

Mathematical Interactions

Getting Started



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*Mathematical Interactions:
Getting Started*

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About this book

As its title suggests, this book is intended to be a resource to help you to start using your calculator effectively.

If you have never used your calculator at all, we suggest that you begin by working through the first few pages of this book with your calculator at your fingertips. Expect to make a few mistakes here and there, as the calculator is a very sophisticated device, and is capable of doing many more things than we will use in this series.

If you have used the calculator before, you might still find it useful to refer to the book, in case there are things described here that you have not yet encountered.

If you are an experienced calculator user, you may need to refer to the book only for particular purposes (such as to find out how to enter a program into the calculator).

Many details of the more sophisticated aspects of using your calculator (such as statistical work) are dealt with in other books in this series. This book is only intended to be the first step.

As well as advice on how to use the calculator, there are a few mathematical interactions for you to try, for which answers have been provided. These will allow you to make sure that you understand thoroughly how to use the calculator in the ways described.

In addition to this book, there are other resources that you may find useful if and when you get stuck. Your fellow students and your teacher are likely to be the quickest way of getting the help you need. There is also a very detailed *User's Guide* that comes with each calculator; you may be able to find a copy of this to use, particularly when you have a little experience with the calculator.

We hope that you find this book a useful assistant for your early work with the calculator.

Barry Kissane
Anthony Harradine

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Changing modes

A graphics calculator can do many different kinds of things.

To turn the calculator on, press the grey AC^{ON} key. To turn it off, press the yellow SHIFT key once, release it and then press the AC^{ON} key. Notice that the command, OFF, is written in yellow just above the AC^{ON} key to remind you how to turn the calculator off.



Once the calculator is turned on you need to choose the appropriate *mode* of the calculator, depending on what you want to do.

To do this, you must go to the MAIN MENU, which looks like this.

Whenever you turn on your calculator, the screen will automatically show the MAIN MENU. At other times, you can go to the MAIN MENU by pressing the grey MENU key, which is next to the arrow keys. (Sometimes, you will first need to press the EXIT key.)

The calculator has 15 *modes* of operation. The MAIN MENU shows 15 square icons, one for each mode. The icon for each mode has a name (like RUN, TABLE, LINK, etc.) and a symbol (like 1, 7, D, etc.) One mode is always highlighted. The screen above shows the RECUR mode (with symbol 8) highlighted.

There are two ways to choose a mode from the MAIN MENU. One way is to first highlight the mode you want, by using the four arrow keys at the top right of the calculator and then pressing the blue EXE key at the bottom right of the calculator. The arrow keys are sometimes called *cursor keys*.

The other way to choose a mode is to simply press its symbol in the MAIN MENU. In the case of the letter symbols, notice the letters written in small pink writing just above the keys. Press the relevant key. For example, for the B symbol, press the log key.

If you lose track of which mode the calculator is in, pressing the MENU key will let you see it. Press the MENU key a second time to return to the same mode.

In this series of books, you will mainly use the following modes:

- | | |
|---------|---|
| 1 RUN | mode will be used for calculations, as for a scientific calculator. |
| 2 STAT | mode will be used for statistical work. |
| 4 LIST | mode will be used for storing lists of numbers for statistics or other purposes |
| 5 GRAPH | mode will be used for drawing and exploring graphs |
| 6 DYNA | mode will be used to draw dynamic graphs of functions |
| 7 TABLE | mode will be used for constructing and using tables of values |
| A EQUA | mode will be used to solve equations |
| B PRGM | mode will be used for calculator programs |
| C TVM | mode (Time Value of Money) will be used for some financial mathematics |
| D LINK | mode will be used to link your calculator with a computer or another calculator |
| E CONT | mode can be used to change the contrast of the screen and its colours |



Interaction A

1. Enter RUN mode and use the calculator to work out the number of days for which you have been alive. When you have done this, press the MENU key twice to see that you are in RUN mode and to return. What happens to your calculation?
2. Change to STAT mode and then change back to RUN mode. What happens to your calculations this time?

Setting up and calculating

In this and the next two sections, you will use the calculator as if it were only a scientific calculator.

Start by entering RUN mode.

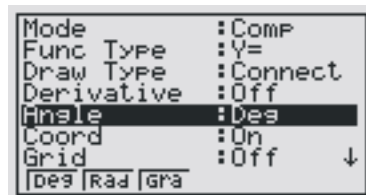
Whenever you enter a new mode, it's a good idea to check the way the calculator has been *set up* to operate. Do this by activating the SET UP menu, by first pressing SHIFT and then the MENU key. The screen will show how the calculator has been set up for this mode.



Yours may look different from this one, depending on how it was last set up.

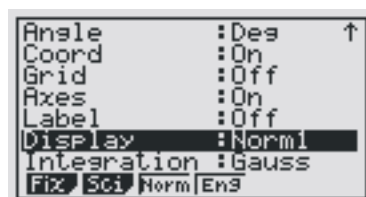
Use the down arrow key to highlight different things that can be set up.

When you highlight one of them, notice that the possible choices are displayed in the bottom row of the screen.



The screen here shows that angles can be entered in the calculator set in degrees, radians or grads.

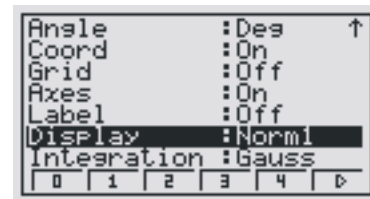
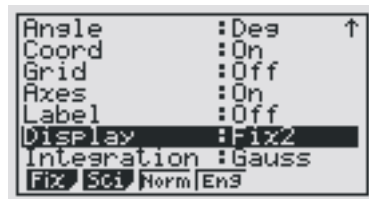
You can change the **Angle** set up by using one of the three screen buttons at the bottom. To press a screen button, press the matching *F-key* directly below it on the calculator. Press the F1, F2 and F3 keys in turn and watch how the display changes. Leave the calculator set to degrees. The arrow pointing downwards at the bottom of the screen indicates that there are further items below.



One of the SET UP menu items shows the **Display** options, shown at the left. At the moment **Norm1** is selected. This is usually the best choice in normal circumstances.

Notice that the arrow on the right of the screen now shows that there are further choices upwards.

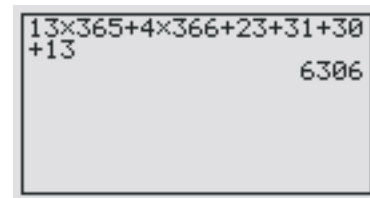
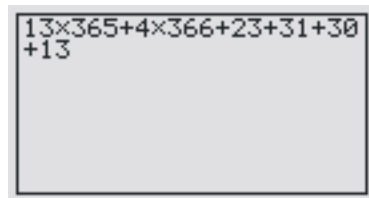
To fix the display to show two decimal places (eg, for money calculations), you would need first to select **Fix** (by pressing F1) and then 2 (by pressing F3). The results are shown on the next page.



To return to Norm1, press the Norm (F3) screen button. Notice what happens if you press the F3 key several times in succession. (The *User's Guide* explains this in detail; refer to *Norm* in the index.)

The EXIT key is very useful. It will often return you to the previous screen when you are using menus. (It's a bit like the X at the top of the screen when using *Windows* on a computer.) In this case, press the EXIT key to return to the home screen for RUN mode.

To complete a calculation, you must first type it into the calculator in a *command line*. The calculation will not be completed until you press the blue EXE key. The next screen shows the calculator being used to calculate someone's age in days on May 13, 2000.



Notice that the result of 6306 days doesn't appear until the EXE key is pressed.



Interaction B

1. Look carefully at the calculation screen above. When was the person born?
2. Use the calculator to check that $\sin 30^\circ = 0.5$ and that $\sin 45^\circ + \sin 60^\circ$ is close to $\pi/2$. (To get π , press SHIFT and then the EXP key, on the bottom row of keys.)
3. Change RUN set up so that numbers are displayed correct to three decimal places. Repeat the calculation from question 2. What changes? Return the Display to Norm1 when finished.
4. In conventional mathematics, $2 + 3 \times 5 = 17$. Brackets are needed to evaluate the sum first: $(2 + 3) \times 5 = 25$. Check that the calculator uses the same conventions. Predict what the result of entering $3 + 4 \times 2 + 5$ will be; then check your prediction on the calculator.
5. Use the calculator to work out $3 + 4$ times $2 + 5$ in a single command line. Check that the result is 49. Compare the calculation with that used in question 4.

$\sqrt{196}$	14
31^2	961
$\sqrt{(5^2+12^2)}$	13

Most calculations are entered into the calculator in the same way in which you would write them on paper or see them in a book. For example, the square root symbol is pressed before the number concerned and the squaring key (x^2) is pressed after the number. The screen shows some examples of this, including an example of the two used together.

$4\downarrow 5+2\downarrow 3$	$1\downarrow 7\downarrow 15$
-------------------------------	------------------------------

Fractions are entered with the fraction key, which is labelled a^b/c . Notice that the fractions on the screen are written in a single line.

The special symbol \downarrow is used instead of the usual fraction bar or slash. Use the a^b/c key to enter the vinculum (the line between the numerator and the denominator).

$1\downarrow 7\downarrow 15$ means 1 and $7/15$. So, to enter a fraction with both whole and fractional parts, you need to press the a^b/c key twice.

5^3	125
2^4+5	21
$2^{(4+5)}$	512

The powering key is next to the EXIT key and looks like an upside down V. The screen here shows how it is used.

Notice the difference between $2^4 + 5 = 21$ and $2^{4+5} = 512$.

The calculator has both a subtraction key and a negative (or opposite) key. The negative key has (-) on it and is located on the bottom row of keys.

$-5--3$	-2
2^{-3}	0.125
$(-17)^2$	289

On the screen, the subtraction sign is longer than the negative sign.

The screen here shows the result of subtracting negative 3 from negative 5.

Notice that $-5 - -3 = -2$.

This screen also shows that you have to be careful with how you enter a calculation. Check for yourself what happens if you omit the brackets when calculating the square of -17.



Interaction C

1. Evaluate $\sqrt{55225}$.
2. Find $3/4 + 5/7$. Press SHIFT a^b/c to see the result as an improper fraction.
3. Find $-7 + -4$. Some people, very incorrectly, say, "Two minuses make a plus." Explain why this is not so for this case.
4. 2^3^2 could mean 2^3^2 or $(2^3)^2$. Which one is it?
5. Enter 2 EXP 6 EXE into the calculator. (That is, press 2 then EXP then 6 then EXE.) Explain what you see.

Editing and correcting errors

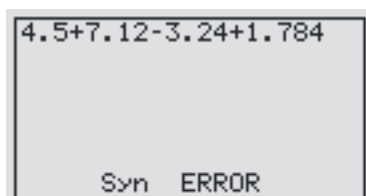
Everyone makes errors; so you need to know how to deal with them.

If you make a typing error and notice it before you press the EXE key, you can correct it using delete (DEL) or insert, INS (SHIFT DEL).

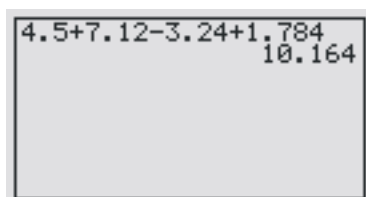
First move the flashing cursor with the left and right arrow keys. The DEL key will delete the symbol that is flashing. The INS key will allow you to insert symbols in place of the flashing symbol; the flashing symbol will then move to the right.

To correct any key errors you notice immediately after pressing the EXE key, press the left or right arrow key, which will recall the previous command. Then edit the command to correct your error. To clear the entire screen in RUN mode, press the AC^{ON} key. It is rarely necessary and not desirable to do this, in fact.

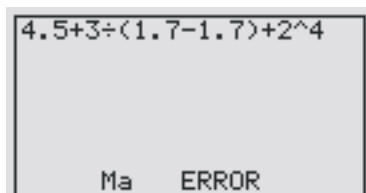
Immediately after pressing the AC^{ON} key, you can recall any prior command lines one at a time by pressing the up arrow key.



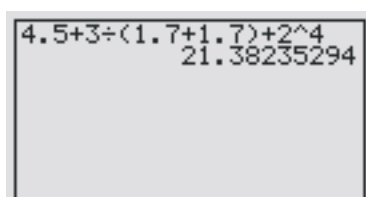
Until you are accustomed to the calculator, it is easy to make a *syntax error*, shown on the calculator screen as Syn ERROR. This means that you have not followed the calculator's syntax – its rules of entering expressions. An example of this is when you press the negative key instead of the subtraction key, as shown here.



To find the syntax error, just press the left arrow key. The original command is repeated, with the cursor flashing in the place where the error is – in this case the opposite sign.



Correct the error (by pressing the subtraction key and thus replacing the negative sign) and press EXE to complete the calculation. (You don't need to move the cursor to the end of the line before pressing EXE).



Another kind of error is a *mathematical error*, shown on the calculator screen as Ma ERROR. Mathematical errors occur when you try to do something mathematically illegal or improper (such as dividing by zero).

Again, the calculator will help you to find the error if you press the left arrow key. Repair the error and press EXE to complete the calculation.

Using menus

Many calculator commands are not shown on the keyboard, but need to be accessed using menus. In addition, menus are important in the operation of most calculator modes.

You have already seen some menus in the SET UP screen. You make choices in menus using the screen buttons, operated by the F-keys directly underneath them.

One kind of menu item is an *immediate* command. That is, it takes effect as soon as the screen button is pressed. The Angle menu in SET UP contains three immediate commands, one each for degrees, radians and grads. Immediate commands are shown in an unshaded rectangle on the screen.



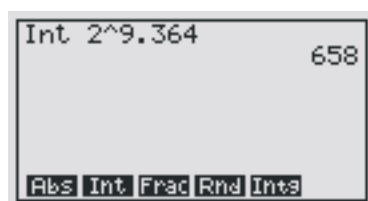
The OPTN menu is especially useful and you will use it often. In RUN mode, activate the menu by pressing the OPTN key (next to the SHIFT key). The screen buttons show six menu items, of two different kinds.



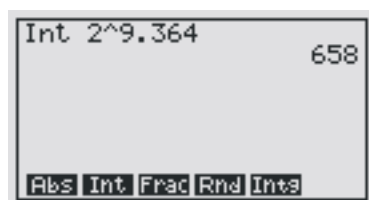
The menu item on the far right is a *continuation command*, which has the effect of continuing to display further menu items.

When the continuation command is activated, the next set of menu items is shown, as the screen here displays.

All but the continuation command showing here are *menu names*. They are shown as shaded rectangles with the bottom right corner chopped off.



Pressing the NUM (F4) menu name reveals the NUM menu itself, which has five separate commands as shown here. Notice that each of the commands is shown in a (complete) shaded rectangle. Pressing one of these screen buttons will have the effect of entering the command onto the screen as part of a command line.



For example, the `Int` command finds the integer part of a number.

The screen on the left shows how to use this command to find the integer part of the number $2^{9.364}$, which is 658.

As noted earlier, the `EXIT` key often has the effect of returning you to the previous screen. A menu will remain on the screen until `EXIT` is pressed. In this case, pressing `EXIT` will return to the previous screen, showing the `OPTN` menu(s). You will need to press `EXIT` a second time to return to the screen with no menus showing.



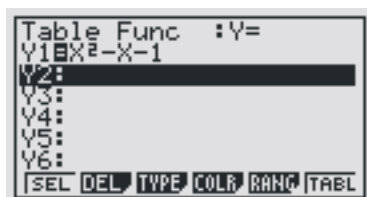
Interaction D

1. In `RUN` mode, bring the `NUM` menu to the screen. The `Abs` command gives *the absolute value* of a number, which is the value obtained by ignoring the sign of the number. In normal mathematical notation it is written using vertical strokes. Check that $|-5| = 5$. Find $|8 - 12|$ and then explain why `Abs 8-12` is not the same as `Abs (8-12)`.
2. The `NUM` menu has two similar commands, `Int` and `Intg`. `Intg` is *the greatest integer function*. It gives the greatest integer less than or equal to a particular number. Do the `Int` and `Intg` functions always give the same result for specific numbers? Try some and see.
3. In mathematical notation, 5C_3 is read as “5 choose 3”, referring to, say, the number of different ways of choosing three people out of five people to form a group. The `PROB` menu in the `OPTN` menu has the command `nCr` (`F3`). Press `5 nCr 3 EXE` to see that ${}^5C_3 = 10$. Notice carefully what is shown on the screen when the `nCr` command is pressed. Use the same command to find out how many different groups of four people can be chosen from a class of 25.
4. Find 7C_2 and 7C_5 . Compare the results. Try to find some other pairs like this.

Making a table of values for a function

A powerful use of your calculator is to make a table of values for a function.

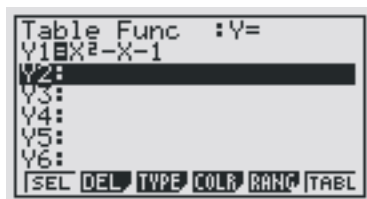
To make a table, you must first enter TABLE mode. If the MAIN MENU is showing on the calculator, just press 7 for TABLE mode. Otherwise, press MENU and 7.



You should see a screen like this.

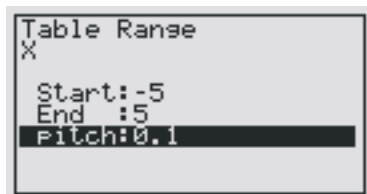
If there are some functions already defined, highlight each one in turn using the cursor keys and then delete it by using the screen button DEL (F2) command, followed by YES (F1) to confirm your decision.

Enter a function by entering the appropriate expression, using X for the pronumeral. To get the X, use the key X,θ,T, which is right under the pink ALPHA key. Press EXE after entering the function.



The screen here shows $f(x) = x^2 - x - 1$ entered in the first location (Y1).

To make a table of values, you need to specify which range of values of x you are interested in. To do this use RANG (F5) to see the current settings.



Start refers to the lowest value of x , End is the highest value and pitch is the spacing or step between values in the table.

The screen here shows table values from -5 to 5, going up in steps of 0.1.

Change the values in the Range screen by entering new values, followed by EXE. (If you want to leave a value unchanged, press the down arrow key to move to the next item, rather than the EXE key.) Press EXIT when you are finished.

X	Y1
-4.9	27.91
-4.8	26.84
-4.7	25.79

FORM DEL ROW G·CON G·PLT -5

Use **TABL (F6)** to obtain the table, as shown here.

Notice that only a few values are shown on the screen. Use the cursor keys to move around to see the whole table.

Notice that pressing **FORM (F1)** will return you to the formula screen, where formulas are entered for functions.

When a table is showing, you can obtain a graph of the function by pressing **G·CON (F5)** or **G·PLT (F6)**. The graph you see will depend on the view window chosen. This is explained in the next section. Press **EXIT** to return from the graph to the table.



Interaction E

1. Check by hand and in a table that when $x = -0.9$, $x^2 - x - 1 = 0.71$.
2. Enter a second function in the function list, in the Y2 position: $g(x) = x + 1$. What happens when you make the TABLE?
3. Notice in the table that successive values of X are automatically evenly spaced. Describe the spacing of the Y1 and Y2 values.
4. Define a third function in the Y3 position, $f(x) = 2$. Describe the values in the table for this function.
5. Highlight a function in the function list. Examine the effects of the **SEL (F1)** key.

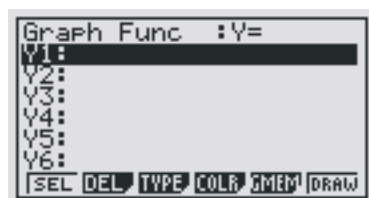
Drawing a graph of a function

A graph is a useful means of understanding a function.

Although you can draw graphs of functions from TABLE mode, it is better to do so using GRAPH mode. To draw a graph of a function, first select GRAPH mode. If the MAIN MENU is showing, just press 5; otherwise, press MENU and then press 5.

Notice that the functions you defined in TABLE mode are automatically defined in GRAPH mode (as there is only one function list in the calculator). So it is very easy to obtain a table of values for a function you have graphed or a graph for a function you have just tabulated.

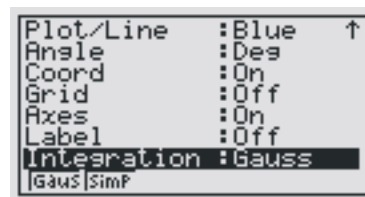
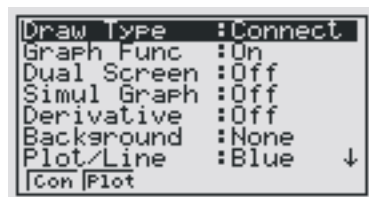
As for TABLE mode, if there are some functions already defined, highlight each one in turn using the cursor keys and then delete it by using the DEL (F2) command, followed by YES (F1) to confirm your decision.



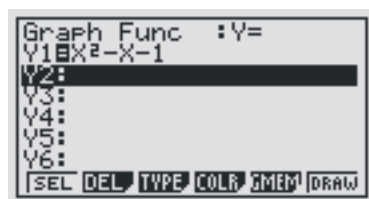
If no functions have previously been entered, you should see a screen like this.

The opening screen is exactly the same as the opening TABLE mode screen except for the heading Graph Func instead of Table Func, and some different menu items.

You can delete and define functions in the same way as for tables. Use SET UP (SHIFT then MENU) to match these screens:



Enter a function using X for the pronumeral. To get the X, use the key X, θ , T, which is right under the pink ALPHA key. Press EXE after entering the function.



The screen here shows $f(x) = x^2 - x - 1$ defined in the first location (Y1).

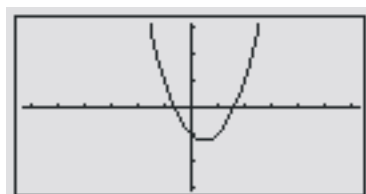
You also need to set up the axes on which the graph is to be drawn. You can think about this as like looking at the whole (infinite) coordinate plane through a rectangular window – the calculator screen.

To do this, select **V.Window** (**SHIFT F3**) to see the current settings. The end points of the two axes are shown, together with the spacing of the tick marks (called the **scale** in this case). You can enter any values you like for these, followed by **EXE**.



In this case, it's a good idea to start by choosing **INIT** (**F1**) however, which gives the values shown here.

These will ensure that the two axes have the same scale and a tick mark is at every unit on each axis.



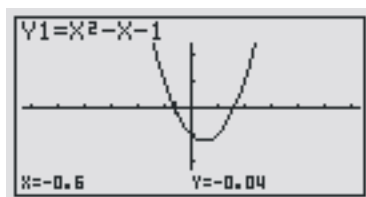
Press **EXIT** to return to the previous screen.

Use **DRAW** (**F6**) to draw a graph on the chosen window. For the graph shown here, $-6.3 < X < 6.3$ and $-3.1 < Y < 3.1$ and there is a tick mark at each unit.

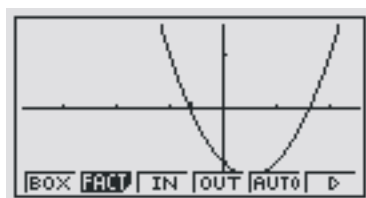
Once the graph is drawn, press **G-T** (**F6**) a few times to switch between the graphics and text displays.

When the graph is showing, you can use **TRACE** (**F1**) followed by the cursor keys to trace the graph, which is like running your finger over the graph. (It is not necessary to use **SHIFT** here, even though the zoom command is written in yellow.) Notice when you do this that the coordinates of each point on the graph are shown.

Each press of the cursor key moves 0.1 units for X in the **INIT** screen. Other view window settings are different from this.



The screen here shows that the graph crosses the X -axis near $(-0.6, -0.04)$.



Use **ZOOM** (**F2**) followed by **IN** (**F3**) to *zoom in* on the graph, which changes the scales on each axis so that the graph appears magnified.

Notice what happens if you now *zoom out* by pressing **F4**.



Interaction F

- Trace to the point where $x = 2.1$. The graph should show that $y = 1.31$. Check by hand that when $x = 2.1$, $x^2 - x - 1 = 1.31$.
- Enter a second function in the function list, in the **Y2** position: $g(x) = x + 1$. What happens when you **DRAW** (**F6**)?
- Enter a third function in the **Y3** position. Choose a function whose graph does not intersect the graph of $y = x^2 - x - 1$.
- Highlight a function in the function list. Use **COLR** (**F4**) to choose a colour for the graph. Press **EXIT** and then **DRAW** (**F6**) the graph to see the effect.
- Now use **DRAW** (**F6**) to graph the three functions. Describe the graph of **Y3**.

Entering programs into your calculator

You will use some calculator programs in this series of books. These have to be entered into your calculator before you can use them.

There are three ways of doing this:

- entering in the program manually from the keyboard of your calculator.
- transferring a copy of the program from another calculator to yours
- transferring a copy of the program from a computer to your calculator

We will briefly deal with all of these in this book.

Manual entering of programs

We will use an example, a program with name *Calendar*. The program, the code for which is shown below, gives the day of the week for a particular modern date. The comments on the right are to help make the program clearer. They should *not* be entered into the calculator. The essence of the program is to evaluate a complicated formula after being provided with a date.

CALENDAR

“DAY”?→D

“MONTH”?→M

“YEAR”?→Y

$2+D+2M+\text{Int}(3(M+1)/5)+Y+$

$\text{Int}(Y/4)-\text{Int}(Y/100)+\text{Int}(Y/400) \rightarrow W$

$7*\text{Frac}(W/7) \rightarrow W$

“WEEK DAY IS”: W

Calendar is the program name

Inputs a day, *D*

Inputs a month, *M* (Jan =13, Feb =14 of previous year)

Inputs a year, *Y*, including the century

These two lines contain the main formula, but ...

Type as one long line; calculator will use three lines.

Evaluates the weekday *W* (Sun = 1, Mon = 2, etc.)

Prints “WEEK DAY IS” and the result on the next line.

Just press EXE to enter another date to find out.

Enter Program mode.

Press **NEW (F3)** to start a new program. The first thing you need is a name for the program. Type the name in the brackets. Only eight letters are allowed. The **Alpha-Lock** comes on automatically, so that you can use the letter keys for the name. Press **EXE** when you're finished.



Now the calculator is ready for you to enter the program commands. The screens below show the *Calendar* program after it is entered into the calculator:



Most of the symbols should already be familiar to you. Exceptions are the quotes symbol, “”, which is available from the initial screen after pressing **SYBL (F6)** to enter the symbol menu; the question mark symbol, obtained by pressing **SHIFT** and then **VARS**; the colon symbol, obtained by pressing **SHIFT** then **VARS** and then the continuation key (**F6**) and the arrow key, just above the **AC^{ON}** key. Also, you will need to press **OPTN** to find the **Int** and **Frac** commands in the **NUM** menu. Remember to press **EXIT** to return to the previous screens.

Press **EXE** at the end of each program line. On the screen, notice that there is a bent arrow symbol shown for this command.

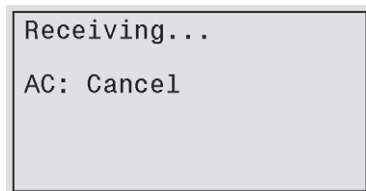
Program *Calendar* is taken from the following book: Kissane, Barry 1997. *More mathematics with a graphics calculator: Casio CFX-9850G*. Perth: Mathematical Association of Western Australia. (pp 155-6)

Transferring programs from calculator to calculator

If someone you know already has a copy of the program you want, in their calculator, then it is usually easier to transfer it to your calculator than to enter it manually. In order to transfer programs between calculators, you must first get the optional cable, for which the serial number is SB-62.



Connect your calculator and another Casio CFX-9850GB+ calculator together with the cable and then enter the **LINK** mode on each. The opening screen here shows that the two important commands are to **Transmit (F1)** and to **Receive (F2)**.



Receiving

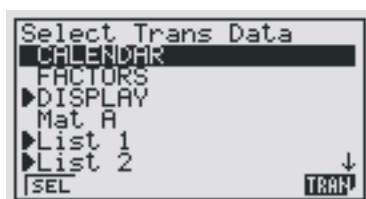
Press **RECV** (F2) on the calculator that is to receive information. The screen will show that the calculator is waiting to receive information. It will wait for about six minutes, giving you ample time to transmit any information. As the screen also shows, you can stop it from waiting by pressing **AC**.



Transmitting

Press **TRAN** (F1) on the other calculator to specify what you want to transmit from the calculator. The screen shows that one choice is **Backup** (F6) which will allow you to replace the memory contents of the receiving calculator with those of the transmitting calculator.

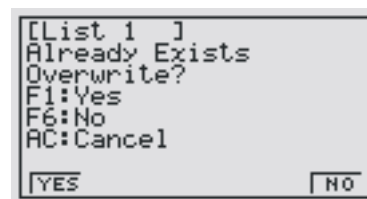
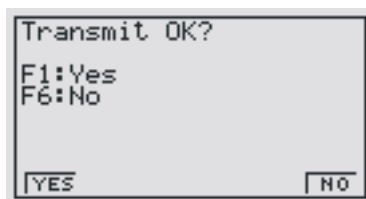
Usually, however, you will want to transmit only a limited amount of information between calculators. The most common items to be transmitted are programs and data (in lists), since it would take a long time to type these in afresh, and errors are likely to be made when you do. Electronic transfer of information is both faster and more reliable than manual copying. So press **SEL** (F1) to select the items.



A list of all available items is shown on the calculator. Use the cursor keys to scroll up and down the list. Select each item to be transmitted by highlighting it and then pressing **SEL** (F1); a small arrow head will be shown next to each item you select. To de-select an item, press **SEL** (F1) a second time.

The previous screen shows that program **DISPLAY** and the data in **List 1** and **List 2** are to be transmitted. (You may not have the same items as these showing in your calculator.) Press **TRAN** (F6) when all selections are made.

The screen on the left below allows you to change your mind. The information sent will overwrite any existing information, but you will have a final chance to prevent it from doing this for programs, lists and matrices, as shown below at the right.



If you need to transfer the same items to a number of calculators you do not need to keep selecting the items prior to each transfer. Once you have made the first transfer, pressed **AC**^{ON} and pressed **TRAN** (F1) to start the next transfer, you can use **CRNT** (F2) to automatically select the same information previously sent. This is particularly useful if you are transferring a number of lists and/or programs.

Transferring programs from a computer to your calculator

Transferring data from a computer is most likely to be done when the computer has been used to obtain programs from the Internet or has been used to store programs that have been made available on a computer disk, or written on the computer using special FA-122 or FA-123 software.

For example, all of the programs in this series are available on a computer disk and can also be downloaded from the ACES website at <http://www.school.casio.com.au>.

To download the programs from the Internet, follow the instructions on the website. Usually, you will need only to click on the appropriate link on the website.

To transfer the programs from the computer to your calculator, you will need the special Casio computer software package, either the FA-122 or the FA-123, which must be installed onto your computer according to the instructions with the package. (This software can be downloaded free of charge from the ACES website.) You will also need a special cable to connect the computer and calculator together. This cable is contained in the FA-122/123 package.

The following website is a good one to start searching the net for programs: <http://www.carmen.murdoch.edu.au/~cwatson>.

Once everything is set up, the transfer process is essentially similar to that between calculators. Set your calculator to **R e c e i v e** in **L i n k** mode and use the computer software to select the program(s) and to **T r a n s m i t** them to the calculator.

Answers

Some of the questions that have been asked do not have a single correct answer. In such cases, MPA (which stands for many possible answers) will be the answer supplied. In many cases, some supporting comment is supplied.

Interaction A

1. The calculation remains visible.
2. All calculations are cleared by this change of mode.

Interaction B

1. 6 February 1983.
2. The result is approximately 0.002 larger than $\frac{\pi}{2}$.
3. The result is given as 1.573, rounded from 1.573132185...
4. The result will be $3 + 8 + 5 = 16$, since multiplication is given priority over addition. The calculator interprets $3 + 4 \times 2 + 5$ as $3 + (4 \times 2) + 5$, consistent with general mathematical practice.
5. Brackets are needed to give $(3 + 4)(2 + 5) = 49$. Notice that no multiplication sign is needed.

Interaction C

1. 235
2. $1\frac{13}{28}$, $\frac{41}{28}$.
3. -11. The rule only applies for multiplication and division.
4. $(2^3)^2$
5. 2 000 000, which is 2×10^6 . EXP is the key used to enter numbers in scientific notation.

Interaction D

1. Abs $8 - 12$ means $|8| - 12 = -4$, while Abs $(8 - 12)$ means $|8 - 12| = |-4| = 4$.
2. Int and Int g give the same result for positive numbers, but different results for some negative numbers. E.g., Int $(-4.5) = -4$, while Int g $(-4.5) = -5$.
3. ${}^{25}C_4 = 12\,650$.
4. Both are 21. There are many other pairs like this, e.g., ${}^7C_4 = {}^7C_3$ and ${}^9C_2 = {}^9C_7$.

Interaction E

1. $(-0.9)^2 - (-0.9) - 1 = 0.81 + 0.9 - 1 = 0.71$.
2. Both functions are tabulated.
3. MPA. Y1 values are not evenly spaced, but Y2 values are evenly spaced.
4. All values are 2.
5. The select command turns a function off and on. Notice that a function is not tabulated unless the equals sign is shaded.

Interaction F

1. $(2.1)^2 - 2.1 - 1 = 4.41 - 3.1 = 1.31$.
2. Both graphs are drawn on the same screen.
3. MPA, e.g. $y = -2$, $y = x - 3$, etc.
4. The graph will be drawn in the chosen colour.
5. MPA

