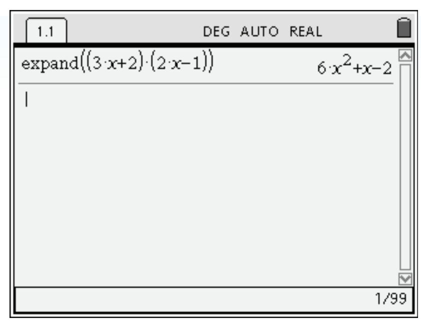
A P P E N D I X

TI-*Nspire* CAS *calculator*

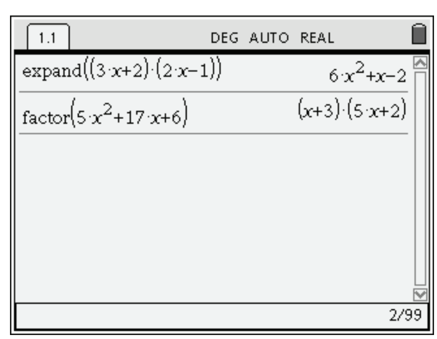
Using technology to expand and factorise

CAS calculators have the added advantage of performing algebraic tasks.

Example: Expand $(3x + 2)(2x - 1)$.

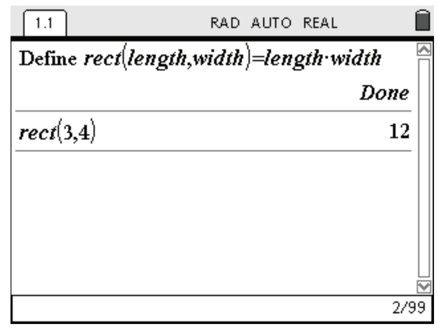
TI-Nspire CAS keystrokes	TI-Nspire CAS screens
From the **Calculator** screen select **expand(** from the **Algebra** menu **(X=)**. Type in your expression, ensuring you include a multiplication between the two sets of parentheses, and press ENTER.	

Example: Factorise $5x^2 + 17x + 6$.

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
From the **Calculator** screen select the **Algebra** menu and choose **factor(** - or just type the command. Type in your expression and press ENTER.	

Using technology to write simple programs for finding areas of shapes

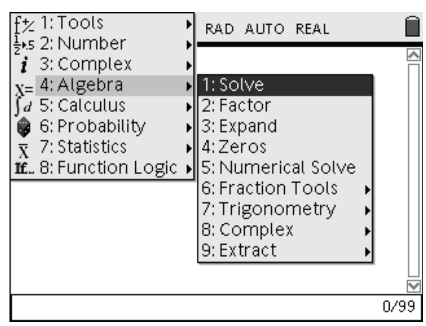
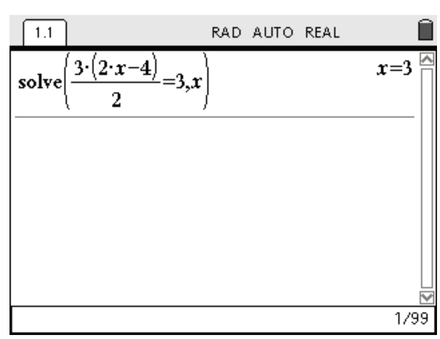
Example: Write a program that will calculate the area of a rectangle given the length and width.

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
While TI-*Nspire* CAS has no programming facility as such, it easily supports defining functions which will serve the same purpose. For example, defining the function 'rect' as shown allows the area of any rectangle to be calculated by simply typing the length and width into the function argument.	

Using technology to solve linear equations

Graphics or CAS calculators can be used to solve linear equations.

Example: Solve the equation $\dfrac{3(2x - 4)}{2} = 3$

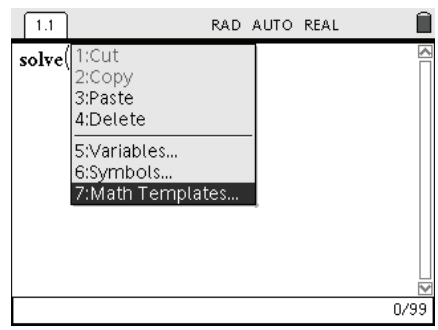
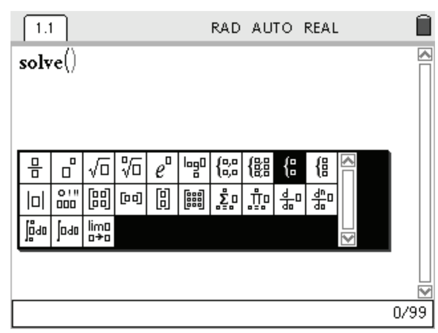
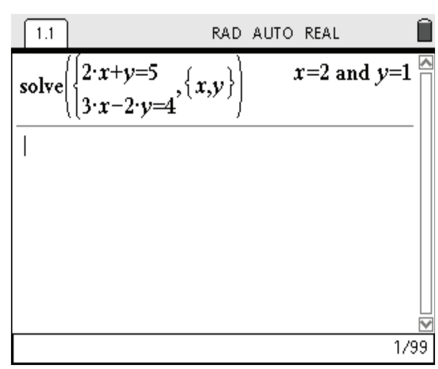
TI-Nspire CAS keystrokes	TI-Nspire CAS screens
Create a **Calculator** page. Choose **Solve(** from the **Algebra** menu (or just type it); enter the equation $3(2x - 4)/2 = 3$, followed by '**,x**' and press ENTER.	
The solution is $x = 3$.	

Using technology to solve simultaneous linear equations

CAS calculators can be used to solve linear equations.

Example: Solve the set of simultaneous equations below.

$$2x + y = 5$$
$$3x - 2y = 4$$

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
Using the **Calculator** application, choose the **Solve(** command from the **Algebra (X=)** menu (or type the command).	
From the **Templates** menu, (CTRL-MENU>7: Math Templates . . .), choose the **System of Equations** option shown. Enter the two linear equations into the template, arrow right to leave the template and type '**{x, y}**'. Press ENTER and the solution will be given.	
The solution is: $x = 2$ and $y = 1$.	

Using technology to construct a table of values and draw a graph

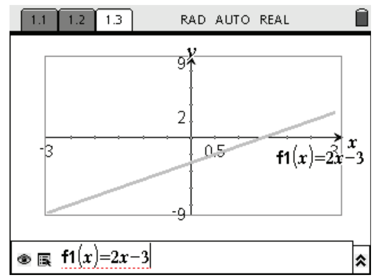
Example: For the rule $y = 2x - 3$ use technology to:

a construct a table of values using $-3 \leqslant x \leqslant 3$

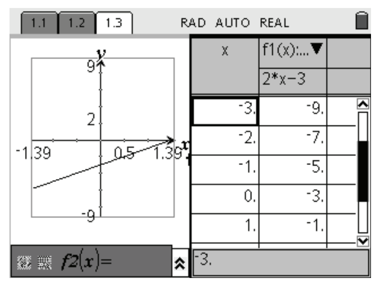
b draw a graph

TI-Nspire CAS keystrokes	TI-Nspire CAS screens

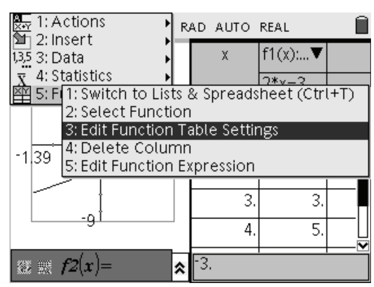
Begin with a **Graphs & Geometry** page, and enter the function **2x − 3** into **f1(x)**. Press [ENTER] to plot the graph.



Press **CTRL-T** to show the table of values for this function and scroll up to show values between −3 and 3.

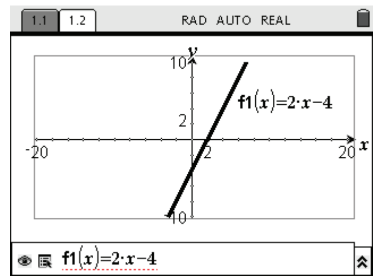
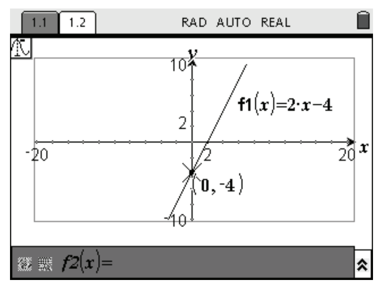
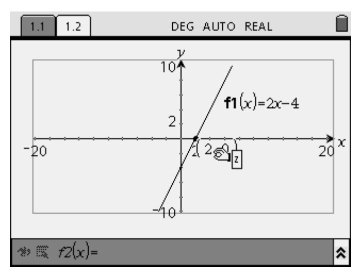


Function table settings may be altered in the **Function Table** menu.



Using technology to sketch straight lines and find *x*- and *y*-intercepts

Example: Use technology to sketch a graph of $y = 2x - 4$ and find the x- and y-intercepts.

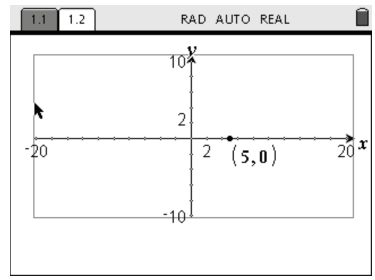
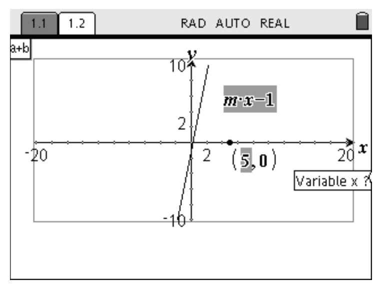
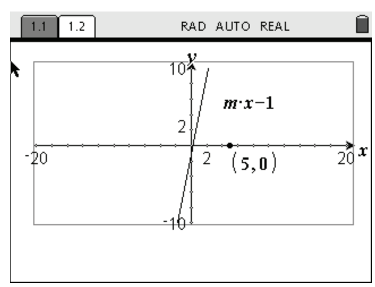
TI-Nspire CAS keystrokes	TI-Nspire CAS screens
Within a **Graphs and Geometry** page, enter the equation into the Graph Box at the bottom of the page (or type it anywhere on the graph screen using the **Text** tool, then drag it onto the axes).	
To find the intercepts, choose the **Trace** menu and drag to the required places along the x-axis (shown).	
Alternatively, choose **Point On** from the **Points & Lines** menu, place a point on the line and then edit the coordinates to jump to the values where x = 0 and y = 0. A **zero marker (z)** will appear to indicate the zero on dragging.	

Using technology to sketch the graph of a family of linear relations

Example: Use technology to sketch a graph of the following family of linear relations.

a $y = -2x + 1$ **b** $y = -x + 1$ **c** $y = 1$

d $y = x + 1$ **e** $y = 2x + 1$

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
On a **Graphs and Geometry** page, use the **Points & Lines** menu to drop a **Point On** the *x*-axis, and then **Coordinates & Equations** from the **Tools** menu to show the coordinates of that point.	
Use the **Text** tool from the **Tools** menu to enter the equation '$m*x - 1$' on the screen, and then choose **Calculate** also from the **Tools** menu.	
Click on the equation, then on the *x*-coordinate of the variable point for *m*. Finally click on the *x*-axis for *x*. The line drawn will vary its gradient as you drag the variable point along the *x*-axis.	

Using technology to find intersections

Example: Use technology to solve the following pair of simultaneous equations graphically.

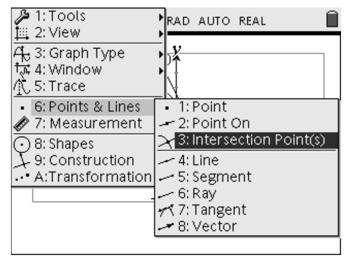
$$y = 4 - x$$
$$y = 5 - 2x$$

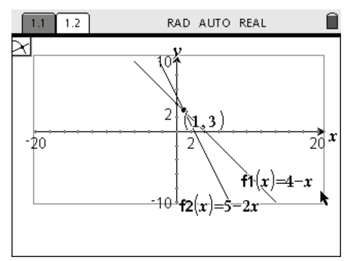
TI-Nspire CAS keystrokes

Enter both functions into the Graph Box on a **Graphs and Geometry** page.

Now select **Point of Intersection** from the **Points & Lines** menu and click on each line.

TI-Nspire CAS screens





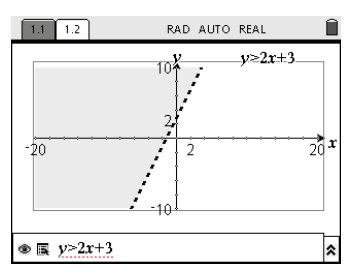
Using technology to graph inequations (Extension material 8.11 on the Student CD-Rom)

Example: Use technology to sketch a graph of $y > 2x + 3$.

TI-Nspire CAS keystrokes

In a **Graphs and Geometry** page, backspace to delete the '=' in the Graph Box and enter '**>2x+3**' as required.

TI-Nspire CAS screens



Example 9

The following is a program that simulates the tossing of a coin 100 times and counts the number of heads tossed.

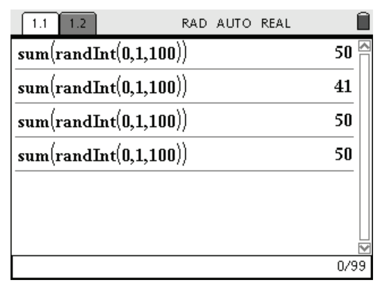
```
PROGRAM:COIN
:0→H
:For(X,1,100,1)
:randInt(0,1)→A
:If A=0:H+1→H
:End
:Disp "NUMBER OF
 HEADS ",H
```

Comments

Number of heads starts at 0
Loop for 100 trials
Selection of 0 or 1 randomly
Tests if A = 1 the number of heads increases by 1
End of loop
Displays number of heads counted

a Type this program into your graphics or CAS calculator and execute the program.
b Record the output of your program.
c Calculate the proportion of heads obtained and compare this with the expected value of 0.5.

Solution

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
a Statistical simulation is easy using the in-built commands of TI-*Nspire* CAS. Using 'randInt('and 'sum' commands readily produces the total of 100 tosses of a coin, as shown.	

b Since the program selects random numbers, the program will deliver different results each time.
c Divide the number of heads by 100 to evaluate your proportion.

Using technology to determine trigonometric ratios

It is difficult to determine trigonometric ratios accurately just by measuring the sides and angles of a triangle. A scientific, graphics or CAS calculator can be used to obtain the accurate values. Before entering angles you need to make sure that the calculator is in degree mode.

Example: Use a calculator to find the value of each of the following, correct to four decimal places.

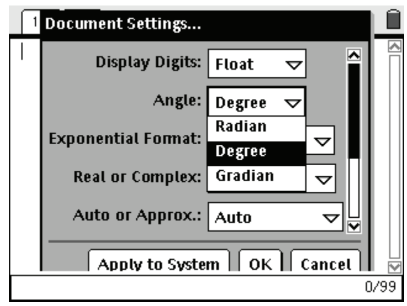
a cos 30° **b** sin 54° **c** tan 89°

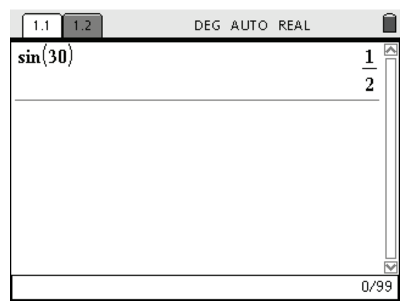
Scientific calculator

a Set **Document Settings** to Degrees, press SIN 30.

This gives the answer 0.5 or $\frac{1}{2}$.

TI-Nspire CAS calculator



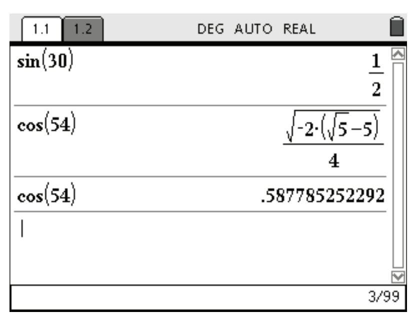


Scientific calculator

b Press cos 54.

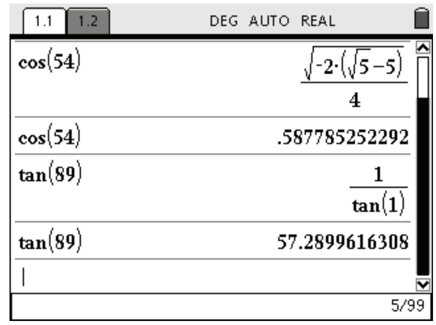
TI-Nspire CAS calculator

Press COS 54.



Use CTRL-ENTER to force a decimal approximation.

c Press TAN 89 (hold down CTRL for a decimal result).



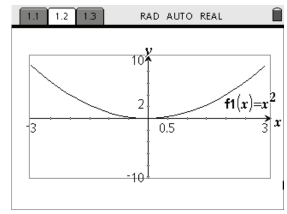
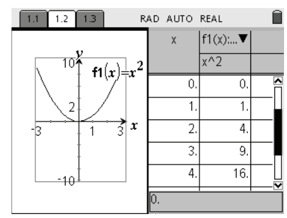
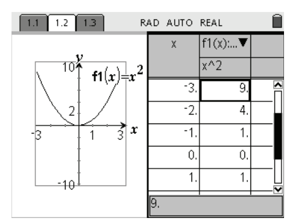
This gives the answer 57.28996 which rounds up to 57.2900.

Using technology to construct tables of values and draw graphs

Example: For the quadratic relation $y = x^2$ use technology to:

a construct a table of values for $-3 \leqslant x \leqslant 3$

b draw a graph

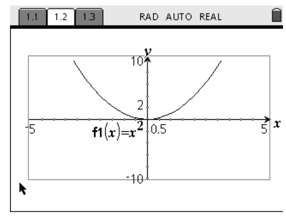
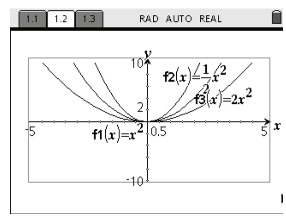
TI-Nspire CAS keystrokes	TI-Nspire CAS screens
In a **Graphs & Geometry** page, enter $\mathbf{x^2}$ into the Entry Line. You may adjust the x-axis limits to –3 and 3 if desired.	
Press **CTRL-T** to show the Function Table. Axis settings may be adjusted using the Window Settings menu if desired.	
Define column **b** as 'a^2'. Scroll up to the value x = −3.	

Using technology to compare graphs of the form $y = ax^2$

Example:

a Use technology to sketch the quadratic equations $y = x^2$, $y = 2x^2$, $y = 3x^2$, $y = \frac{1}{2}x^2$ on the same axes.

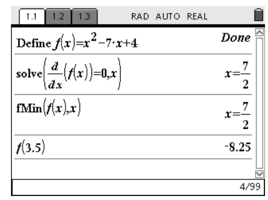
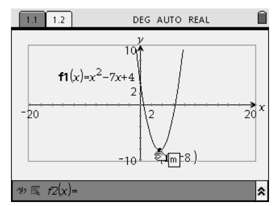
b Describe how each graph transforms the graph of $y = x^2$.

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
In a **Graphs and Geometry** page, type x^2 into the Graph Box (or use the **Symbol Palette**).	
Other functions may be entered into subsequent graph definitions or the 'arms' of the parabola may be dragged to give the required graphs. The graph of $y = 2x^2$ is narrower than the graph of $y = x^2$. The graph of $y = \frac{1}{2}x^2$ is wider than the graph of $y = x^2$.	

Using technology to find turning points

A graphics or CAS calculator can be used to find the turning point of the graph of a quadratic relation.

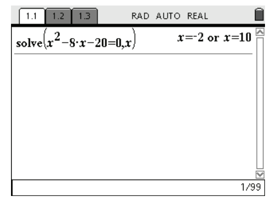
Example: For $y = x^2 - 7x + 4$ use technology to find the turning point correct to two decimal places.

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
Turning points may be found in several ways. Using the **Calculator**, define the function, and then use the template to solve for the zero of the derivative, or just use the **fMin(** command.	
Graphically, use the **Text** tool to type ***f*(*x*)** onto the graph screen and drag it over the axes to graph the function. Then select **Graph Trace** or **Point On** to identify the turning point. The turning point is (3.5, −8.25).	

Using technology to solve quadratic equations

A graphics or CAS calculator can be used to solve quadratic equations.

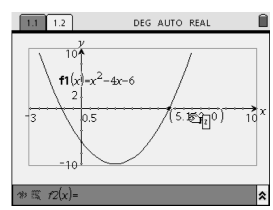
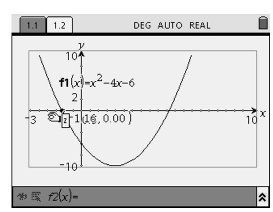
Example: Use technology to solve $x^2 - 8x - 20 = 0$.

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
In the **Calculator** application, choose the **Solve(** command from the **Algebra** menu **(X=)** (or simply type it) and enter the equation as shown.	

Using technology to find *x*-intercepts

A graphics or CAS calculator can be used to solve quadratic equations or find x-intercepts of graphs.

Example: For $y = x^2 - 4x - 6$ use technology to find the x-intercepts correct to two decimal places.

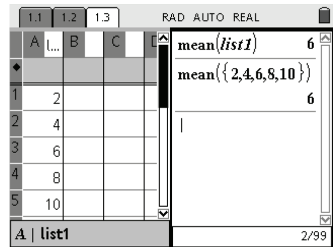
TI-Nspire CAS keystrokes	TI-Nspire CAS screens
Enter the function into the Graph Box of a **Graphs and Geometry** page. Choose **Graph Trace** or **Point On** from the **Points & Lines** menu to read off the required intercept points.	
The decimal display may be adjusted by hovering over the value and pressing plus or minus keys to increase or decrease the accuracy. The first x-intercept is $x = -1.16$. Repeat the process to find the second x-intercept, $x = 5.16$.	

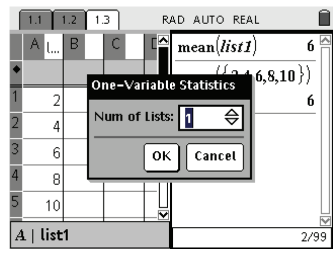
Using technology to find the mean

Example: Determine the mean for this set of numbers: 2 4 6 8 10

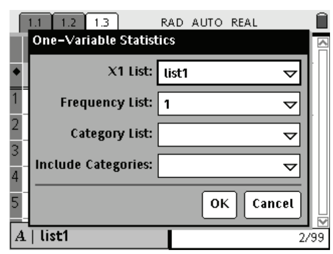
TI-Nspire CAS keystrokes | **TI-Nspire CAS screens**

Statistical operations may be carried out using either the **Lists and Spreadsheet** tool or the **Calculator** tool (where the operation may be chosen from the **Statistics** menu or simply typed, and may act upon a list already defined—as shown—or on a set of numbers entered as a list using braces—as shown.

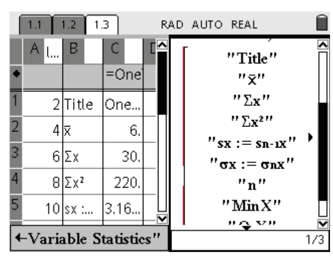




Within the **Lists and Spreadsheet** page, the list may be named and the data entered, and then the **One-variable statistics** command chosen.



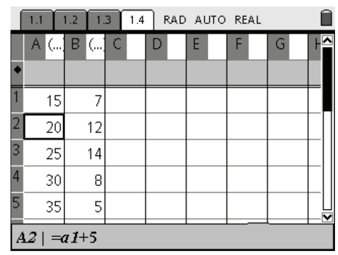
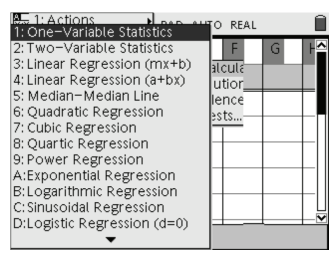
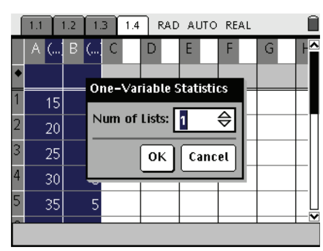
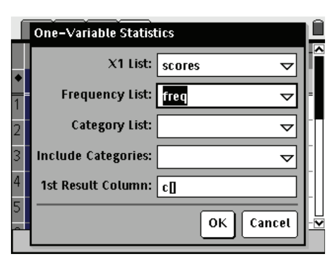
Following the steps as shown drops one-variable statistics data into the page, as specified.



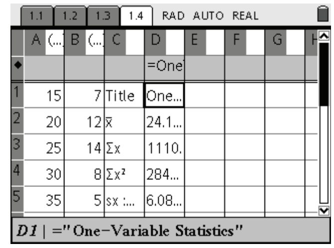
Using technology to determine the mean of a frequency distribution

Example: Determine the mean for the following set of data.

x	f
15	7
20	12
25	14
30	8
35	5

TI-Nspire CAS keystrokes	TI-Nspire CAS screens
In a **Lists and Spreadsheet** page, data may be entered and the lists named, as shown. Note that spreadsheet features may be used if desired: after entering 15 into cell, **a1, a2** is defined as '**=a1+5**' and this formula is copied into subsequent cells by dragging from the bottom right corner.	 
Using the **Statistics** menu, select **One-variable statistics** (as shown), complete the floating menus as required.	 

The results are placed on the page.



Of course, once the lists have been named, the mean may be found using the **Calculator** page as well!