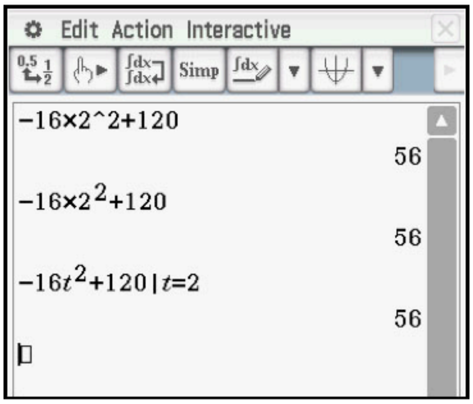
For a more mathematical display, the raised exponent template can be used from the **Math1** Keyboard.

Press:
(–) 1 6 × 2 Keyboard ▫▪ 2 ▶ + 1 2 0 EXE.



This expression can also be evaluated using a variable for substitution. A command in the form *expression* | *variable* = *value* means evaluate the expression with the given value(s) substituted for the variable(s).

Press
(–) 1 6 Keyboard Var *t* Math1 ▫▪ 2 ▶ + 1 2 0 Math3 | Var *t* = 2 EXE.

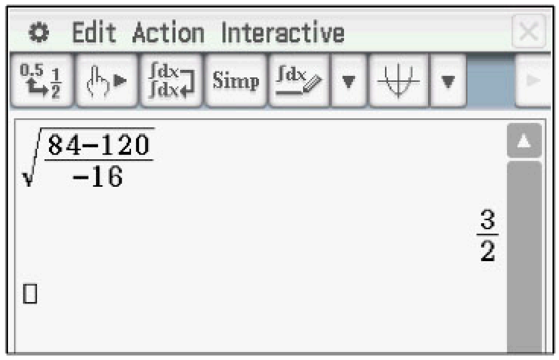


Main Menu

2. Compute the time when the height of the ball is 84 feet.

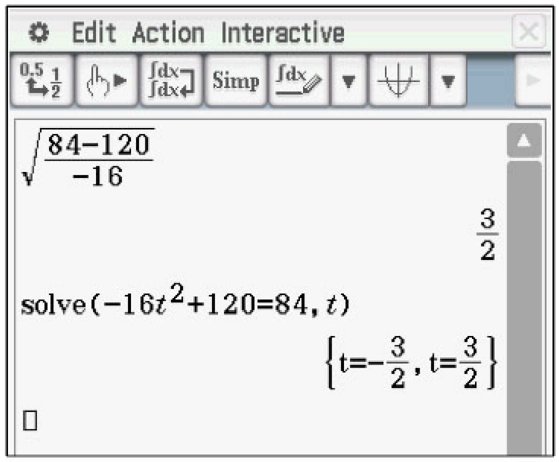
The value can be computed using the square root and fraction templates from **Math1**.

Tap
[Keyboard] [√■] [fraction] [8] [4] [−]
[1] [2] [0] ▼ [(−)] [1] [6] [EXE].



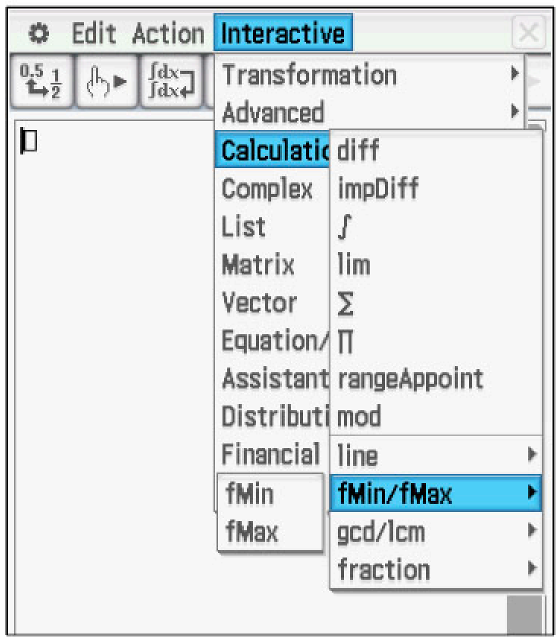
The value can also be computed using a **solve** command from **Math1**. The format is (*equation,variable*) even if there is only one variable in the equation.

Tap
[Math1] [solve(] [(−)] [1] [6] [Var] [Math1] [□■] [2]
▶ [+] [1] [2] [0] [=] [8] [4] [,] [Var]
[t] [)] [EXE] [•]

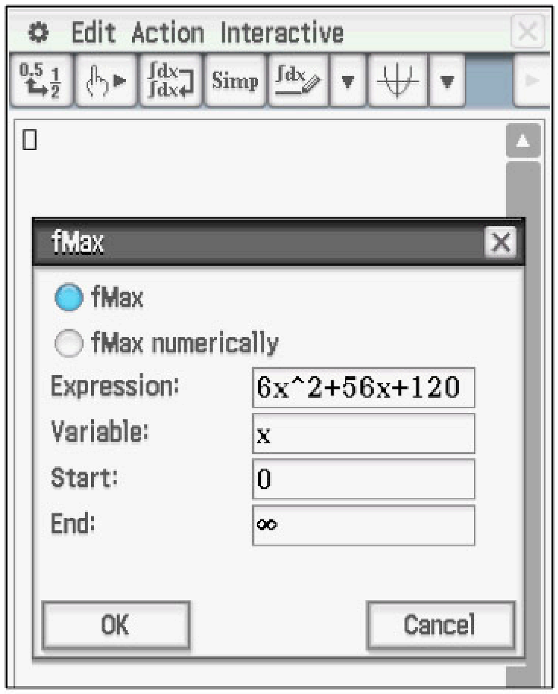


3. A ball is tossed upwards with an initial velocity of 56 feet/second, from an initial height of 120 feet. Compute the time and the height when the ball is at a maximum height.

Commands such as **fMax** are found under the **Interactive** and the **Action** menus. The **Interactive** commands open a dialogue box which gives prompts for the input. The **fMax** command uses *x* as the default variable, but another variable such as *t* can be used.

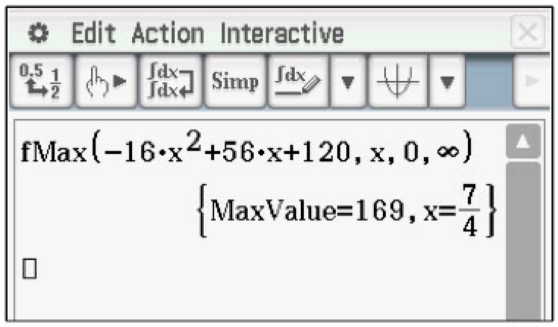


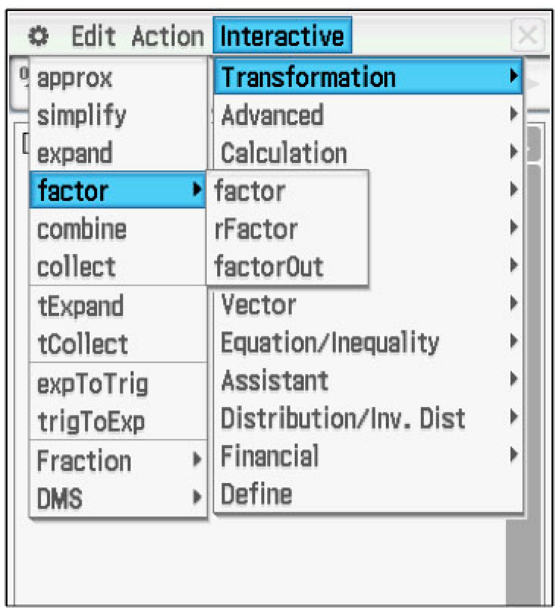
Tap **Interactive, Calculation, fMin/fMax, fMax** and complete the inputs as shown. (Part of the first coefficient, -16, has scrolled off the screen.)
Then tap **OK**.



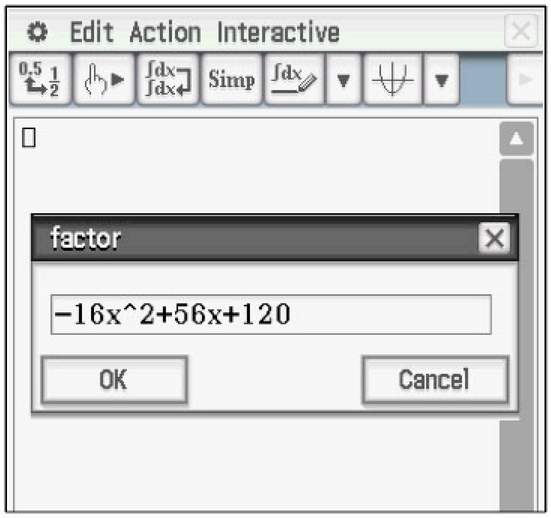
4. Rewrite the expression from Question 3 in factored form.

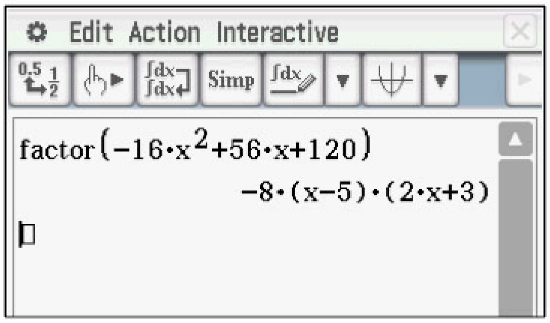
Tap **Interactive, Transformation, factor, factor.**





Enter the expression in the box. Then tap **OK.**

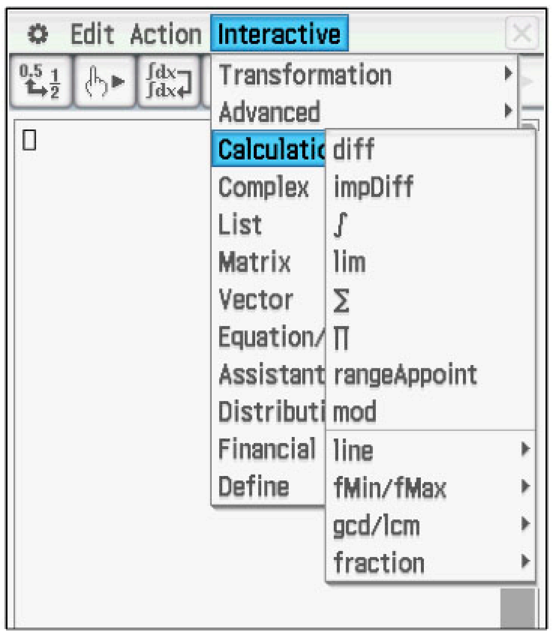




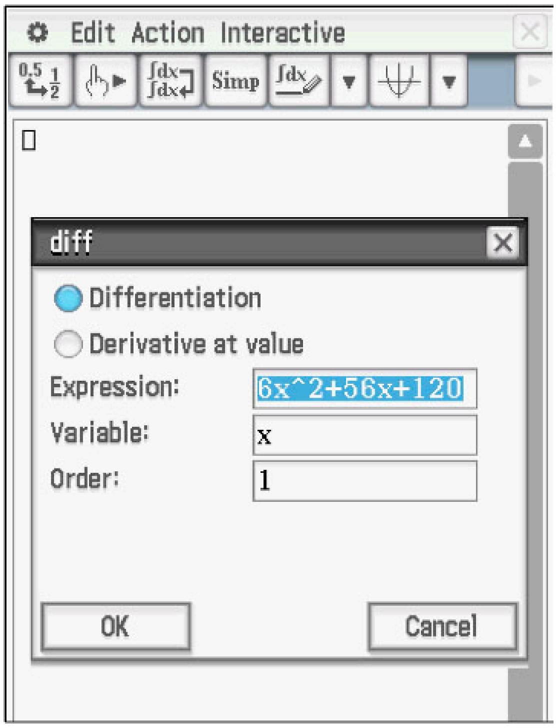
5. This model expresses height, or position, as a function of time. Construct a model for velocity as a function of time.

The velocity would be the derivative of the position function.

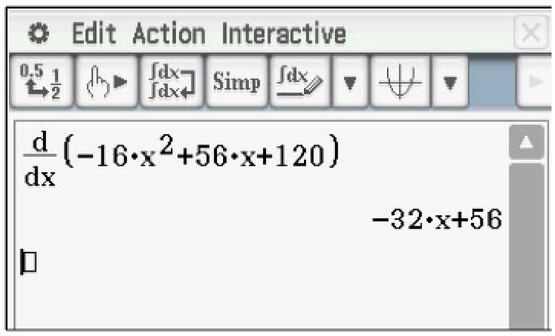
Tap **Interactive, Calculation, diff.**



Enter the expression in the box. (Again, part of the first coefficient, -16, has scrolled off the screen.) Then tap **OK**.

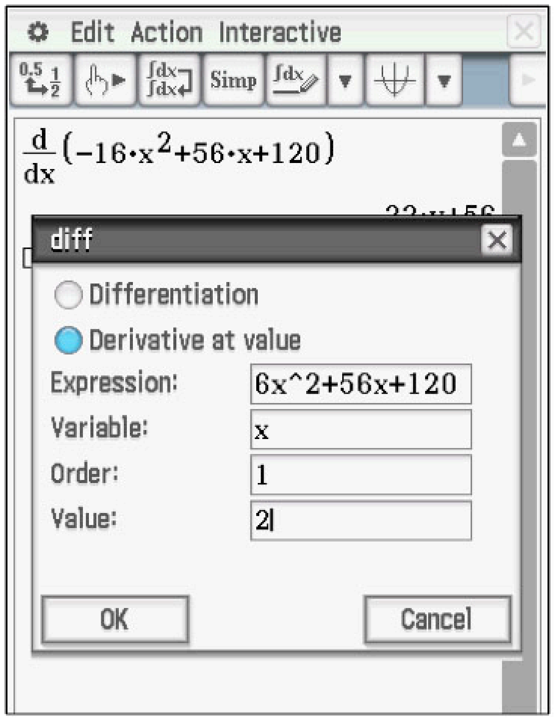


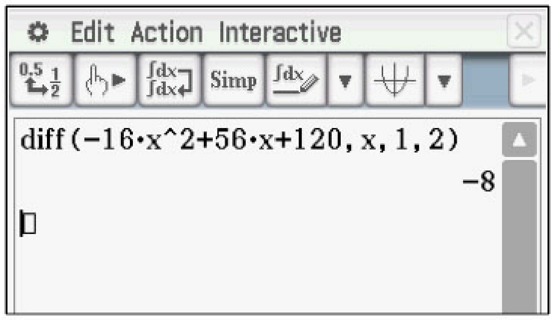
Alternately, the template for a derivative from **Math2** can be used; the result will look the same.



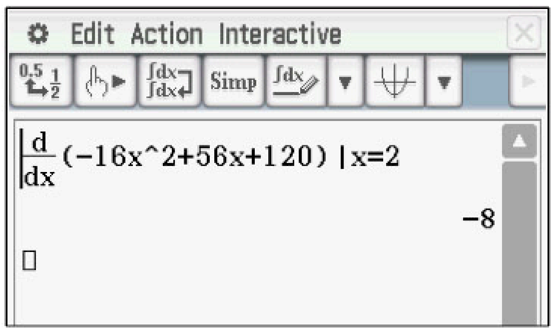
6. Compute the instantaneous velocity at time 2 seconds.

The only difference is to tap the bullet for **Derivative at value**, and to enter the value in the last box.

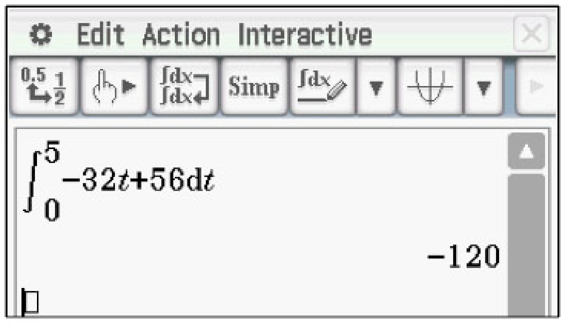




For a more intuitive display, use the derivative template from **Math2** and the “with” (|) command on **Math3**.



7. Compute the total net distance that the ball travels.



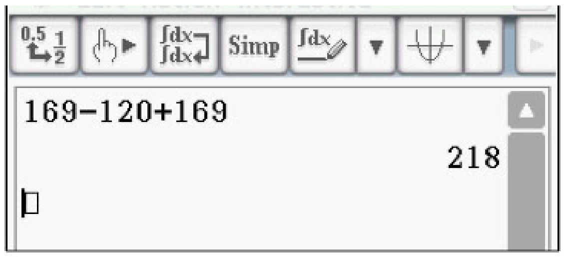
The ball had an initial height of 120 and fell to height of 0, so the net distance should be -120.

For a calculus connection, integrate the velocity function.

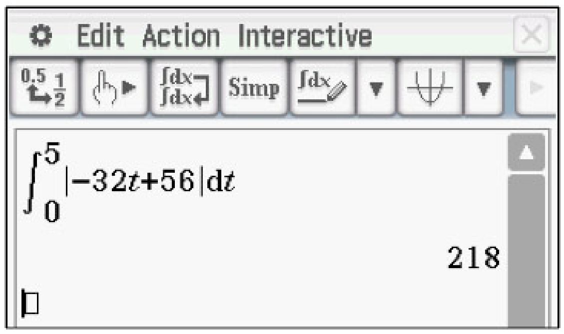
Tap
[Keyboard] [Math2] [∫▭].

Enter the integrand, the variable, and the limits. The variable t can be found at [Math2], then tap [EXE].

8. Compute the total distance that the ball travels.



The initial height and the maximum height are known, so the total distance can be easily computed.



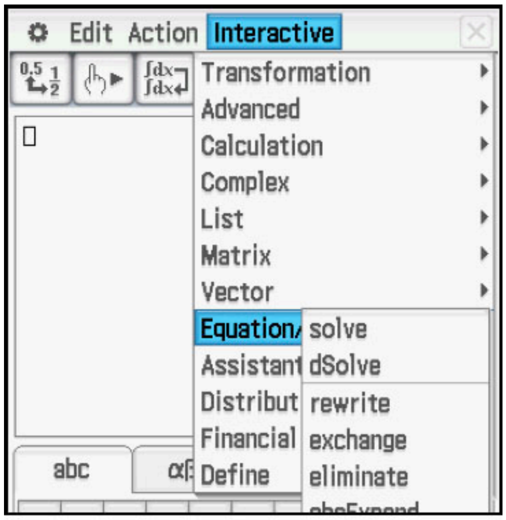
For another calculus connection, another integral can be used. The traditional approach is to use two integrals, but it is quicker to use the absolute value template. The template is also in [Math2].

Main Menu

The ClassPad has a symbolic algebra system, sometimes called a computer algebra system, or CAS. An important distinction is a calculator using symbolic algebra can manipulate undeclared variables. The factoring example from Question 4 was an illustration. It is usually a good idea to tap **Edit**, then **Clear All Variables** to ensure that the variables do not have a value stored in memory. The next 2 questions illustrate additional symbolic algebra.

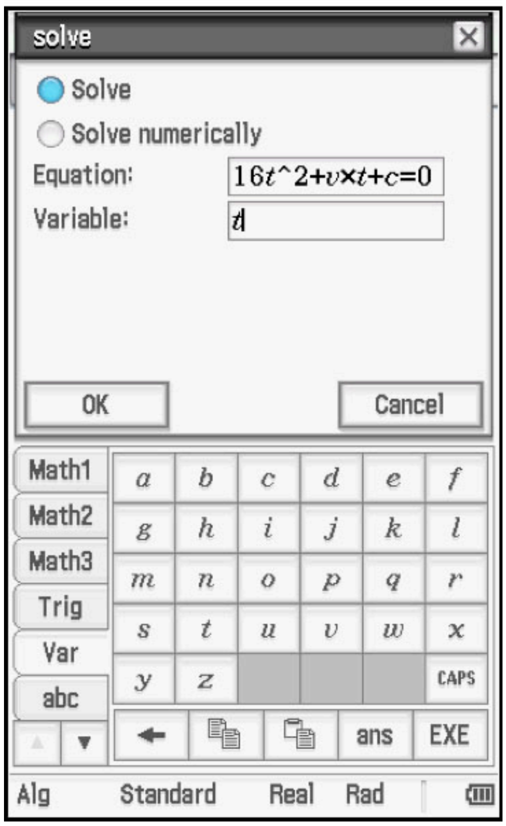
9. If a model for the height of a ball thrown upwards as a function of time is given by $h = -16t^2 + vt + c$, compute an expression for the time when the ball hits the ground.

Tap **Interactive, Equation, solve.**

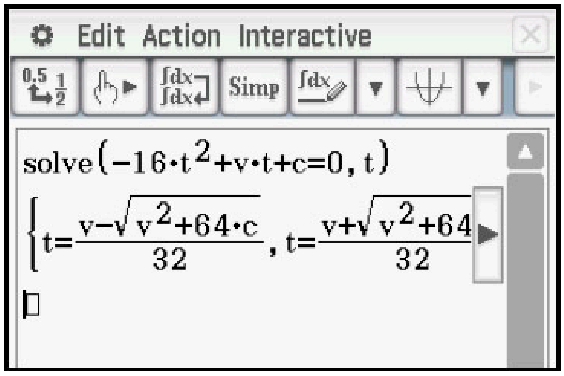


Enter the equation in the box by pressing Keyboard and tap abc to view the variables. The negative sign is to the left of 16 and has scrolled off.

Enter the variable in the second box and tap EXE, or press the EXE key; then tap **OK**.

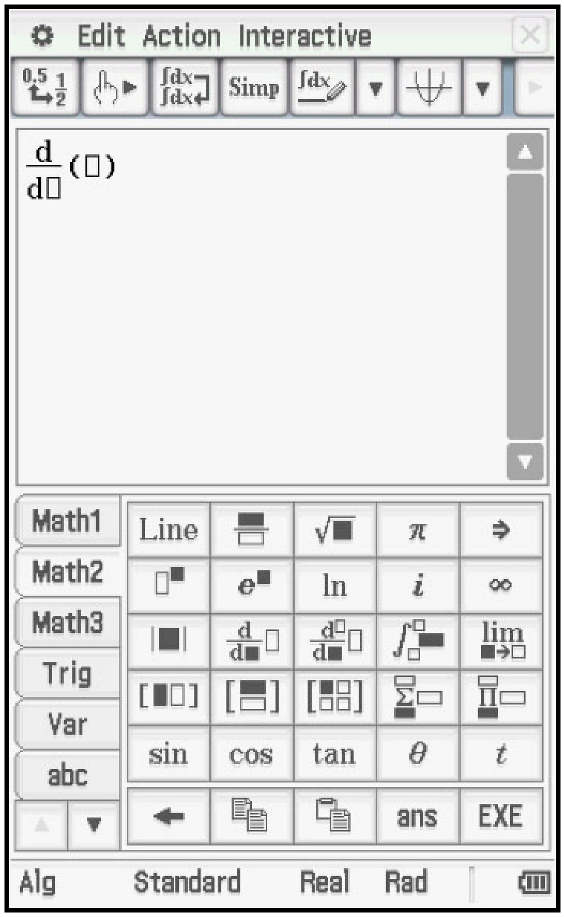


Both solutions are shown; the first solution would be negative and is not in the domain.

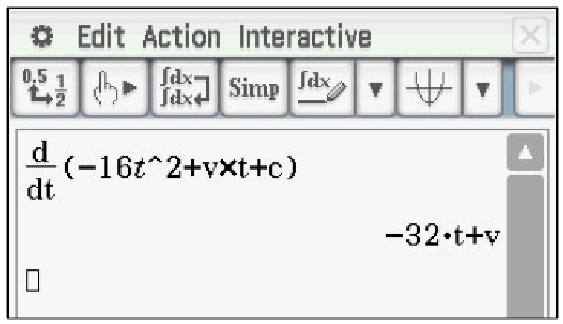


10. If a model for the height of a ball, thrown upwards, as a function of time, is given by $h = -16t^2 + vt + c$, compute an expression for velocity as a function of time.

Press
Keyboard and tap Math2 $\frac{d}{d\square}\square$.



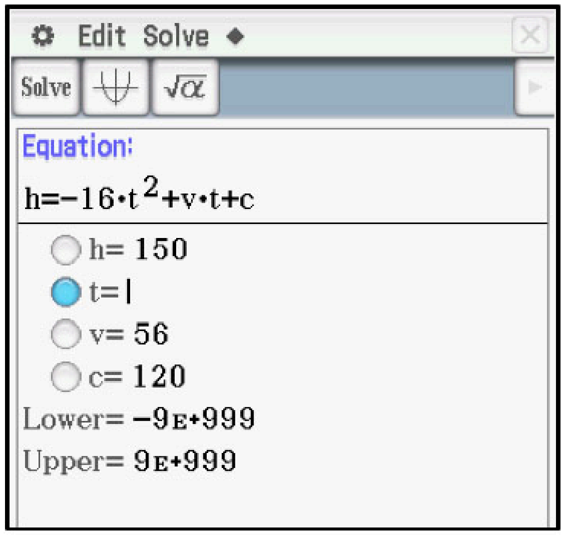
Enter the expression and the variable and tap EXE, or press the EXE key.



Numerical Solve Menu

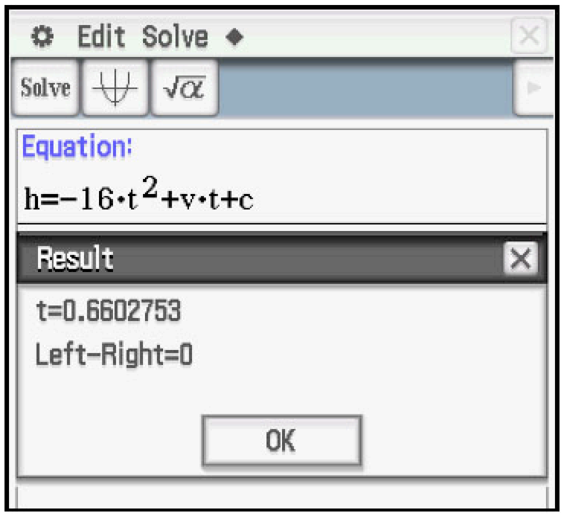
To use the Numerical Solve menu, tap the icon, enter the equation in the box, then enter values for the variables. Tap the bullet for the unknown variable and tap 1.

1. If a ball is tossed upwards with an initial velocity of 56 ft/sec, from an initial height of 120 feet, compute the times when the ball is at height 150 feet.

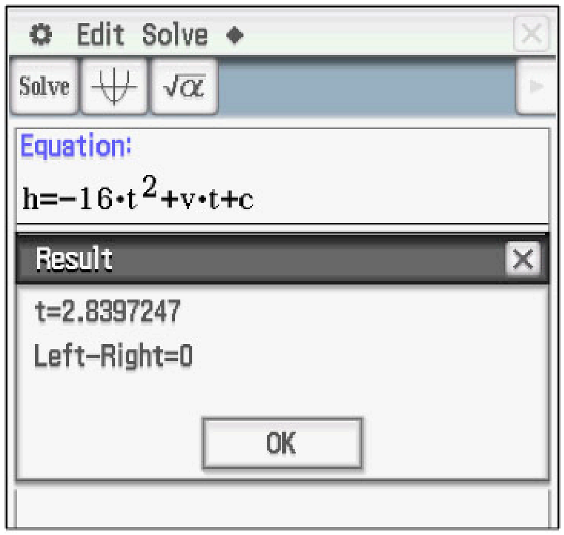


Enter the equation. Note that a times symbol is needed between v and t to distinguish the product from a single variable named vt.

Enter the values of 150, 56, and 120, select the bullet for t and tap Solve.

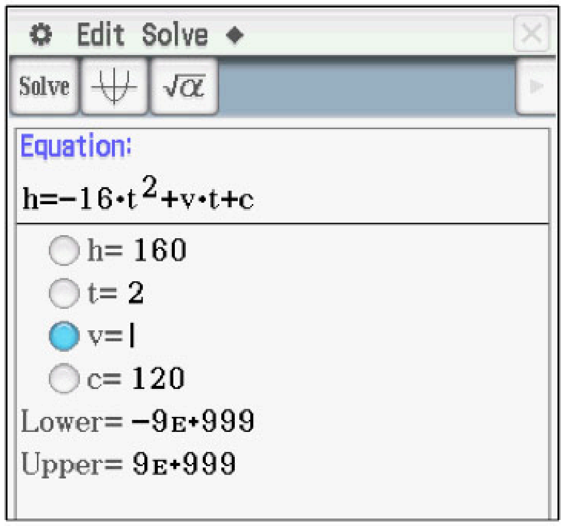


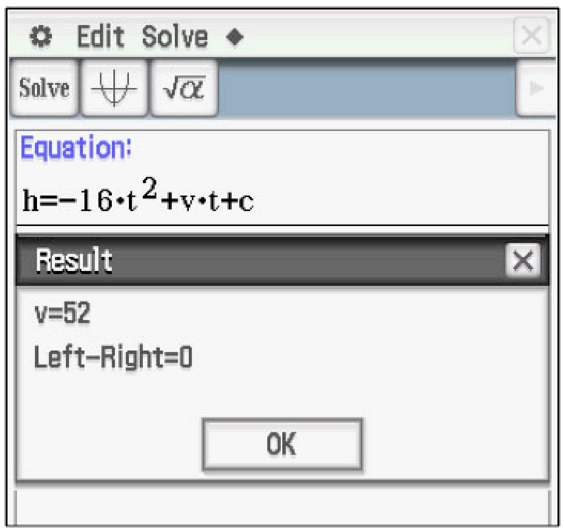
To compute the second value for t, enter an initial estimate, say 4, for t and tap [Solve].



2. If a ball is tossed upwards from an initial height of 120 feet, and has height of 160 feet after 2 seconds, compute the initial velocity.

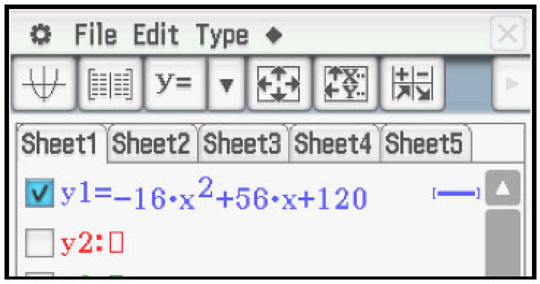
Enter the values of 160, 2, and 120, select the bullet for v and tap [Solve].





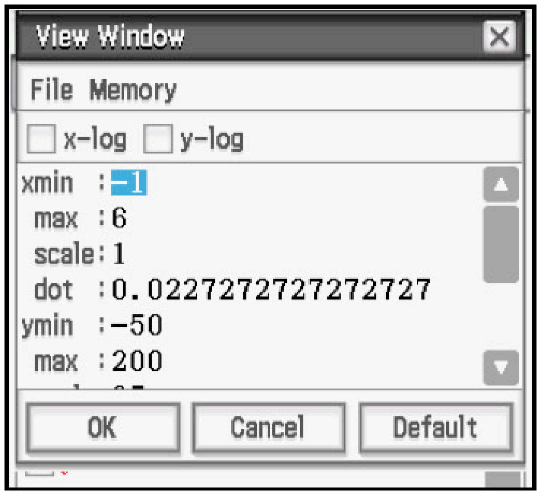
Graph & Table Menu

1. If a ball is tossed upwards with an initial velocity of 56 ft/sec from an initial height of 120 feet, graph the height of the ball, as a function of time.

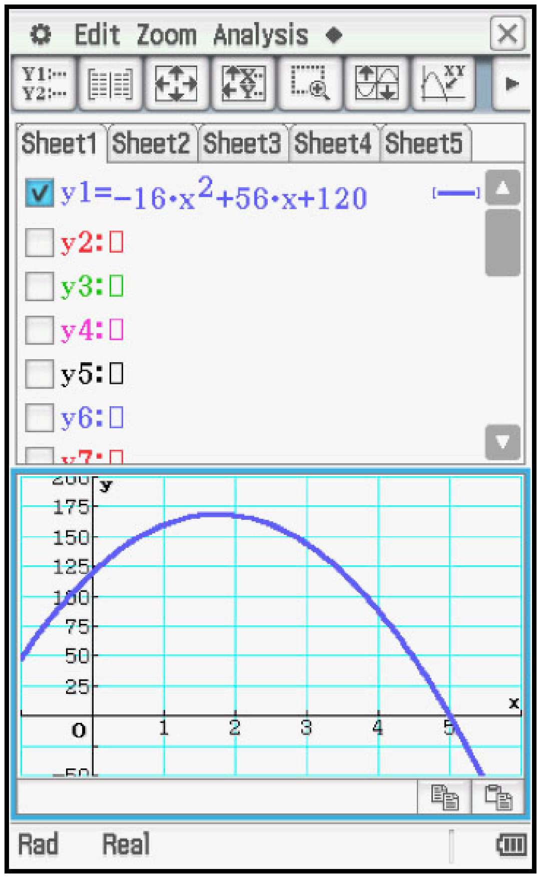


From the Menu, select the Graph & Table icon.

Enter the function as y1.



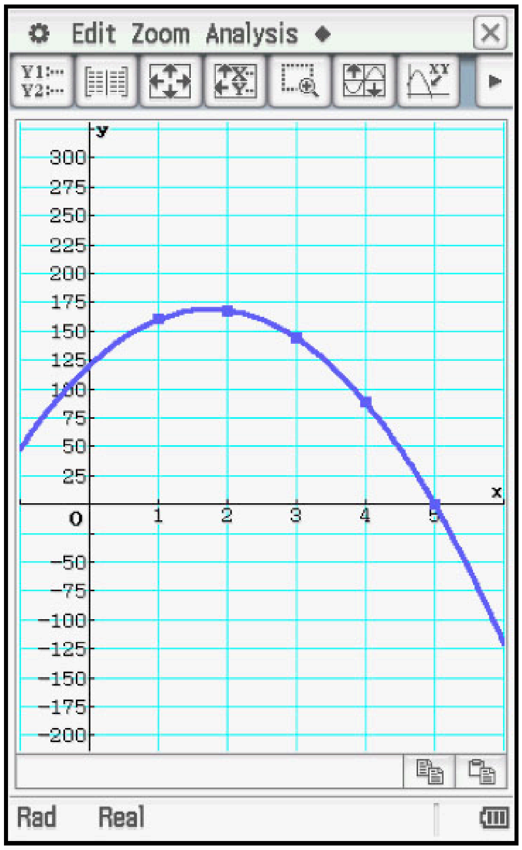
To set a window tap, enter the values and tap **OK**.



Tap to graph.

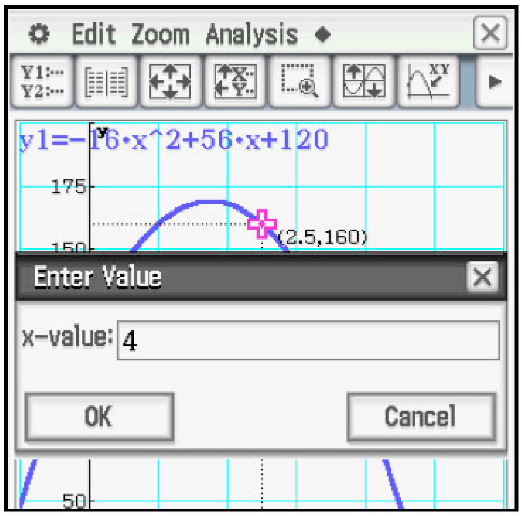
Graph & Table Menu

Tap to plot the graph in a full screen. To adjust the window, use to scroll in any of the four directions, to zoom in, and to zoom out.

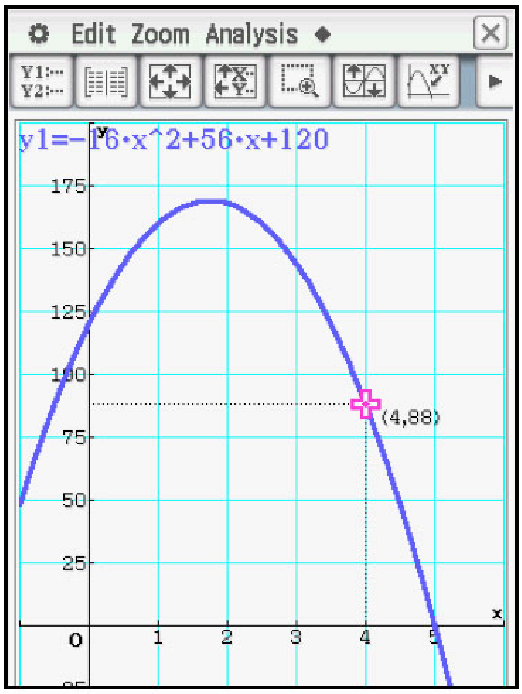


2. Compute the height of the ball at time 4 seconds.

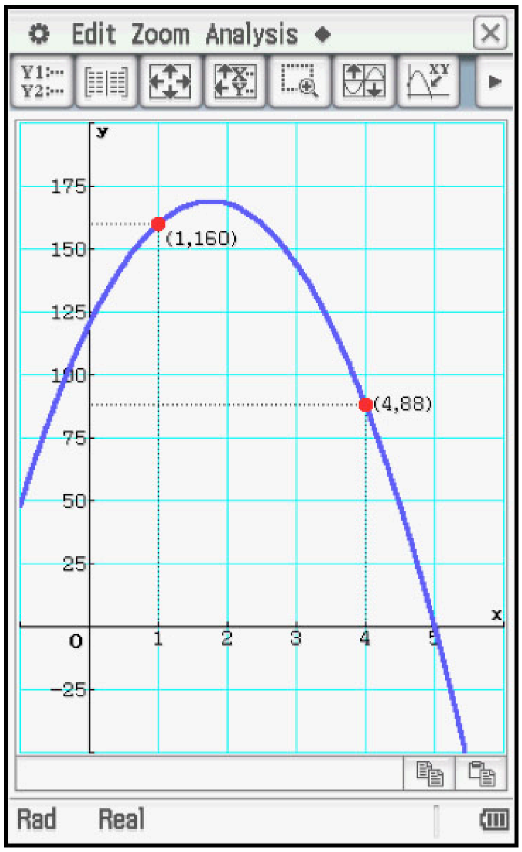
To trace, tap . To find a specific value, press any one of the number keys; this will open a dialogue box. Then tap **OK**.



Graph & Table Menu

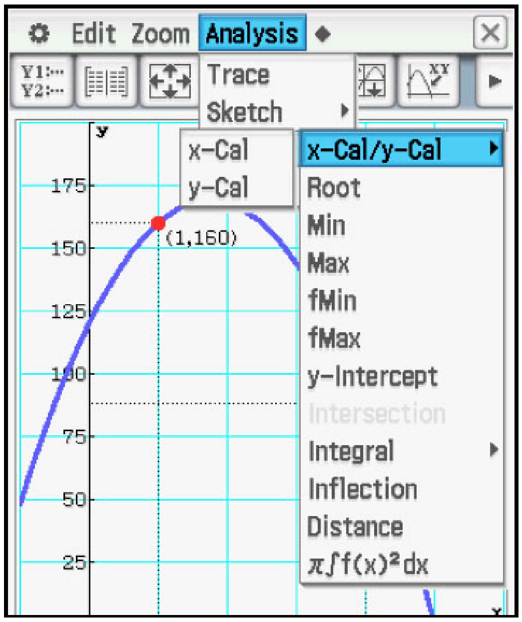


Press **EXE** to mark the point and keep the coordinates on the display.

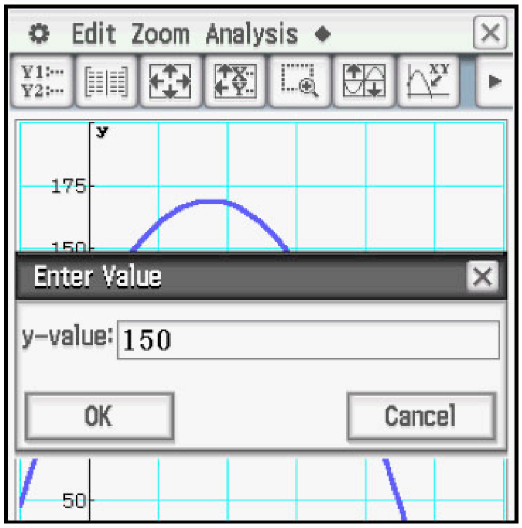


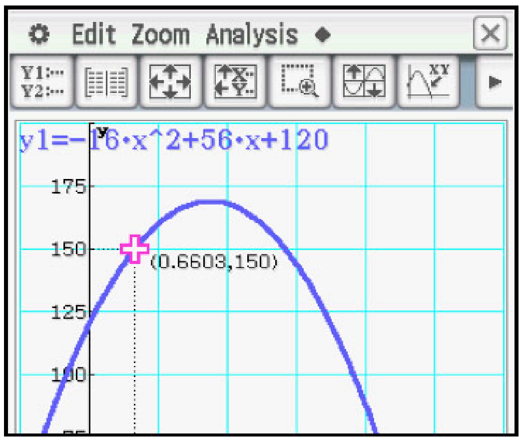
3. Compute the times when the ball is at height 150 feet.

Tap **Analysis, G-Solve, x-Cal/y-Cal, x-Cal**.



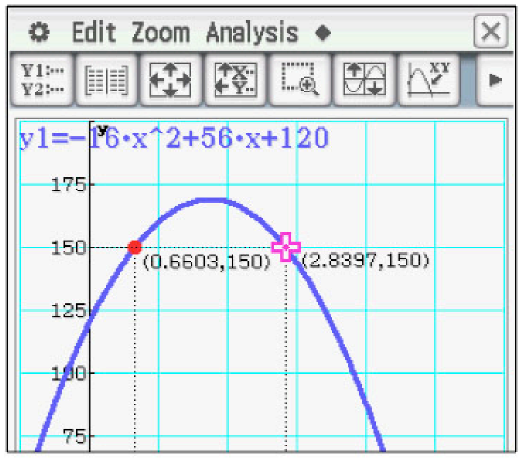
Enter the value for *y* and tap **OK**.





Press EXE to mark the point and keep the coordinates on the display.

Press ▶ to move to the second point.



4. Compute the time when the ball hits the ground.

To compute an x-intercept, tap the ▶ icon at the top of the screen, then tap Y=0.

Graph & Table Menu

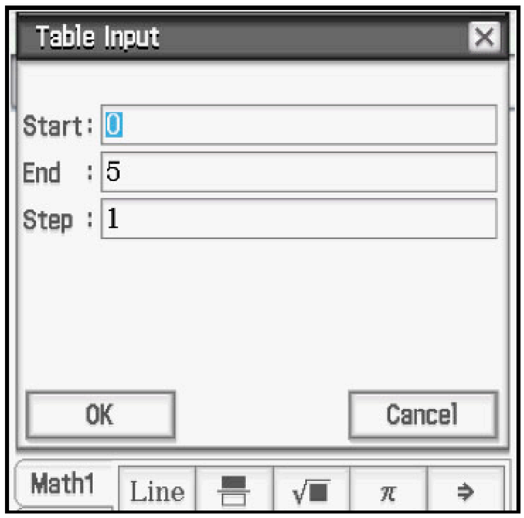
5. Compute the coordinates of the maximum point.

For a maximum point, tap the ▶ icon at the top of the screen, then tap MAX.

6. Construct a table of values for times {0, 1, 2, 3, 4, 5}.

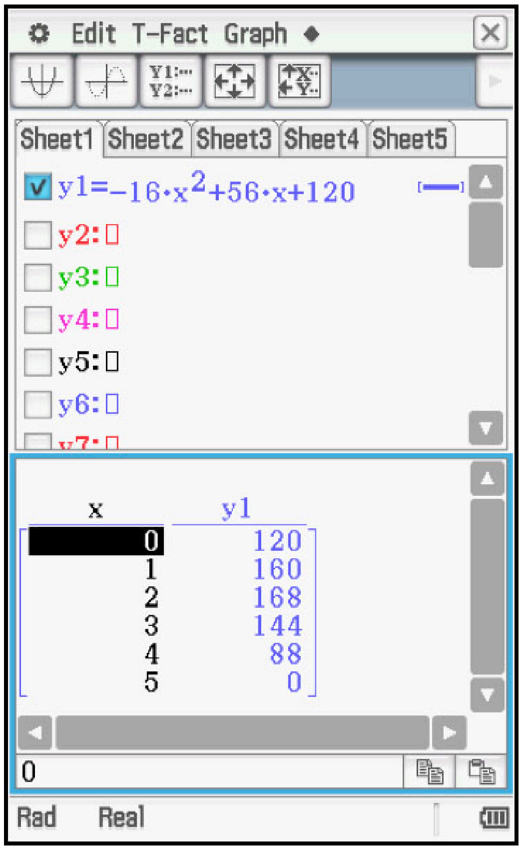
To set the table, tap the table-input icon.

Enter the values and tap **OK**.



Graph & Table Menu

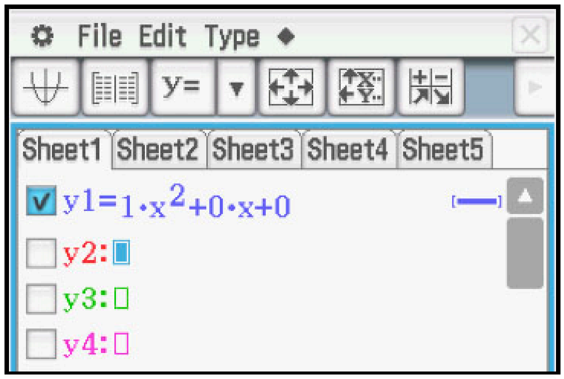
To view the table, tap .



Graph & Table Menu

These examples have used the coefficient of -16 for the t^2 term. The value of that coefficient could be different, based on conditions such as altitude. It would also be different on the moon or another planet, and of course, if different units for distance and/or time were used. A more general equation for the model would be $h = -\frac{1}{2}gt^2 + vt + c$. This is an application of the general quadratic $y = ax^2 + bx + c$.

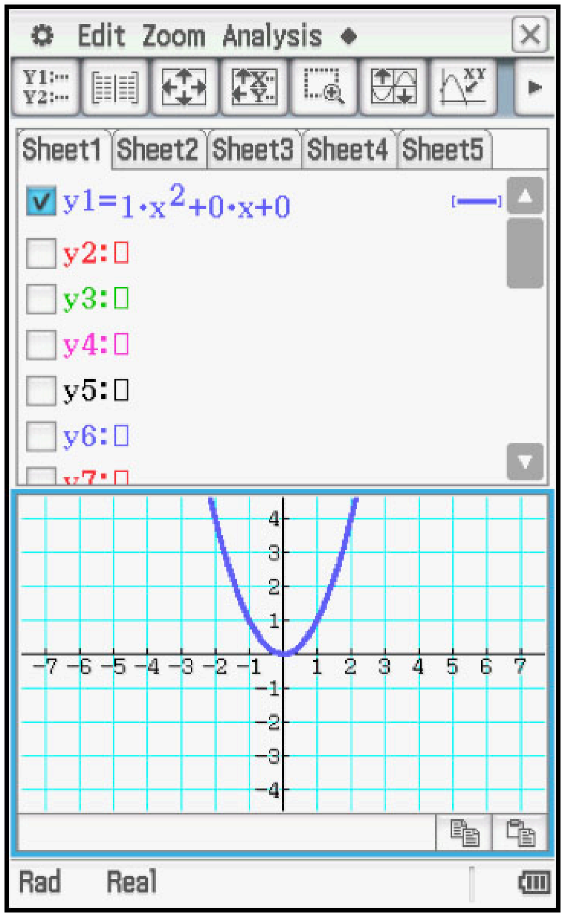
7. Explore the transformations of the graph of the function $y = ax^2 + bx + c$ as the coefficients a, b, c are changed.



Enter the function $y1 = 1x^2 + 0x + 0$. The three coefficients are needed, as explained later.

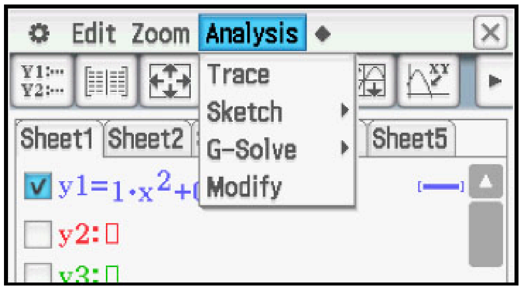
Set the window to **Default**.

Graph the equation.

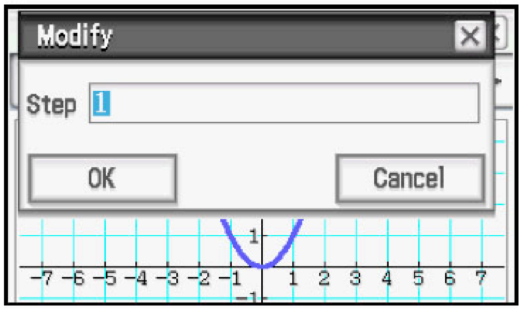


Graph & Table Menu

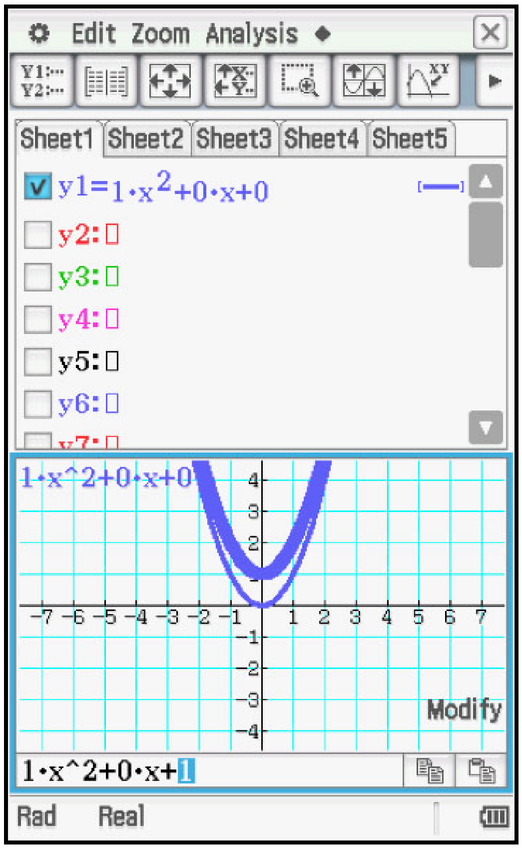
Tap **Analysis, Modify**.



Enter 1 for the **Step** size and tap **OK**.

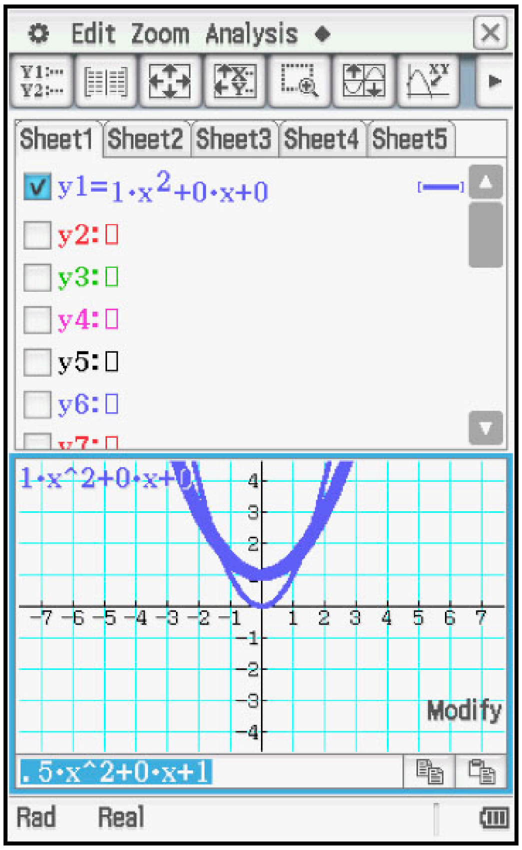


The word **Modify** appears on the graph screen, the graph is thicker, and the function rule appears in a dialogue box at the bottom. To explore the transformations, tap any one of the 3 coefficients and highlight it. Tap on the graph screen. Now use ▶ and ◀ to increase or decrease the coefficient, respectively, and see the graph transform.



Graph & Table Menu

Alternately, to make changes without a step size, tap any one of the 3 coefficients, highlight it, enter a new value and press EXE.



Conic Menu

The Conic Menu will graph conics in an (H, K) form, such as $x = A(y - K)^2 + H$, a standard form such as $x = Ay^2 + By + C$, or the general form, $Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$. The general form includes rotated conics. The easiest way to input the equation for the relation is to insert a form, and edit the coefficients.

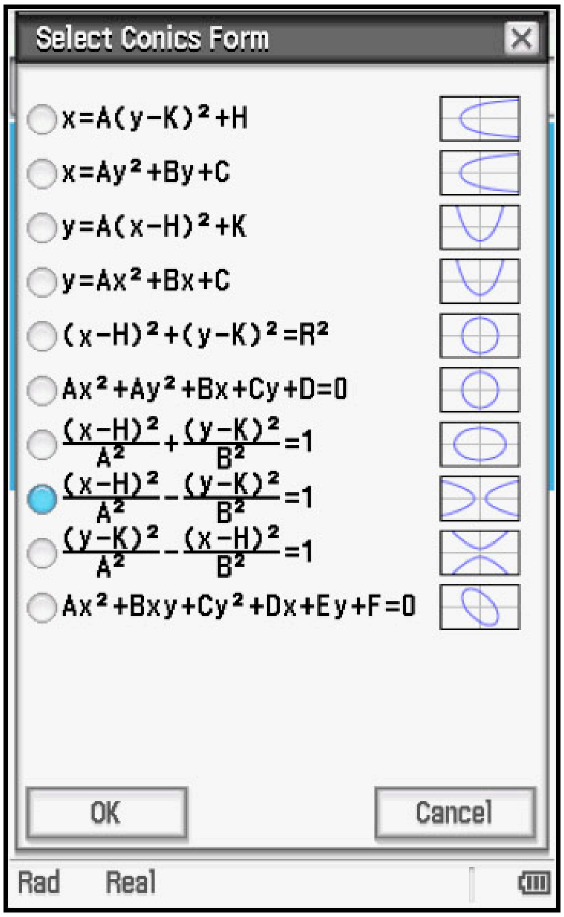
The G-Solve commands will display important features related to conics, such as a center, vertices, foci, and asymptotes.

1. Graph $\dfrac{(x - 2)^2}{6^2} - \dfrac{(y + 1)^2}{8^2} = 1$

Tap Menu, then the Conics icon.

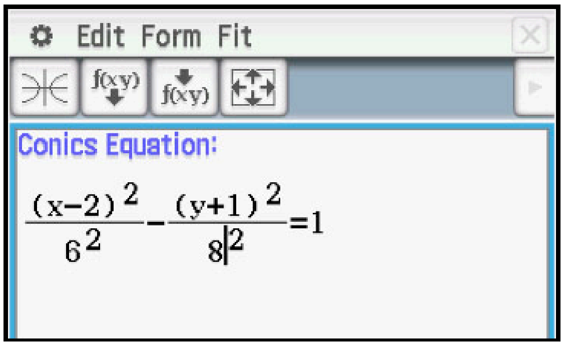
Tap f(x,y).

Select the form for this hyperbola, and tap **OK**.



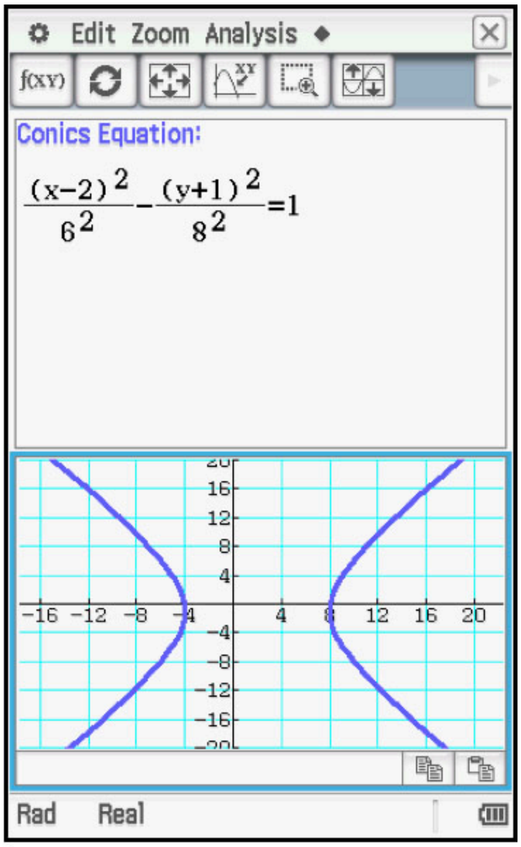
Edit the coefficients **A, B, H**, and **K**. Highlight the letter and press the key for the number. For **K**, also change from subtraction to addition.

Tap the window icon to set the window, or use shortcuts after graphing.



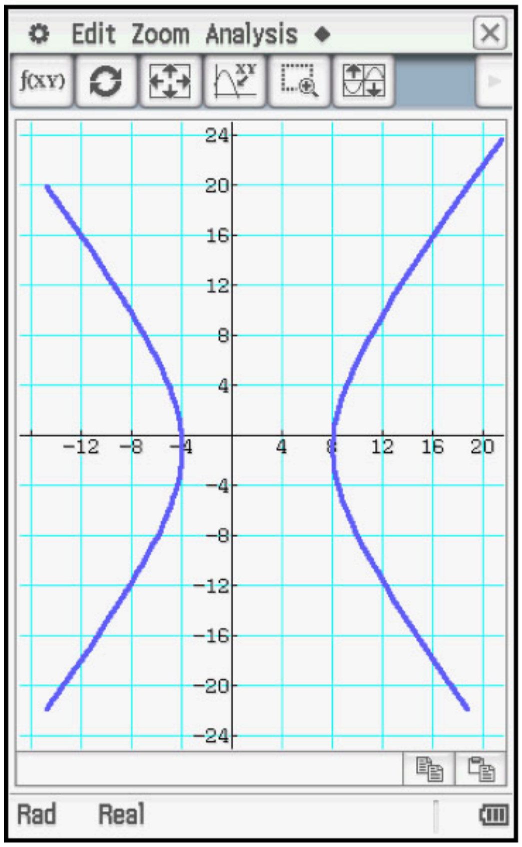
Conic Menu

Tap to graph.



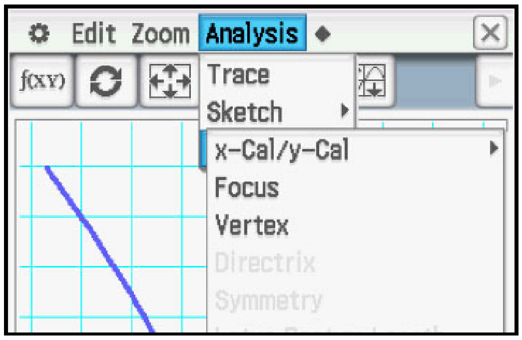
Tap Resize to plot the graph in a full screen. You may wish to adjust the window.

The window can be easily changed by using ▼ ▲ ◀ ▶ to scroll in any of the four directions, + to zoom in, and − to zoom out.



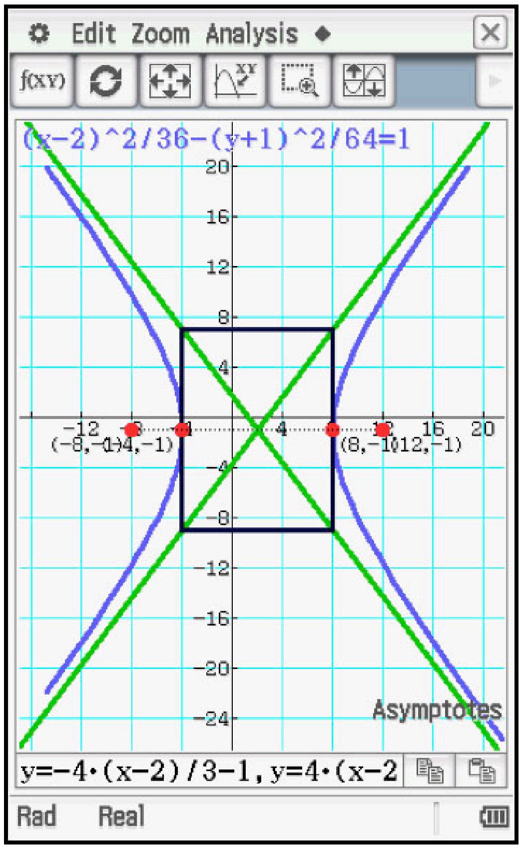
2. Display the vertices, foci, and asymptotes.

For vertices, tap **Analysis, G-Solve, Vertex.**



Press EXE to mark the point and keep the coordinates on the display. Press ◀ to display the other vertex.

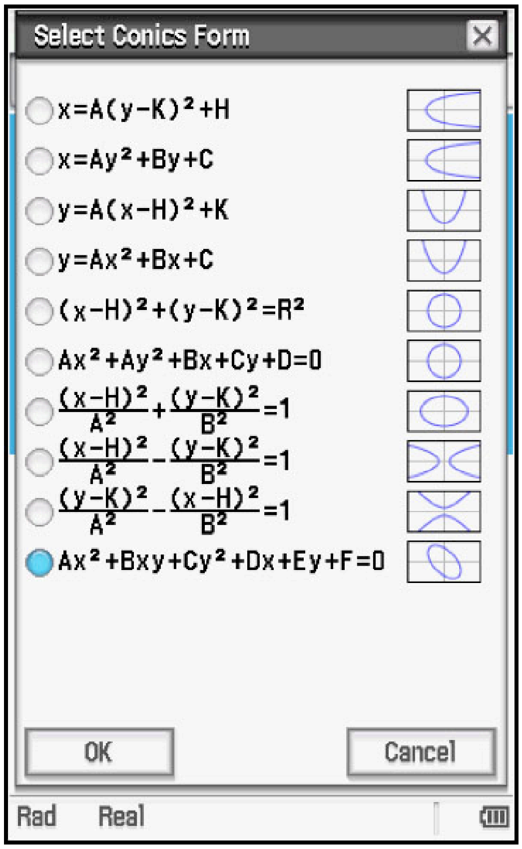
Use **G-Solve** in the same manner for foci and asymptotes.

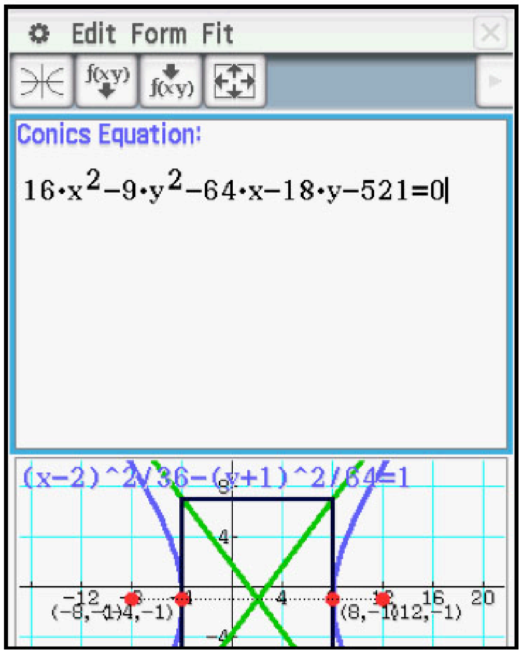


3. Convert the equation to a standard form.

Tap Resize, then tap the equation window.

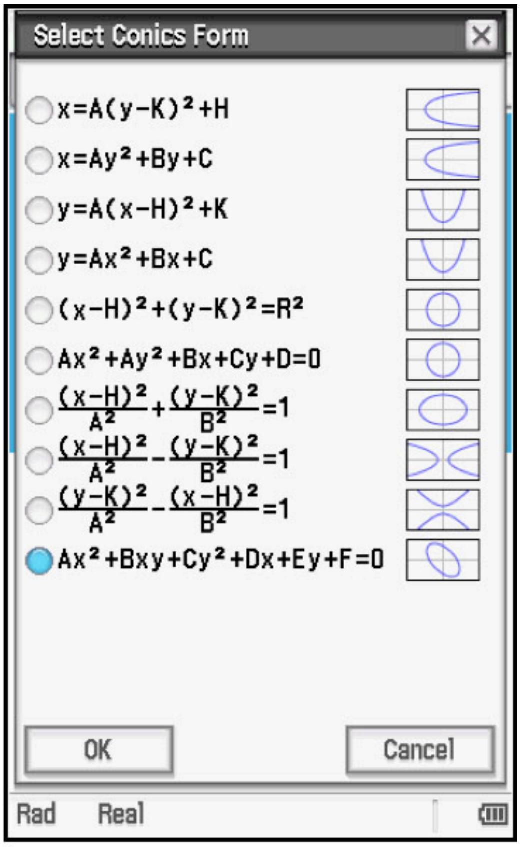
Tap f(xy), then select the bullet for general form, then tap **OK**.





Conic Menu

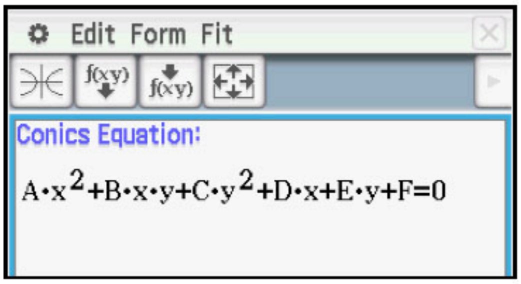
4. Graph the rotated conic
$2x^2 - 3xy + 4y^2 - 5x + 6y - 7 = 0$.

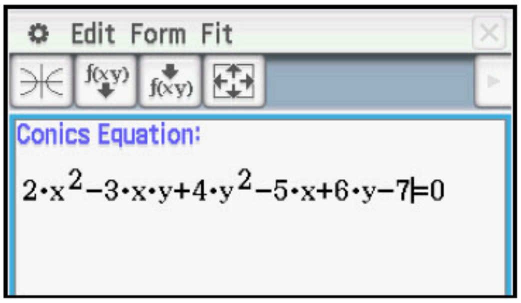


Tap f(x,y).

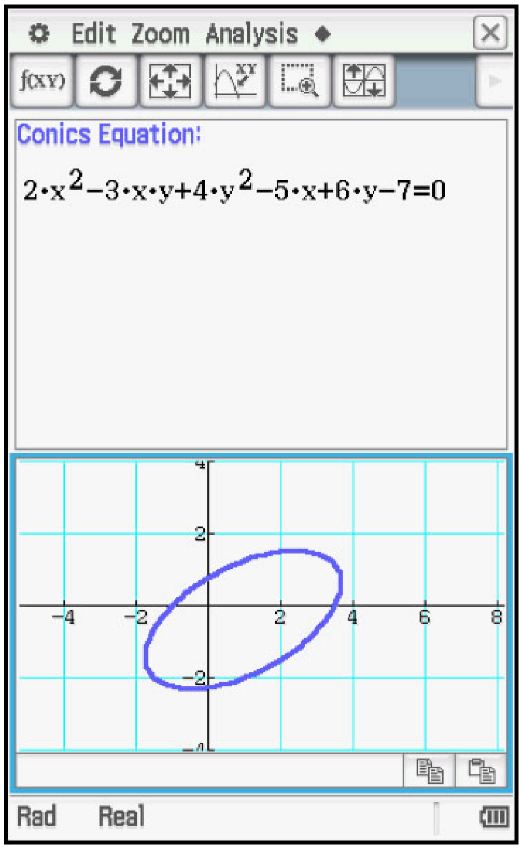
Tap the bullet for general form, then tap **OK**.

Edit the coefficients and the signs. The addition sign and the number can be highlighted together.



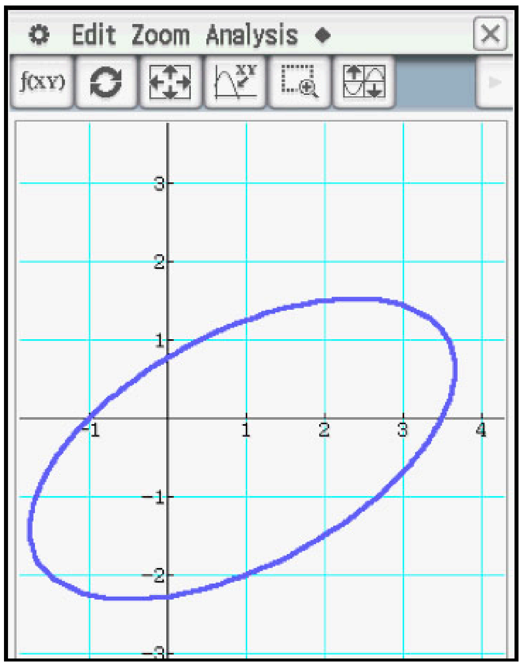


Tap to graph.

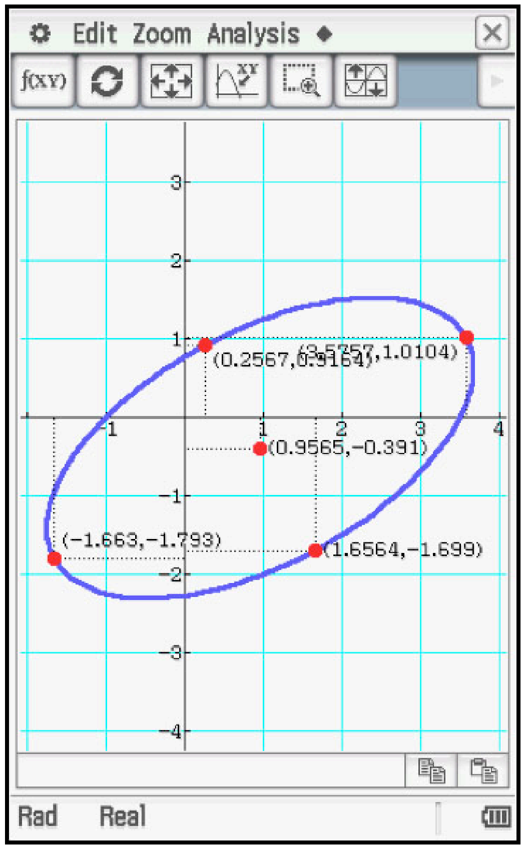


Again, you may tap Resize to plot the graph in a full screen. You may wish to adjust the window.

The window can be easily changed by using ▼ ▲ ◀ ▶ to scroll in any of the four directions, + to zoom in, and − to zoom out.



G-Solve commands may be used on rotated conics.

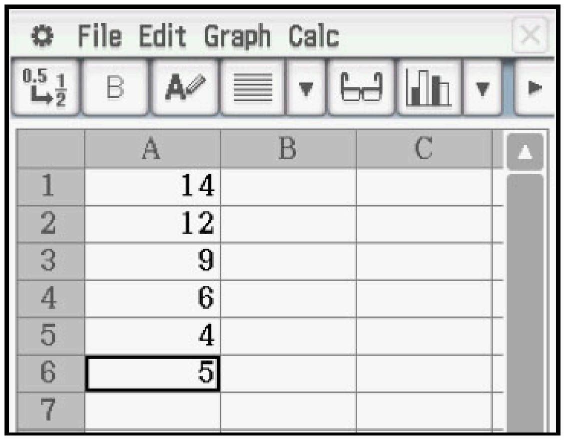


Statistics Menu

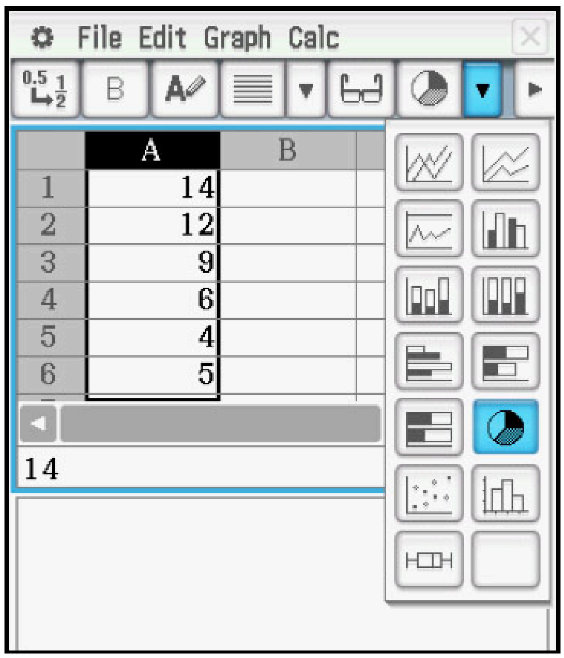
Suppose one of the questions asked on a survey was “What type of pet do you have?”, and the results from 50 people are shown in this table.

Pet Category	Dog	Cat	Fish	Bird	Other	None
Frequency	14	12	9	6	4	5

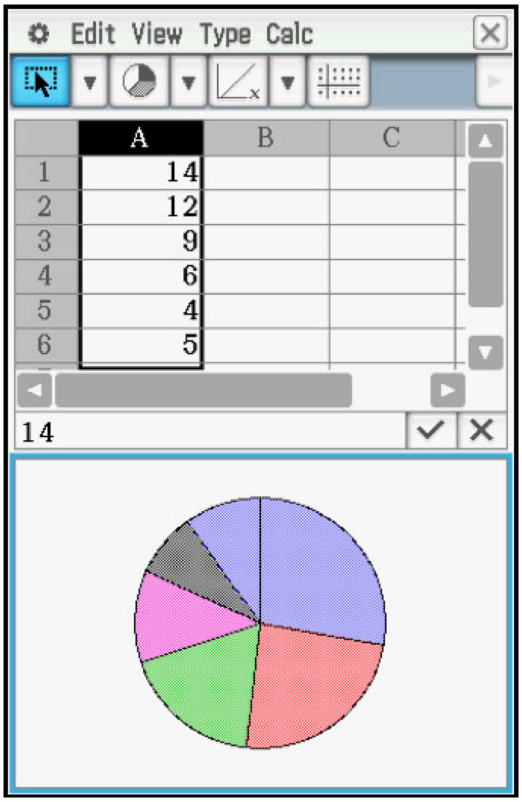
1. Construct a pie chart of these data.



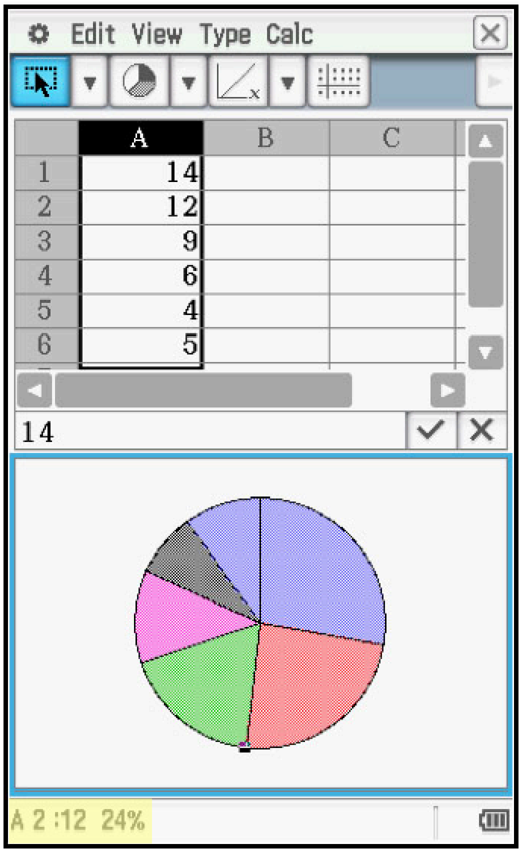
It is easiest to work with categorical data from a spreadsheet. Tap Menu, then the Spreadsheet icon. Enter the frequencies in the first column. Press EXE to move to the next cell.



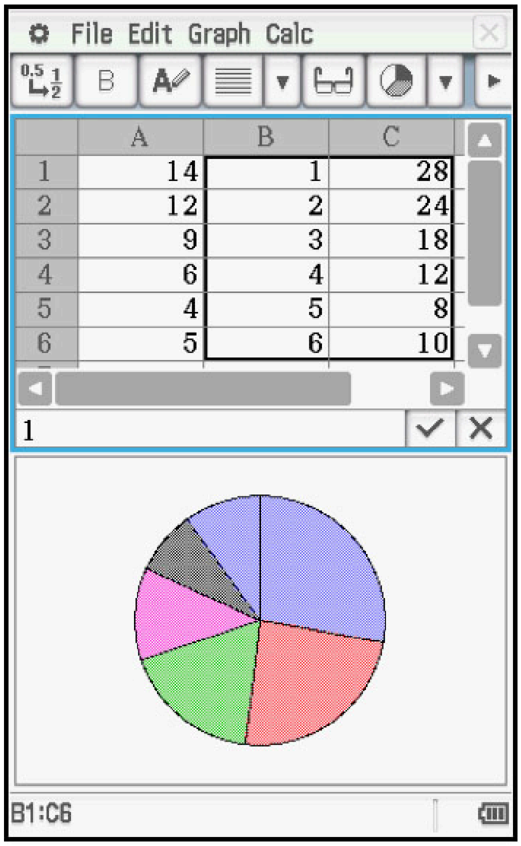
To construct the chart, tap **Column A** so it is selected. If the graph icon is , tap it. Otherwise tap the ▼ near the top-right to open the graph menu and then tap from the drop down list.



Tap any section of the chart to display the frequency.



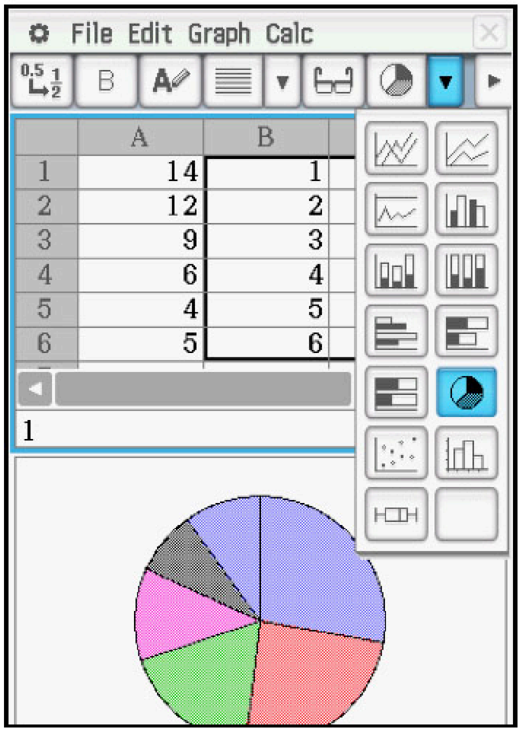
Tap the chart and drag to **Cell B1** to display the relative frequencies, shown as percents. (tap-and-drag is similar to click-and-drag with a mouse.)



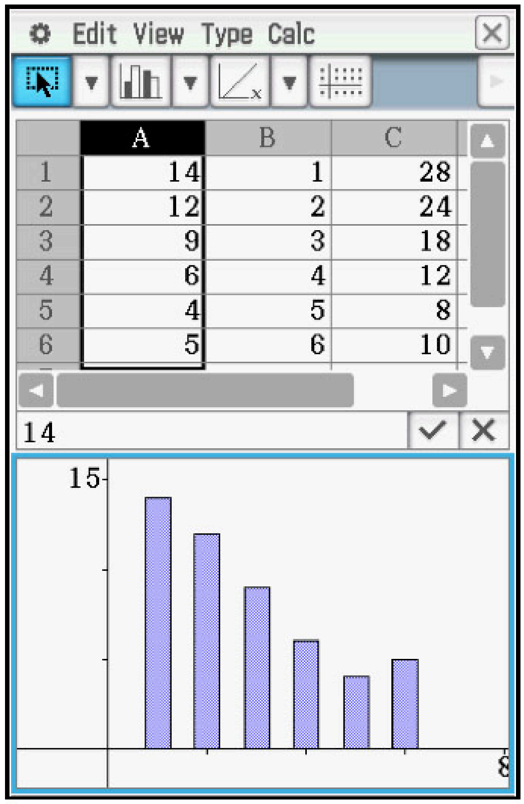
2. Construct a bar chart for these data.

Select **Column A** again. Tap the ▼ near the upper-right corner to access the graph drop down menu.

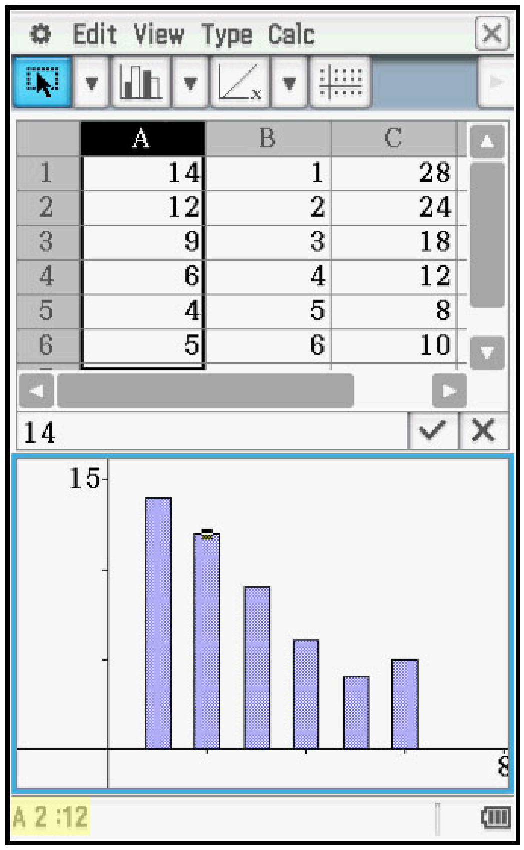
Then tap to construct a bar chart.



The bar graph is displayed.



Tap any bar to display the frequency.



Statistics Menu

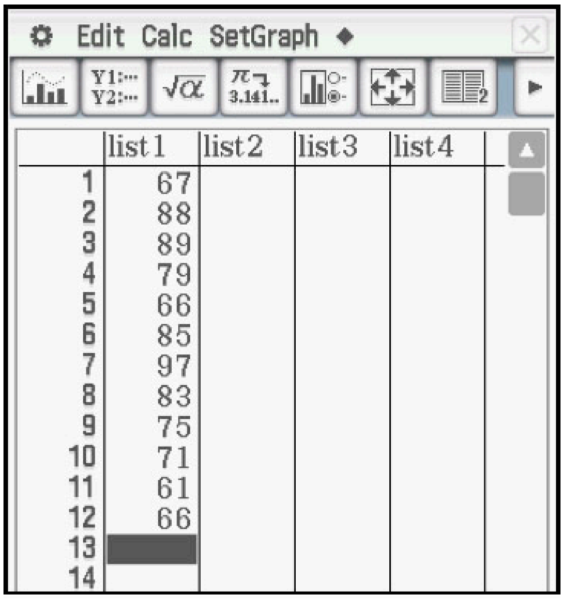
Plots and statistics for quantitative data can be created in either the spreadsheet or statistics menu. The statistics menu will be used for this example.

The number of games won (out of 162) by a certain baseball team for the years 2002 – 2013 are shown in the table.

67	88	89	79	66	85
97	83	75	71	61	66

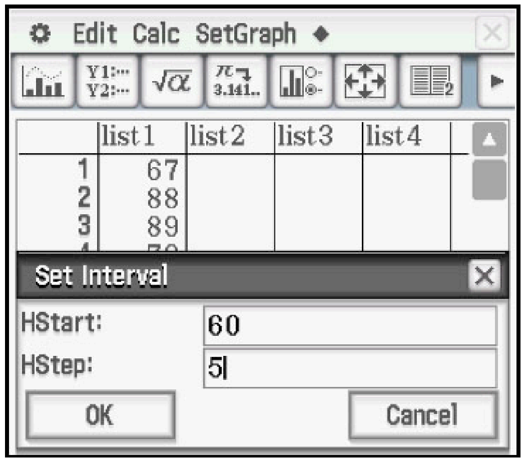
1. Construct a histogram for these data.

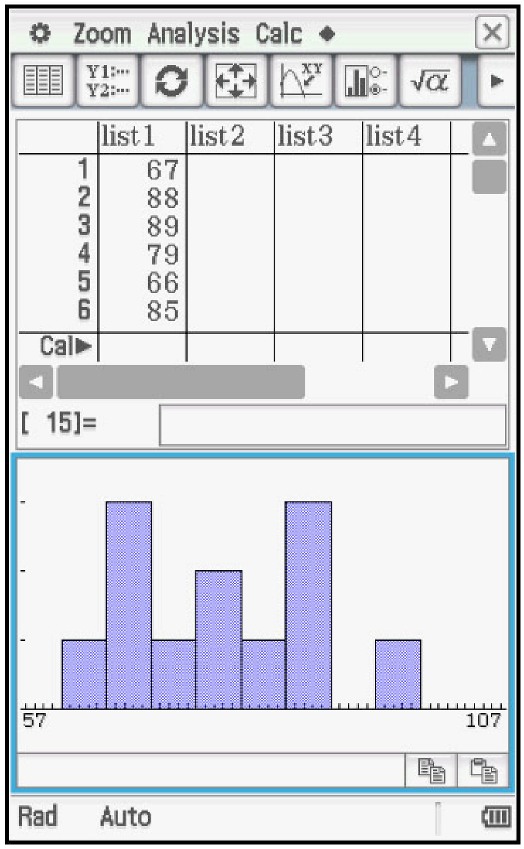
Tap Menu, then the Statistics icon. Enter the frequencies in **list1**. Press EXE to move to the next value.



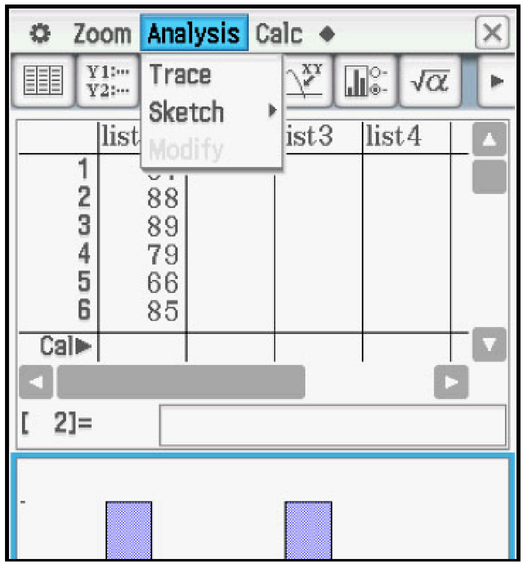
Tap the SetGraph icon to setup the plot. Select **On,** and use the drop down menus to select **Histogram, list1**, and 1 as shown. Then tap **Set**.

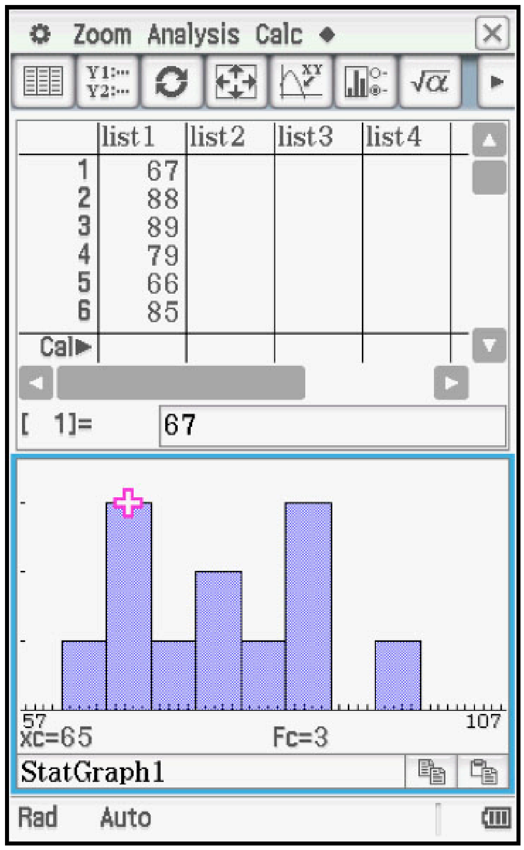
Tap . Enter values for the starting value (**HStart**) and the step (**Hstep**), the width of each bin; then tap **OK**.



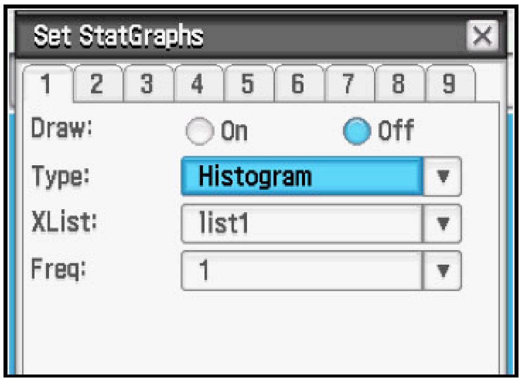


Tap **Analysis, Trace** to display the frequencies, using the directional pad to move through the data values.



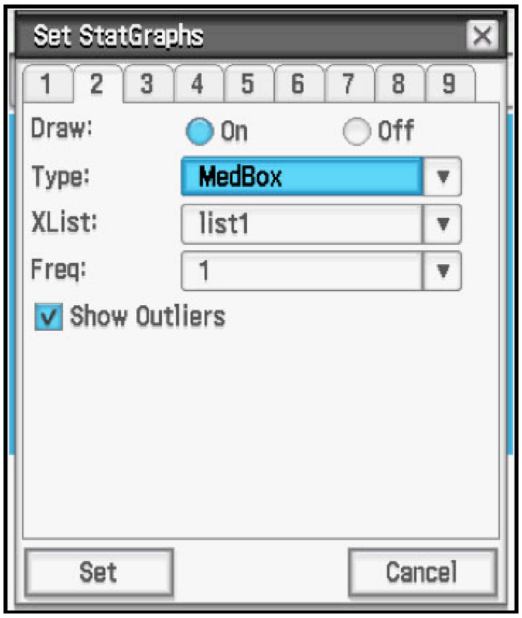


2. Construct a box and whisker plot for these data.



Tap the list editor window.

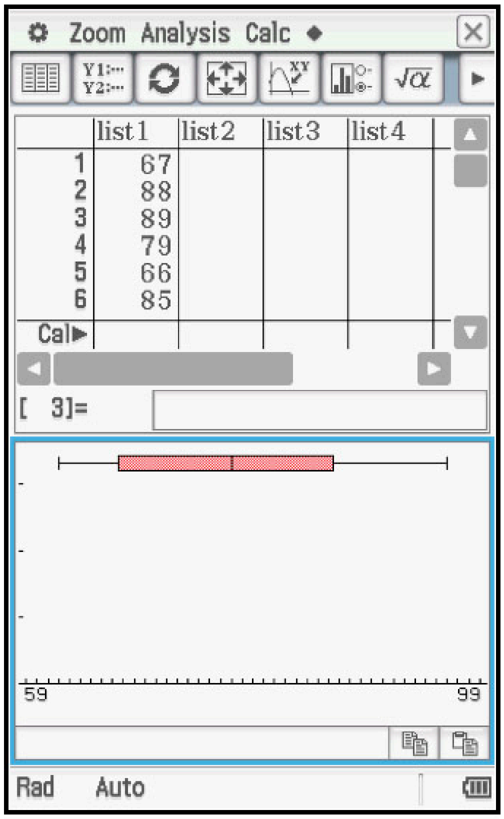
Tap to setup the plot. Tap **Off** for **StatGraph1**, then tap the 2 tab to select **StatGraph2**.



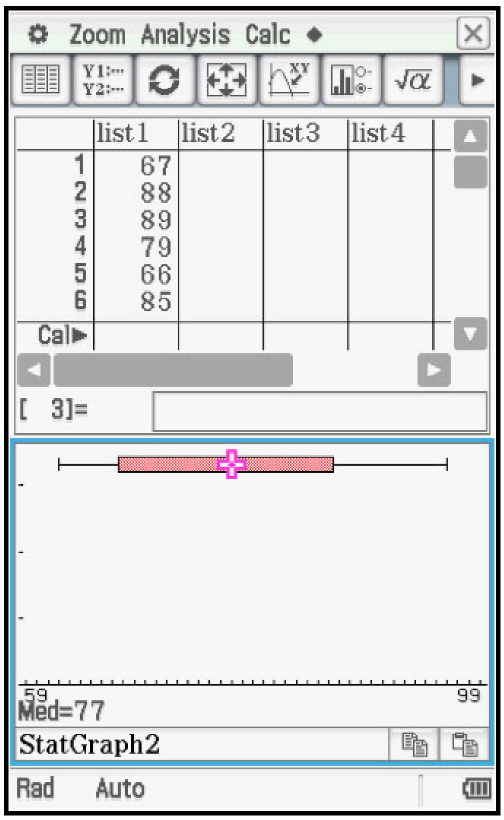
Select **On, Medbox, list1**, and **1** as shown. Tap the box to **Show Outliers** and tap **Set**.

Statistics Menu

Tap to view the box and whisker plot.



Tap **Analysis, Trace** and use the directional pad to view the five number summary.

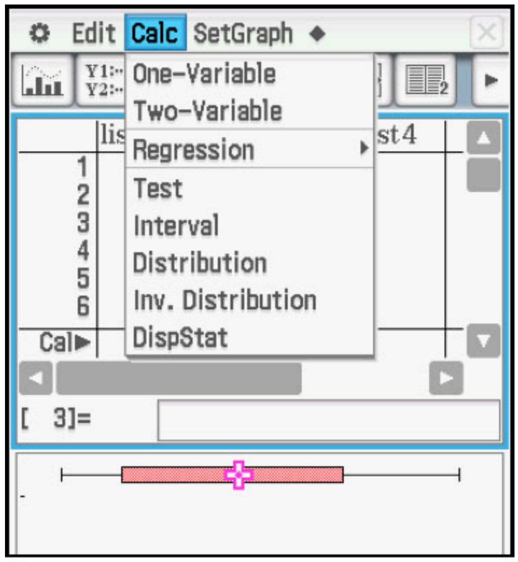


Statistics Menu

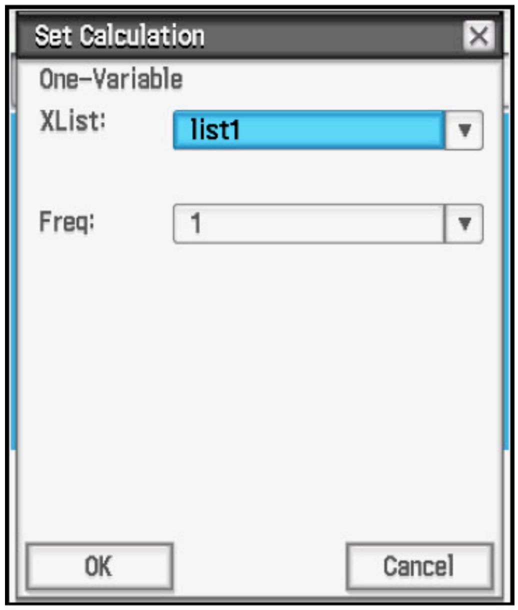
3. Compute summary statistics for these data.

When the list editor window is selected (note the bold border) the **Calc** command is the second command. When the plot window is selected, the Calc command is the third command.

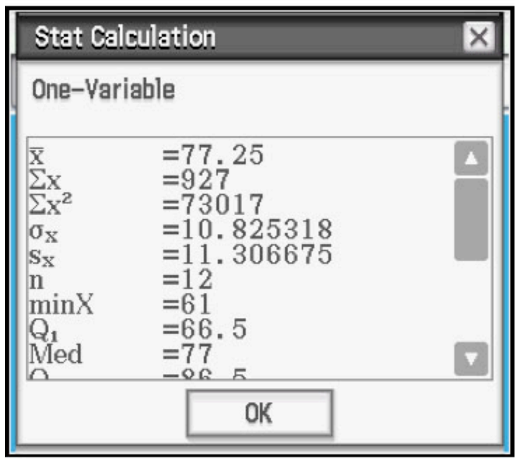
In either case, tap **Calc, One-Variable.**



Select **list1** and **1**, then tap **OK**.



One variable statistics are displayed; use the scroll bar to see additional information.



Notes

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http://edu.casio.com/

Worldwide education website for teachers and students