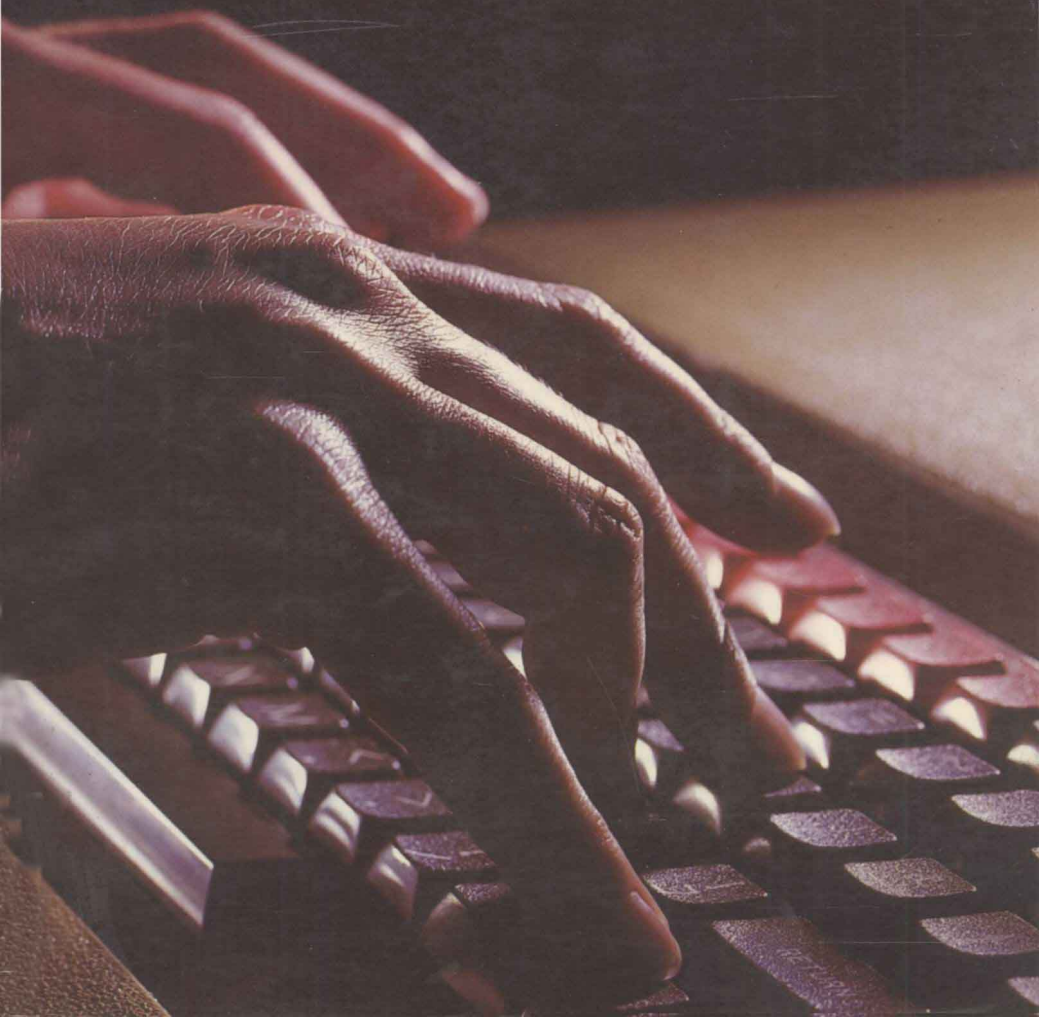


# The BBC Microcomputer for beginners

Seamus Dunn & Valerie Morgan



# THE BBC MICROCOMPUTER FOR BEGINNERS

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# PREFACE

This is a book with two purposes each of which supports and complements the other. The first is to teach the beginner how to write clear well-structured programs in the BASIC language; and the second is to ensure that the reader becomes familiar with all the facilities and characteristics of the BBC microcomputer.

The book emphasizes learning by doing. It should be read and used while sitting in front of the computer typing-in programs and instructions. It is not meant to be read by itself, independently. The contents have been tightly sequenced so that progress is made carefully and gradually with respect to each of the two purposes. However, any reader already familiar with the BASIC language could quickly use this knowledge to find out from this book how the various special characteristics of the BBC machine work.

Many books about BASIC are written either for large mainframe computers or are not designed for any particular machine or for any particular dialect of the BASIC language. This means that they can deal only with very general programming and are forced to leave out much that is specific and interesting. To some extent this means that the most important advantages of microcomputers are missed out. A machine like the BBC microcomputer allows the user not only the normal programming facilities but also a great variety of new sophisticated techniques, some of which arise from the way in which BASIC has been implemented, and some of which are to do with presentation, graphics, music and so on.

For these reasons, this book concentrates very carefully on bringing together the development of programming skills and the development of knowledge about the machine itself. In each chapter therefore new words and ideas related to programming and to some of the machine's special facilities (such as color, sound, graphics) are introduced and tried out.

The book has a total of fourteen chapters with exercises, and there are appendices containing summaries of data and information referred to in the book. Some of this information is hard to find elsewhere. The material can be used with either Model A or Model B of the machine.

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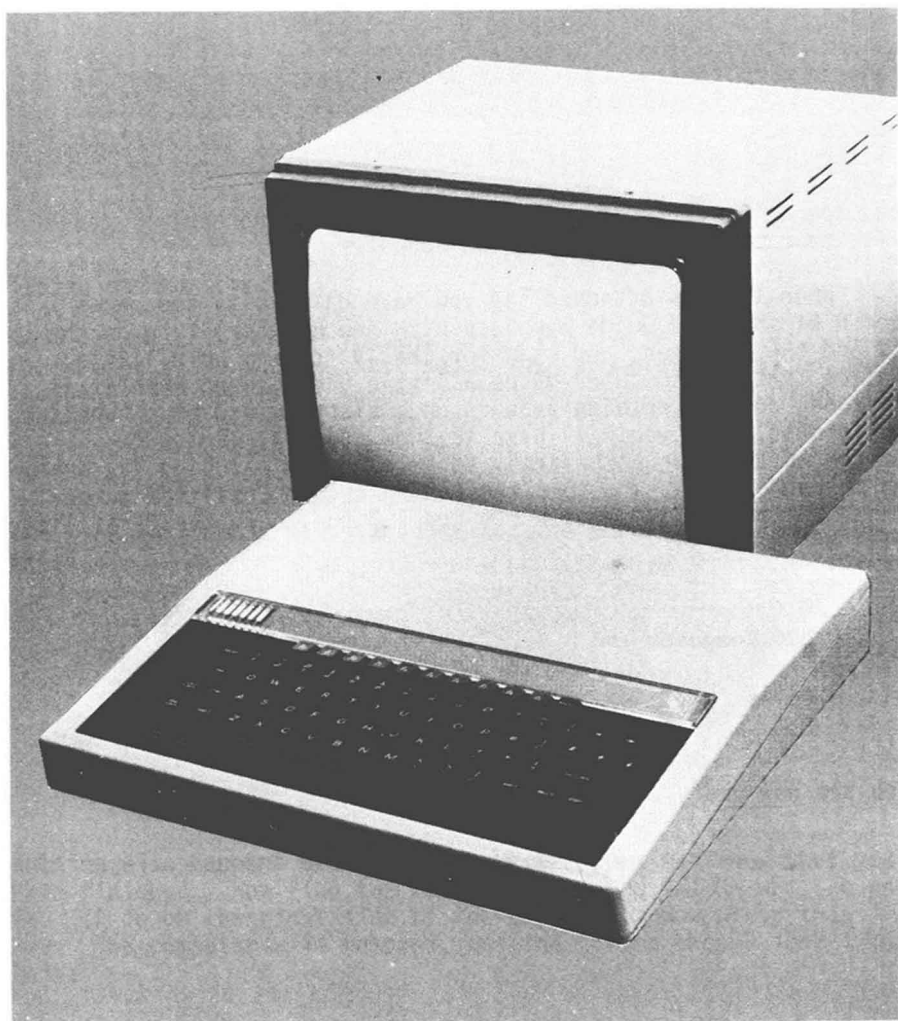
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# CHAPTER 1 BEGINNING





## Getting started

The BBC microcomputer is a small cream-colored box, rather like a typewriter but with nowhere to put the paper. The keys are all black except for a row of 10 red keys along the top. Above the keyboard on the right are the words 'BBC Microcomputer' followed by a dotted 'owl' motif. On the bottom left there are three red warning lights, with the words 'cassette motor', 'caps lock' and 'shift lock' above them.

At the back (left) a power line is attached which should be connected to a plug in the usual way, and plugged into a normal power socket. There is a rocker switch beside this, but do not switch this on as yet.

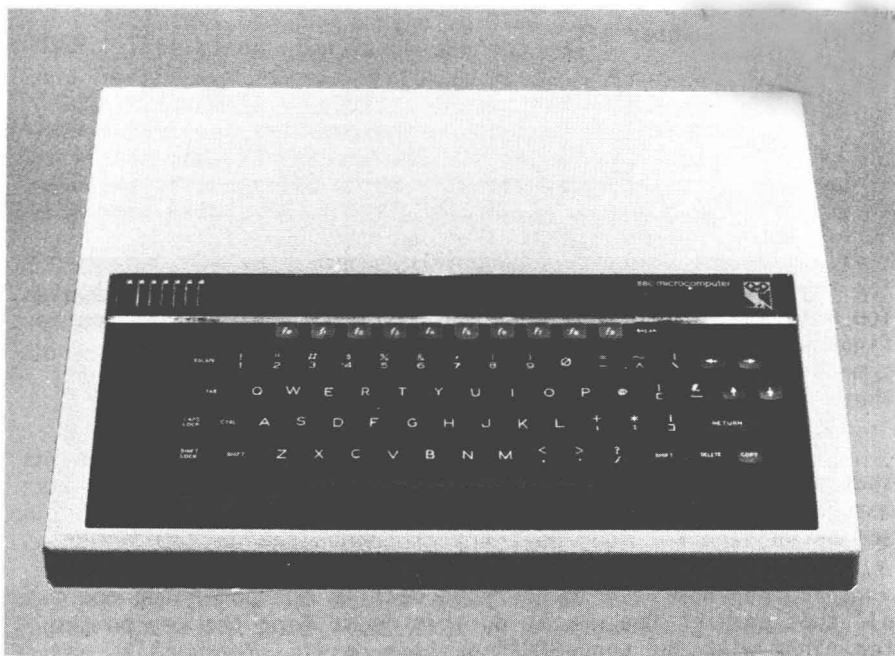
You now need a monitor or a TV set, preferably one that allows color, although this is not essential. This must be connected to the computer using a cable, one end of which is attached to the normal aerial input on a TV (or the corresponding input on a monitor) and the other end of which is attached either to the socket marked 'UHF out' or to the socket marked 'video out'. Both of these are at the back (right) of the computer. If you are using a TV then an appropriate cable will have been supplied with the computer.

When this is attached (if you have difficulty see pages 7 and 8 of the User Guide supplied with the machine) turn on the TV and the computer, and wait for the TV to warm up a little. Notice that the computer makes a little bleep sound when it is switched on. If nothing appears on the screen except a bubbling white mass, then you will have to tune your TV. Press the button on any channel unlikely to be used for watching TV, such as channel 6 or 7, and turn the tuning button until the screen looks something like this. (On model B the 16 on the first line will be 32).

```
.....  
: BBC Computer 16K  
:  
: BASIC  
: >  
:
```

You are now ready to begin.

## TYPING ON THE SCREEN



### Typing on the screen

We will now try to make you familiar with the keyboard by performing a few simple exercises. When you press a key on the computer, the letter or number written on the key appears on the screen. You must press the key and then let it go at once. A little flashing dash (or thin rectangle) on the screen indicates where the letter or number will appear. This flashing rectangle is called the CURSOR. To demonstrate this, type in the word DOG. When you have done so, the screen will look like this:

```
.....  
BBC Computer 16K
```

```
BASIC
```

```
>DOG_
```

Nothing else happens because the computer does not know that you have finished. Now find the key with the word RETURN written on it. It is on the right side of the keyboard. Now press this key. The computer will respond, and the screen should look like this:

```
.....  
BBC Computer 16K  
  
BASIC  
  
>DOG  
  
Mistake  
.>_
```

The key marked RETURN is the most important one on the computer. You must always press it when you wish to indicate that you have finished with your input and now wish the computer to do something. If you do not press it the computer will just sit there and do nothing.

In this case the response was the word Mistake which means that the computer did not recognize the word DOG as having any meaning for it. So the cursor has just moved onto the next line and is waiting for your next try at communication

You may now wish to go right back to the beginning and try all that again. One way to do this is to find the key on the top right with the word BREAK written on it. Press this, and the screen will now look almost exactly as it did when you first switched on. This is a very dangerous key and we mention it here mainly to make you aware of the danger. It has more or less the same effect as switching off and then switching on again. Obviously on most occasions it will not be wise to use this key.

Try typing in some other words, and remember to press RETURN after each. See if you can find a word which the computer recognizes. It is virtually impossible to damage the machine by pressing the keys.

Now try typing in a number. For example, when 45 is typed in, and the RETURN key pressed, the screen looks like this. (It does not exactly look like this, since we have been typing in other words, but we are just showing you the bit of the screen that we wish to talk about).

```
.....  
.>45  
.>_
```

This time the word Mistake does not appear. The computer does not reject this number, but it does not do anything obvious with it either. Try other things with numbers. It may work like

some calculators, so try something like 7-3 and then press RETURN. (The minus sign is on the top row).

Again there is no obvious answer and no Mistake message. We obviously need to learn the words that the computer understands and can respond to. It has a very limited vocabulary of about 120 words. The first of these to consider is the word PRINT.

### The word PRINT

Type in the word PRINT followed by a number, like this: PRINT 48. Then press RETURN. The screen will look like this.

```
.....  
: >PRINT 48  
:           48  
: >-  
:
```

There are two things to notice about this. First, the computer has, for the first time, done exactly what we asked it to do. That is it has printed the number 48 on the next line. It has then gone on to the next line and is waiting for the next instruction.

The second thing to notice is that it has printed 48, not at the beginning of the line, but out about 10 columns. It will always do this with numbers. To demonstrate this, type in PRINT 3 and press RETURN. The 3 will be printed on the same column as the 8 of 48. This is the tenth column out from the left. The computer will print any number in such a way that its last digit appears on this tenth column. Check this by typing in some other numbers and pressing RETURN. Like this:

PRINT 1341	and press RETURN
PRINT 78932	and press RETURN
PRINT 134.6	and press RETURN

We now wish to use this word PRINT to get the computer to do some arithmetic. We will begin with addition, and suppose that we want the answer to 4+3.

Type in PRINT and then press the key with 4 on it. Then press the key with + on it. The result will be as follows:

```
.....  
: > PRINT 4;  
:  
:
```

That is the semicolon has appeared on the screen, instead of the plus. Notice that both the semicolon and the plus are written on the same key. When you simply press it, you get the semicolon. To get the plus you must use the SHIFT key. There are two of these, one on the left and one on the right of the bottom row of keys.

### DELETE and SHIFT

First, however, we must get rid of the semicolon. To do this we use the DELETE key. This is on the bottom right side of the keyboard. Press it once. The result will be that the cursor moves back one place and wipes out the semicolon.

Now put one finger on the SHIFT key and hold it down. Then press the key with both the plus and the semicolon on it, and let go of both keys. This should produce a plus on the screen. If it does not, use the DELETE key and try again. Remember that you must HOLD the SHIFT key down while pressing the other one. Now press the 3 key and then press RETURN. The result is as follows:

```

.....
: >PRINT 4+3
:                                     7
: >-
:

```

To demonstrate this further, let us make some more mistakes. Suppose that we wished to type PRINT 13+4. Type in PRINT 13. Now type in 4567; so that the screen looks like this:

```

.....
: >PRINT 134567;_
:

```

Then press the DELETE key to remove the semicolon. Then press it again to get rid of the 7. Then press it again, and continue to press it until only PRINT 13 remains on the screen. Then hold the shift key and press + as before. Then let go both keys. Then press 4 and then RETURN. The result will be 17.

These keys, the DELETE key and the two SHIFT keys, are very important. If at any time you make a mistake on the screen, you can always use the DELETE key to go back and correct it. When you wish to use any of the keys with two symbols, the top symbol can only be printed by holding one of the SHIFT keys.

**Doing arithmetic**

We now know how to do addition on the computer. Subtraction is done in exactly the same way. Try a few more examples like these. Remember to press the RETURN key when you want the answer.

```
PRINT 25 + 30
PRINT 17 - 11
PRINT 23 + 18 - 16
```

The multiplication sign is the star which is on the same key as the colon. To use it you must use the SHIFT key. Now try some multiplication problems, like these:

```
PRINT 5 * 7
PRINT 8 * 3 - 5
PRINT 3 * (8 + 4)
```

Notice that, in this last one we used the brackets to enclose the sum of 8 and 4. This means that we are multiplying together 3 and 12, so the answer should be 36. There are two mistakes you might make here. First, you might leave out the brackets. Type it in, as follows:

```
PRINT 3 * 8 + 4
```

and press RETURN. This time the answer is 28. That is, three and eight are multiplied together, and four is added to the result. The other mistake is to leave out the multiplication sign, that is the star. Type this in:

```
PRINT 3(8 + 4)
```

and press RETURN. The screen looks like this:

```
.....
|>PRINT 3(8 + 4)
|          3      12
|>_
|
|
```

That is, the computer has treated this as two problems. First PRINT 3 and then PRINT 8+4. So it is most important not to leave out the multiplication sign.

The sign for division is the slash line on the same key as the question mark. It looks like this /. Try some examples; remember to press RETURN after each.

```
PRINT 12/3
PRINT 20/4
PRINT 17/8
```

Finally, try some more complicated problems using a variety of operations. Remember that if you wish to ensure that a particular operation is done first, put brackets round it. Here is an example:

```
PRINT 3 + 5 * (6 - 2)
```

The computer will calculate  $6-2$  first, to get 4. It will then multiply this by 5 to get 20, because multiplication is done before addition. Finally, it will add 3 to get 23. To summarise this the symbols used in arithmetic are:

```
+ add
- subtract
* multiply
/ divide
```

The order in which these are performed is:

- (a) Any operations put inside brackets are done first.
- (b) If there are brackets within brackets, the inside ones are cleared first.
- (c) The arithmetical operations are then performed in this order: multiplication and division first, then addition and subtraction.

### The red keys

Later on in this book there will be a section on the ten red special-function keys along the top of the keyboard. We will, however, use one of them now just to demonstrate the idea. They are labelled  $f_0$ ,  $f_1$ , and so on up to  $f_9$ . We will use the first one labelled  $f_0$ . ( $f$  is short for function).

The first word in the computer's vocabulary that we have met is the word PRINT. Since we have to use this a great deal it would be handy if we could type it by just pressing a single key. Type in the following line carefully. Don't worry for the moment about what it means. The symbol 0 after the word KEY represents the numeral zero and is on the second row of the keyboard. There it appears with a stroke across it. It must not be confused with the letter O which is just below it on the keyboard.

```
* KEY 0 PRINT
```

Now press the key marked RETURN. The red key f0 has now been programmed. We can now use it as follows. Suppose that we wished to type in

PRINT 35 \* 4

First, press the red key f0. Immediately the word PRINT will appear on the screen. Then type in the rest of calculation and press RETURN. This means that each time you wish to use the word print, just press the key f0.

Look at the line again. The star and the word KEY tell the computer that we are about to 'program' one of the special-function f keys. The zero, in this case, tells it which of the f keys we are referring to. The word after this is the statement or command that will now be associated with that key.

If you switch the machine off and then on again, you will have lost this facility and will have to type it in again. However, using the BREAK key does not remove it.

### PRINT with words

We now know how to use PRINT with numbers to do calculations. We must now try to print letters and words. Type in PRINT A. (Remember to use your f0 key). Now press RETURN. The result is as follows:

```
.....  
.....  
.....> PRINT A
```

```
.....No such variable
```

```
.....>  
....._
```

Try some other letters, or even words. For example, try PRINT PRINT by pressing f0 twice and then pressing RETURN. The same message, 'No such variable', will appear each time. This is because nearly all letters or words represent variables for the computer. You can think of a variable as the name or the title of a unit of memory inside the machine. This unit of memory is then used to store a number in. The variable does not exist until it has a number stored in it, and so, in this case we get this message "No such variable". (There will be much more about variables and their meaning later on Page 32).

Now try this again, only this time put quotation marks around the word or letter that you wish to print. Here is an example. It shows what happens when you type in PRINT "BBC" and press RETURN.



```

>PRINT "BBC"
BBC
>_

```

So, the computer will print exactly what it finds inside quotation marks. Try a line containing some of the other symbols as well as letters:

```

>PRINT "* & 6 ARE SYMBOLS"
* ! & 6 ARE SYMBOLS
>

```

Notice also that, unlike numbers, material inside quotation marks is printed starting on the column on the extreme left of the screen. If you type in a long sentence you will, after forty characters, reach the edge of the screen. You can however keep on typing in material onto the next line and the computer will accept both lines as one.

You can now combine material of this kind with number calculations. Here is an example:

```

>PRINT "THE SUM OF 3 AND 4 IS" 3+4
THE SUM OF 3 AND 4 IS          7
_

```

Notice that the words and numbers inside the quotation marks appear in the result exactly as printed; but the actual calculation of  $3+4$  is left outside the quotation marks and so this is performed and becomes 7. You could get further insight into this by typing in the following, and pressing RETURN.

```
PRINT "THE SUM OF 3 AND 4 IS 3+4"
```

This time everything is put inside quotation marks, and so the actual calculation is not performed. Do some more examples like this and think about the difference.

## Drawing and color

The BBC microcomputer has very good drawing and color facilities. We will develop these ideas a little at a time as we go through the book without always going into a lot of detail especially at the beginning.