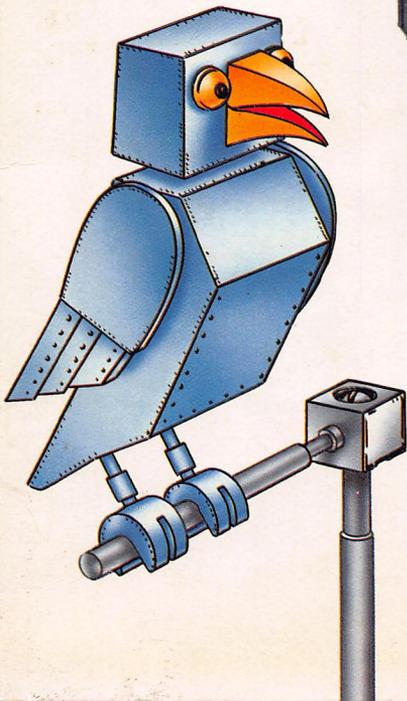
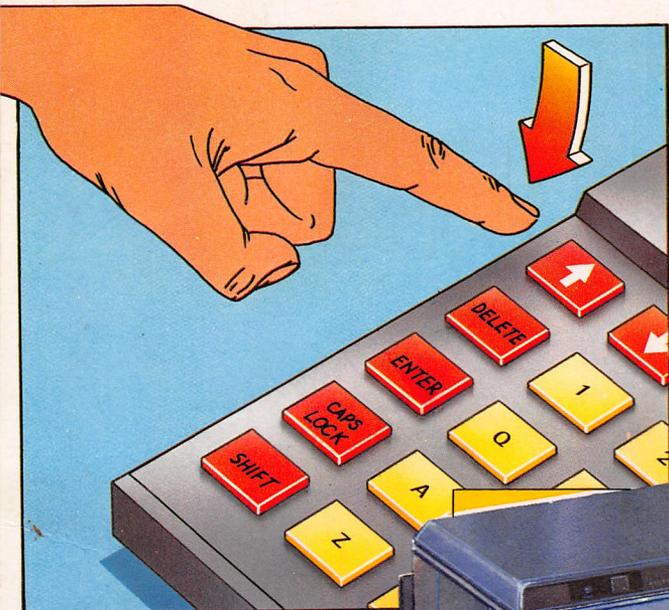


# USING THE COMPUTER

A BEGINNER'S  
GUIDE TO  
THE MICROCOMPUTER





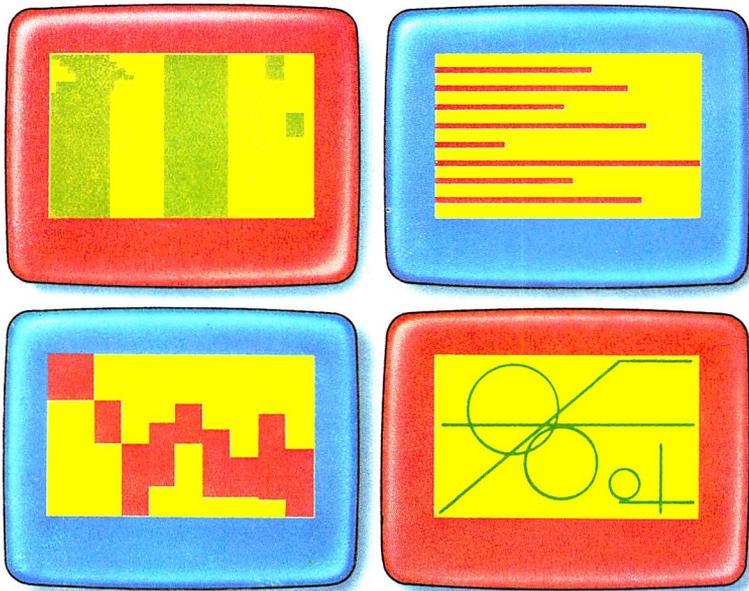
  
**ACTION  
SCIENCE**

# **USING THE COMPUTER**

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**Neil Ardley**

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**London New York Toronto Sydney**

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© 1983 Franklin Watts Ltd  
First published in Great  
Britain in 1983  
by Franklin Watts Ltd  
12a Golden Square  
London W1

Reprinted 1983

First published in the United  
States of America by  
Franklin Watts Inc.  
387 Park Avenue South  
New York  
N.Y. 10016

Printed in Belgium

UK edition:  
ISBN 0 86313 022 4  
UK paperback edition:  
ISBN 0 86313 068 2  
US edition:  
ISBN 0-531-04518-8  
Library of Congress  
Catalog Card Number:  
82-51007

**Designed by**  
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**Illustrated by** Janos Marffy,  
Hayward Art Group and  
Arthur Tims

# **USING THE COMPUTER**

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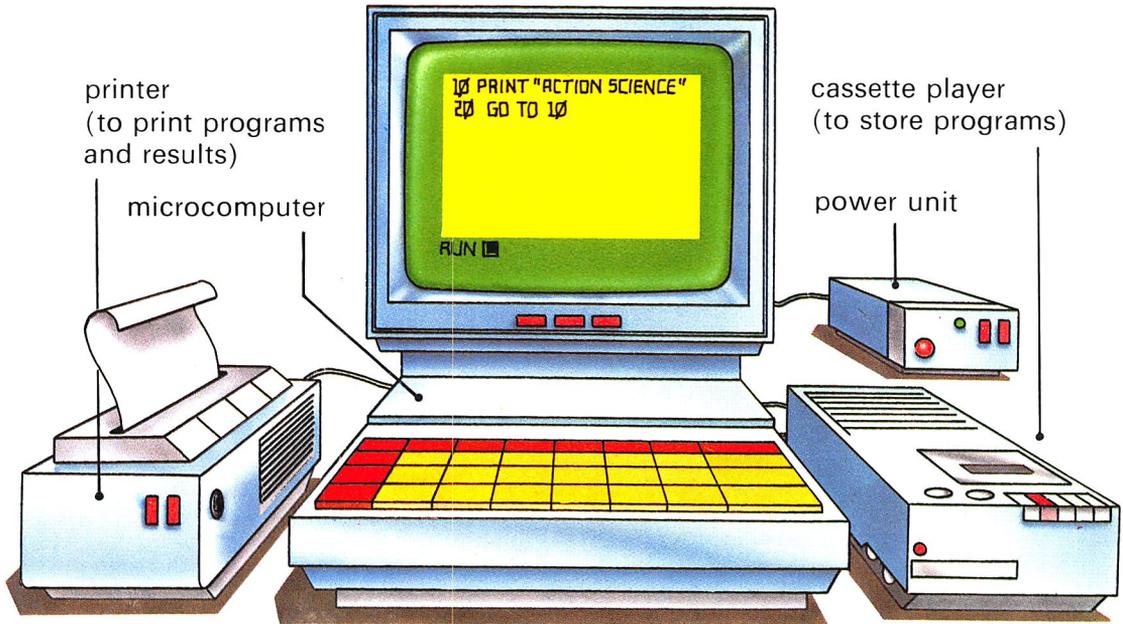
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# Equipment

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To carry out the activities in this book, you will need a microcomputer. This may be plugged directly into the mains supply of electricity, or it may need to be connected to a power unit that is plugged into the mains. The power unit should be supplied with the microcomputer if it is needed. The microcomputer may have its own screen. If not, it must be connected to a television set. A lead for connecting the computer to the television set should be supplied with the computer. If in doubt, consult the instruction manual supplied with the computer.

---

# ***Introduction***

---

The computer is the marvel of our age. This amazing machine can do a million calculations in the blink of an eyelid or play games at superhuman levels of skill. Yet it is our servant, a machine that will obey our every command.

To use the computer, we have to speak its language, and then it will speak ours in return. Most kinds of microcomputers use a simple language called BASIC and this book explains how to talk to a computer in this language and make it do things. It gives several interesting and entertaining activities that demonstrate the ways in which the computer works.

Before starting, get to know how to operate the keyboard of your computer. Make sure you know how to use the key marked **DELETE** or **RUBOUT** to change letters, numbers or signs. This will save you from making a lot of mistakes. If something goes wrong and you cannot find your mistake, turn to 'Tips and troubles' on page 30.

 This symbol appears throughout the book. It shows you where to find the explanation of the way in which the program works.

# Switching on

**Plug in and get the computer ready for action.**

Adjust the tuning control to get a sharp picture.



Be sure to push all the leads in firmly.

## Cables and connections

Some microcomputers have a video screen and are ready for action as soon as you switch them on. But to use many microcomputers, you have to connect them to a television set.

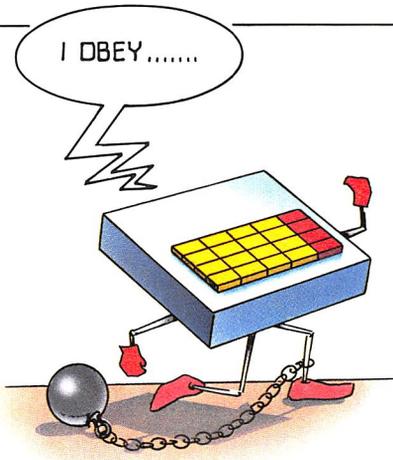
Take out the aerial cable at the back of the television set, and insert the cable that connects it to the computer. Switch on the computer and the television set, but turn down the sound. Choose one of the tuning controls on the television set and adjust it until you get a picture from the computer. You should see a blank screen with a sign in one corner. The computer is now ready for action. You may need to adjust the tuning control again later to keep the picture sharp.

✱ A computer has to be given commands, or instructions, and information such as numbers or words. It then obeys the commands or instructions, which tell it to produce certain results from the information. Computers have a screen so that the people using them can see the commands and information they give to the computer. The screen also displays the results that the computer produces.



△ You can get a colour picture with a micro-computer and a television set, but the set must be a colour television set **and** the computer must be a colour computer. If not, the picture will be in black and white. With a colour computer, you have to use special colour commands to get the colours to appear.

# Commanding the computer



△ The computer will do nothing until you give it an instruction to work. Then it will obey your instruction and carry it out. The instruction has to begin with a command such as **PRINT** that the computer can understand.

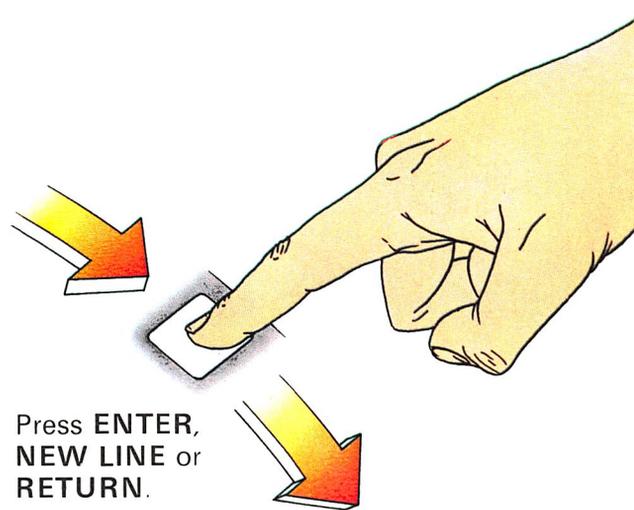
**The computer is your servant. Make it obey your commands.**

## Number cruncher

The computer is good at handling numbers, so ask it to do some arithmetic for you. It can easily solve very difficult problems, but let's give it a simple task to find out how to make it work. You give the computer a command by pressing the keys on its keyboard. On some computers you can do this by pressing a single key for each command. On others you have to type every letter in the command separately.

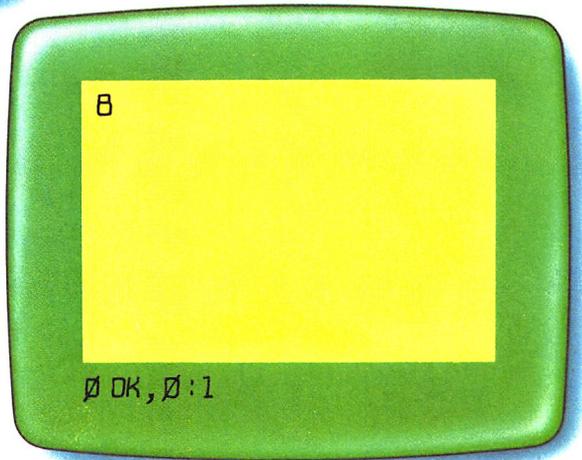
You will need to see a result, so ask the computer to get ready to display something on the screen. You do this by operating the keyboard to give the command **PRINT**. This is called *entering* a command. See that **PRINT** appears on the screen as you enter it.

Now press more keys to give the computer the problem you wish it to solve. Enter  $6 + 2$  so that the screen shows **PRINT**  $6 + 2$ . This is an instruction to the computer to add up 6 and 2 and then display the result on the screen. To make the computer obey an instruction, you press the key marked **NEW LINE**,



Press **ENTER**,  
**NEW LINE** or  
**RETURN**.

△ As you press the keys, a sign called the cursor moves ahead of the numbers and letters. It shows you where the next one will appear. On this computer, the cursor looks like an L.



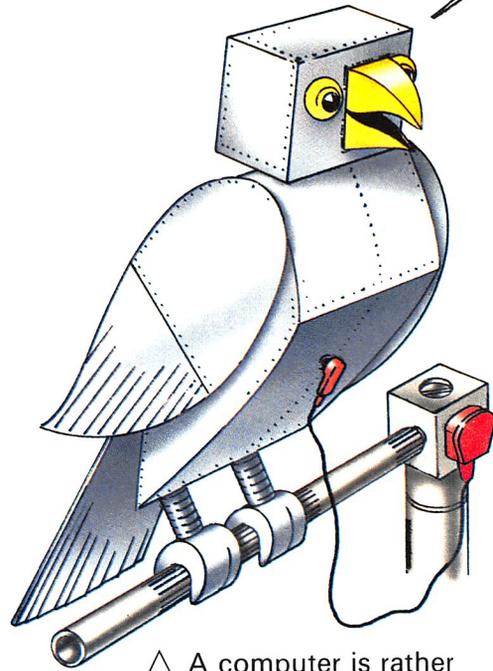
**RETURN** or **ENTER** (its name depends on which computer you have). The computer immediately adds up the numbers and the result 8 appears on the screen.

✱ Just as the computer obeys the plus sign (+) as a command to add, it obeys the minus sign (−) as a command to subtract. But to multiply numbers, you must enter \* and *not* ×. And to divide, you must enter / as there is no ÷ sign. So the instruction **PRINT 6−2** displays 4; **PRINT 6\*2** displays 12; and **PRINT 6/2** displays 3.

△ When the computer has obeyed your instruction and produced a result, a report may appear on the screen. On this computer the report is Ø OK, Ø:1, which means that the computer has found no mistakes in the instruction and has carried it out. If you do make a mistake, the report may tell you what it is.

# Making a display

... PIECES  
OF EIGHT ...



△ A computer is rather like a robot parrot. A real parrot can be taught to say any words you like, but it does not understand them. The computer can also be made to show anything you want it to, even nonsense. It simply does what it is told without thinking about it in any way.

The computer can handle letters, words, sentences and signs as easily as numbers.

## Robot parrot

Enter this instruction.

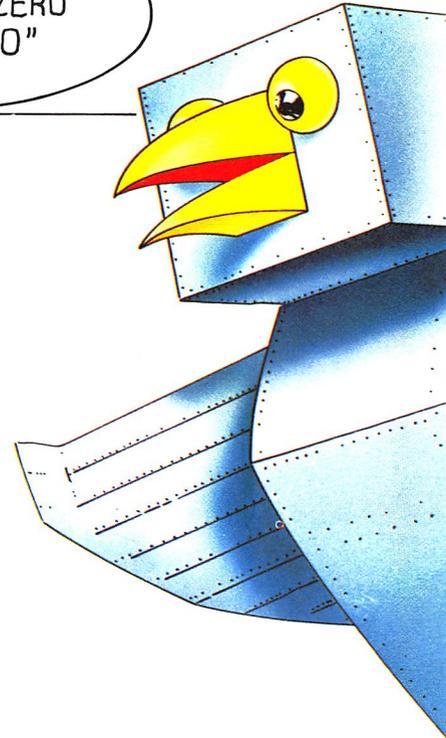
**PRINT** "THE TIME NOW IS 9:52."

Press the letter, number, sign and space keys, then press **NEW LINE**, **RETURN** or **ENTER**. The sentence THE TIME NOW IS 9:52. appears on the screen.

✱ The computer displays all the letters, numbers, signs, punctuation marks and spaces between the quote marks or inverted commas (" ") **exactly** as they appear in the instruction. You can make anything you like appear on the screen, but you must place quote marks before and after it when you instruct the computer.

Notice that the computer does not tell you the correct time or make any calculations with the words and numbers it displays. You could instruct it to display nonsense, for example, THE TIME NOW IS 13:62, or  $2 + 2 = 5$ . It would obey you, provided quote marks are placed around the nonsense in the instruction.

DON'T FORGET...  
∅ = NUMBER ZERO  
O = LETTER "O"



## Dividing the date

Ask the computer to show today's date – say 12/1/83. Enter **PRINT** 12/1/83 and display the result (press **NEW LINE**, **RETURN** or **ENTER**). You get a long number like ∅.14457831! What's gone wrong?

✦ You forgot to put quote marks around the date, so the computer thought you were asking it to divide the numbers. Instead you should enter **PRINT** "12/1/83".

△ With computers, you have to press the key marked ∅ to enter the number zero or nought. The letter O is given by the key marked O.



# Build a program



△ The program appears as a list of commands with numbers. These numbers usually go in tens to leave room for any extra lines in case they are needed later. Entering **RUN** gets the computer ready to obey the commands in order.

The computer will obey in order a list of commands called a program.

## The name's the same

Enter these two commands, pressing **NEW LINE**, **RETURN** or **ENTER** after each one. Put your own name in quotes where it says NAME.

```
10 PRINT "NAME"  
20 GOTO 10
```

These two commands make up a two-line program. Make the computer *run* the program (carry out the commands). Type or press **RUN** and then **NEW LINE**, **RETURN** or **ENTER**. Your name appears in a column down the screen.

★ When the computer runs a program, it carries out the commands in each line in the order of the line numbers. Line 10 tells the computer to display your name. Then it goes to line 20. The command **GOTO 10** means *go to line 10*, so it displays your name again at the next line on the screen. Then the computer reaches line 20 again and goes back yet again to line 10. It does this over and over again until your name appears in every line.



### Pattern making

Enter and run this program. Be sure to include a space after your name and before the quote marks, and to enter a semicolon (;) after the quote marks.

```
1Ø PRINT "NAME ";  
2Ø GOTO 1Ø
```

Your name builds up in a pattern all over the screen!

✱ A semicolon (;) instructs the computer to place the names next to each other on the screen instead of on separate lines. Each name is separated by the spaces included within the quote marks.

△ You can have a lot of fun making the computer display a pattern of words all over the screen. Run the program again but with two or more spaces instead of one to get a different pattern. If the pattern keeps moving up the screen, you may be able to press **ESCAPE** to stop it.

# Loopy computer

**Make the computer keep on changing its mind!**

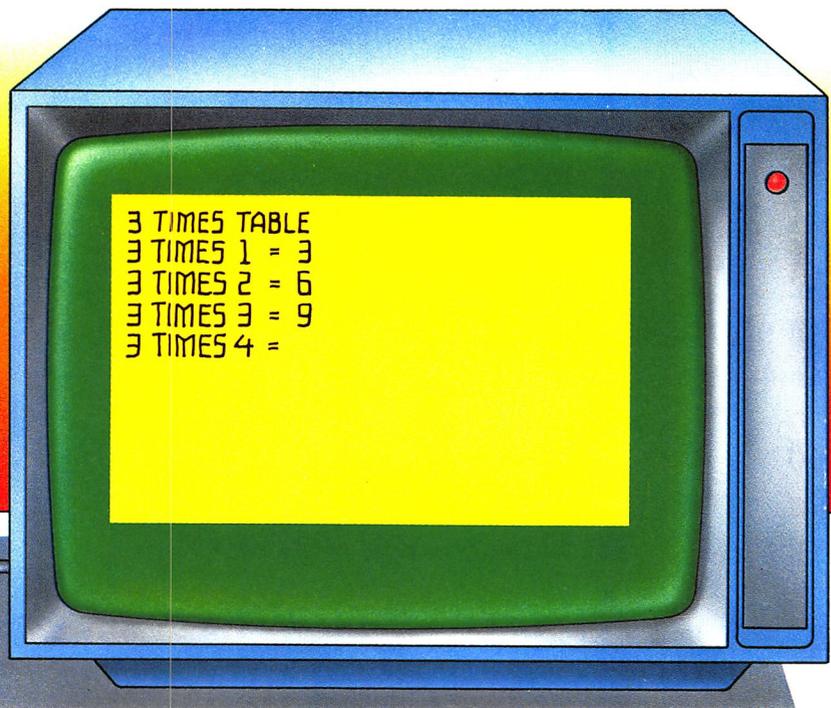
▽ This computer is running the program shown on this page. It has got to the part of the loop where X is equal to 4. In fact, you would not see this happen because the computer runs the program so fast that the table appears almost instantly.

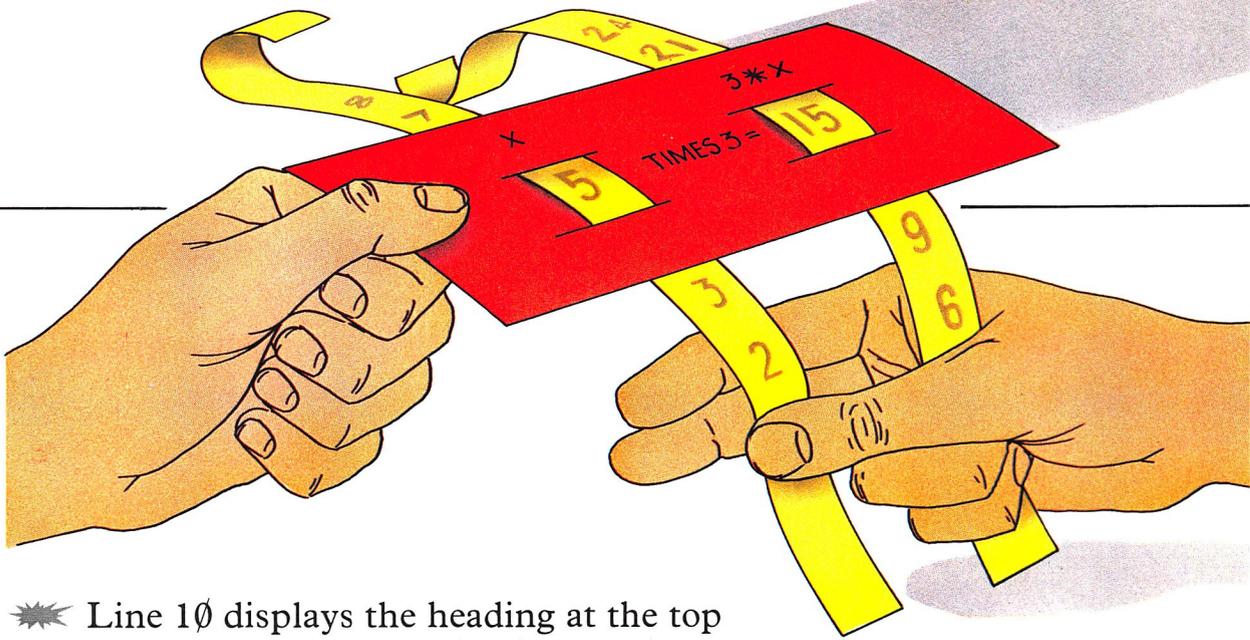
## Three times table

Enter and run this program.

```
10 PRINT "3 TIMES TABLE"  
20 FOR X=1 TO 12  
30 PRINT "3 TIMES ";X;" = ";3*X  
40 NEXT X
```

The computer prints out the three times table for you.



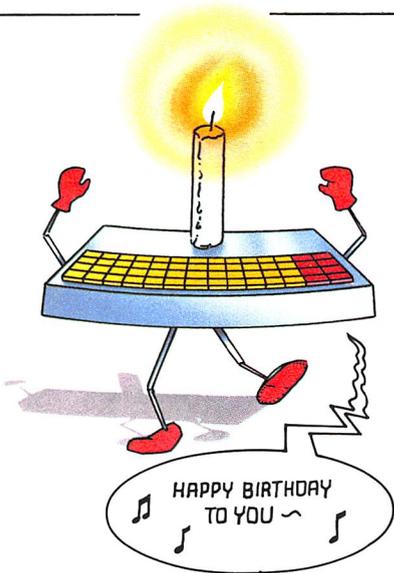


✦ Line 10 displays the heading at the top of the screen. Now, lines 20, 30 and 40 form what is called a *loop*. The computer goes round this loop 12 times, changing its mind each time. First it displays 3 TIMES 1 = 3, then 3 TIMES 2 = 6, and so on up to 3 TIMES 12 = 36. The commands that make it do this are **FOR** and **TO** in line 20 and **NEXT** in line 40. X is a letter that stands for a number which will change every time the computer goes round the loop. Any letter will do in fact. The first time the computer gets to line 20, X is equal to 1. This means that line 30 will display 3 TIMES 1 = and then the result of 3 \* 1, which is 3. See how semicolons and spaces are used in this line to space out the words and letters. Then the computer goes to line 40, which simply instructs it to go back around the loop, but this time make X equal to 2. This continues until it reaches the highest value of X, which is 12.

Can you display a 999 times table?

△ You can see how the loop works with two strips of paper marked with the numbers in the table. Pulling them through the slots makes the numbers appear in the same way as the computer works them out and displays them

# Computer talk



You can talk to the computer and it will reply and tell you things!

## Happy birthday

Enter this program.

```
10 PRINT "WHAT IS YOUR NAME?"
20 INPUT N$
30 PRINT "HELLO, ";N$
40 PRINT "IN WHICH YEAR WERE YOU
   BORN?"
50 INPUT Y
60 PRINT "YOUR ";1983 - Y;"TH
   BIRTHDAY IS THIS YEAR, ";N$
```

Change 1983 in line 60 to the correct year if it is not 1983.

When you run this program, the question **WHAT IS YOUR NAME?** first appears on the screen. Enter your name by spelling it on the keyboard and then pressing **NEW LINE, RETURN** or **ENTER**.

The computer then says hello to you and asks you **IN WHICH YEAR WERE YOU BORN?**

Enter the year of your birth in the same way as you entered your name. The computer then tells you which birthday you are celebrating this year.



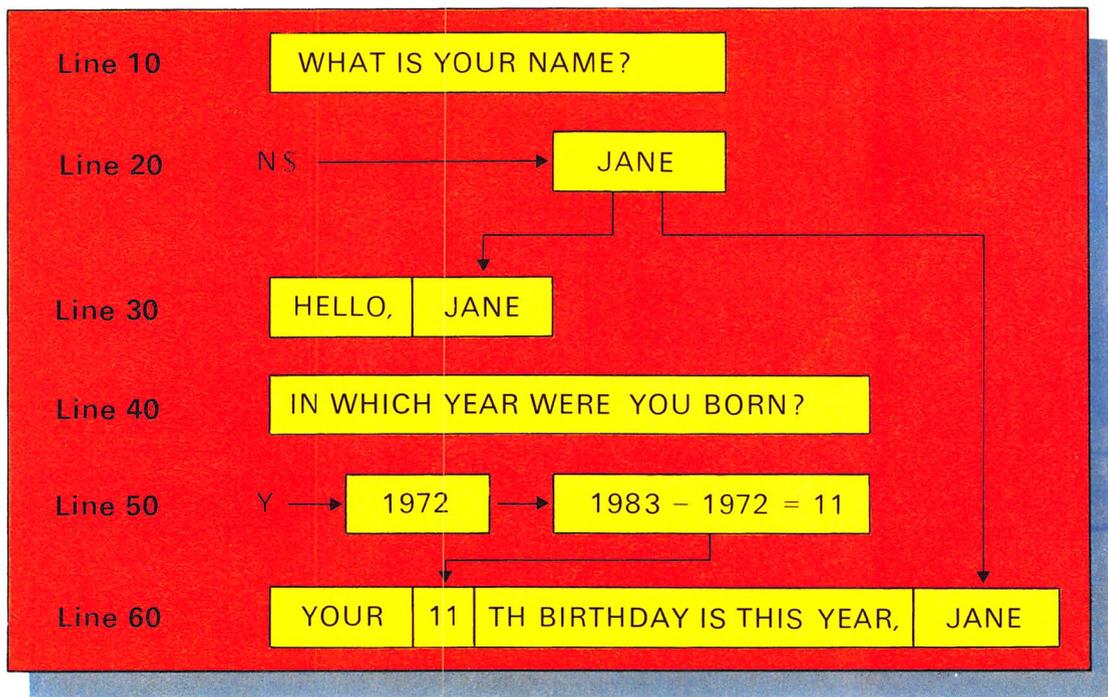
✦ With this program, you use the command **INPUT** to feed words and numbers into the computer and it then uses them to complete sentences. Line 10 first displays the question **WHAT IS YOUR NAME?** **INPUT** in line 20 means the same as *put in*. It makes the computer ready to be told any name, and **N\$** stands for the word or words in the name. Any letter could be used instead of **N** but **\$** must be placed after it. The **\$** sign is called *string*, not dollars. When your name has been entered, the computer goes on to the next

△ Jane has just entered her name into the computer, which remembers it. Using **INPUT** makes it remember words or numbers. But if you run the program again, the computer forgets this word or number and remembers the new one that is entered instead.

## Computer talk continued

▽ This is how the program shown on page 16 works. In this case, the name is JANE and she was born in 1972. The computer remembers JANE whenever N\$ is used in the program, and 1972 whenever Y is used. It subtracts 1972 from 1983 to get 11, and so tells us that Jane's 11th birthday is this year.

line. It displays the words between quote marks (HELLO, ) and then the word or words that N\$ stands for – that is, your name. In the same way, Y in line 50 stands for the year in which you were born. As this is a number and does not contain any letters, it does not need \$. In line 60, the computer calculates your age by subtracting the year of your birth from this year (1983 – Y), and it then places this number together with your name in the last sentence that appears on the screen.



# What happens if...?

Tell the computer to make a decision on what is going to happen next.

## I Spy

With this program, you can play I Spy with some friends.

```
10 PRINT "CHOOSE A LETTER"  
20 INPUT A$  
30 PRINT "CHOOSE A WORD  
   BEGINNING WITH ";A$  
40 INPUT B$  
45 CLS  
50 PRINT "I SPY WITH MY LITTLE  
   EYE"  
60 PRINT "SOMETHING BEGINNING  
   WITH ";A$  
70 INPUT C$  
80 IF C$=B$ THEN GOTO 110  
90 PRINT "NO, NOT ";C$;" . TRY  
   AGAIN."  
100 GOTO 70  
110 PRINT C$;" IS CORRECT."
```

When you run this program, the computer first asks you to choose a letter. Enter any letter (and press **NEW LINE**, **RETURN** or **ENTER**). The computer next asks you to choose a word beginning with this letter. Enter this word without letting your friends





△ When you play this game, make sure that you spell correctly the word which is being guessed. If you do not, the computer will compare a guess that has the correct spelling with the first word and tell you that the guess is wrong. For the same reason, make sure that your guesses have the correct spelling too.

see the screen or the keyboard. The computer now asks your friends to guess which word you have entered. They enter their guesses and the computer tells them whether they are right or wrong. To play again, type or press **RUN** and then **NEW LINE, RETURN** or **ENTER**.

With some computers, **GOTO** need not be entered after **THEN**.

✦ A\$ stands for the first letter of the word you choose, and B\$ for the whole word. C\$ stands for any guess that is made. When the computer gets to line 8Ø, it looks at both B\$ and C\$, which are in its memory. If these words are exactly the same (**IF B\$ = C\$**), then the computer goes to line 11Ø (**THEN GOTO 11Ø** or **THEN 11Ø**). This line tells the computer to inform you that the guess is correct. But if the two

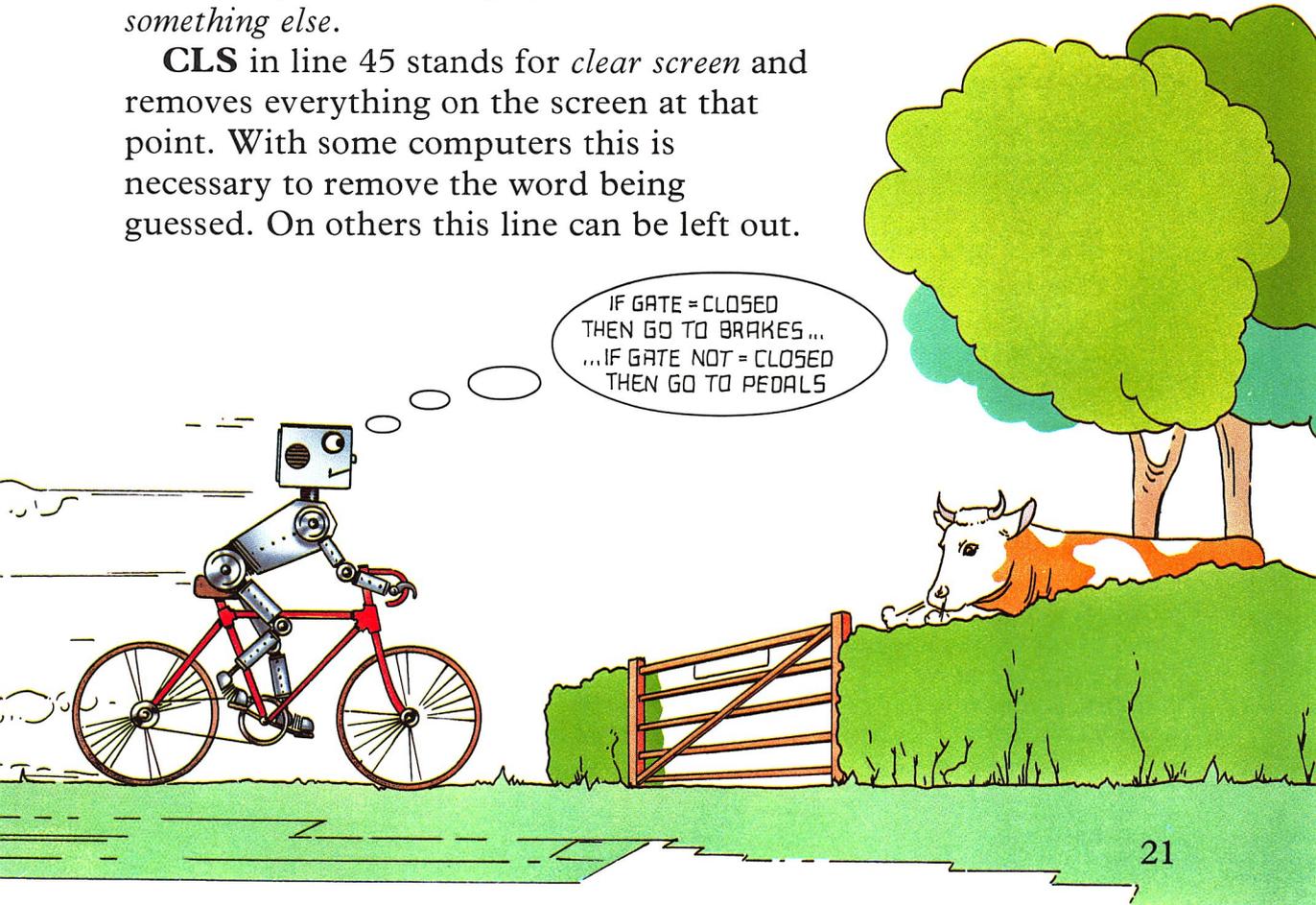
## What happens if...? continued

words are not the same, then the computer skips line 80 and goes to line 90. This tells it to inform you that the guess is not correct and to try again. The computer then goes back to line 70 and waits for another guess (a new C\$) to be entered.

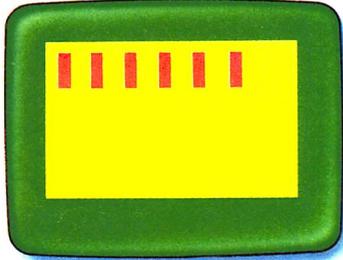
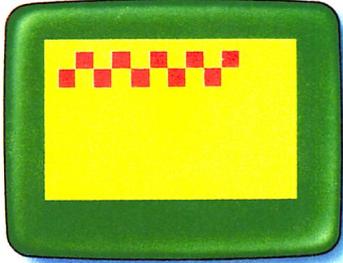
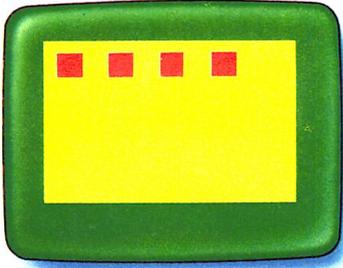
The command **IF** followed by **THEN** enables the computer to make a decision. It always takes the form *If this is right, then do that; but if this is not right, then do something else.*

**CLS** in line 45 stands for *clear screen* and removes everything on the screen at that point. With some computers this is necessary to remove the word being guessed. On others this line can be left out.

▽ This is how an **IF-THEN** command works. If the gate is closed, then the robot must use the brakes to stop crashing into the gate. But if the gate is not closed, then he must use the pedals to get away from the bull.



# Charts and chequers



Use computer graphics to draw patterns.

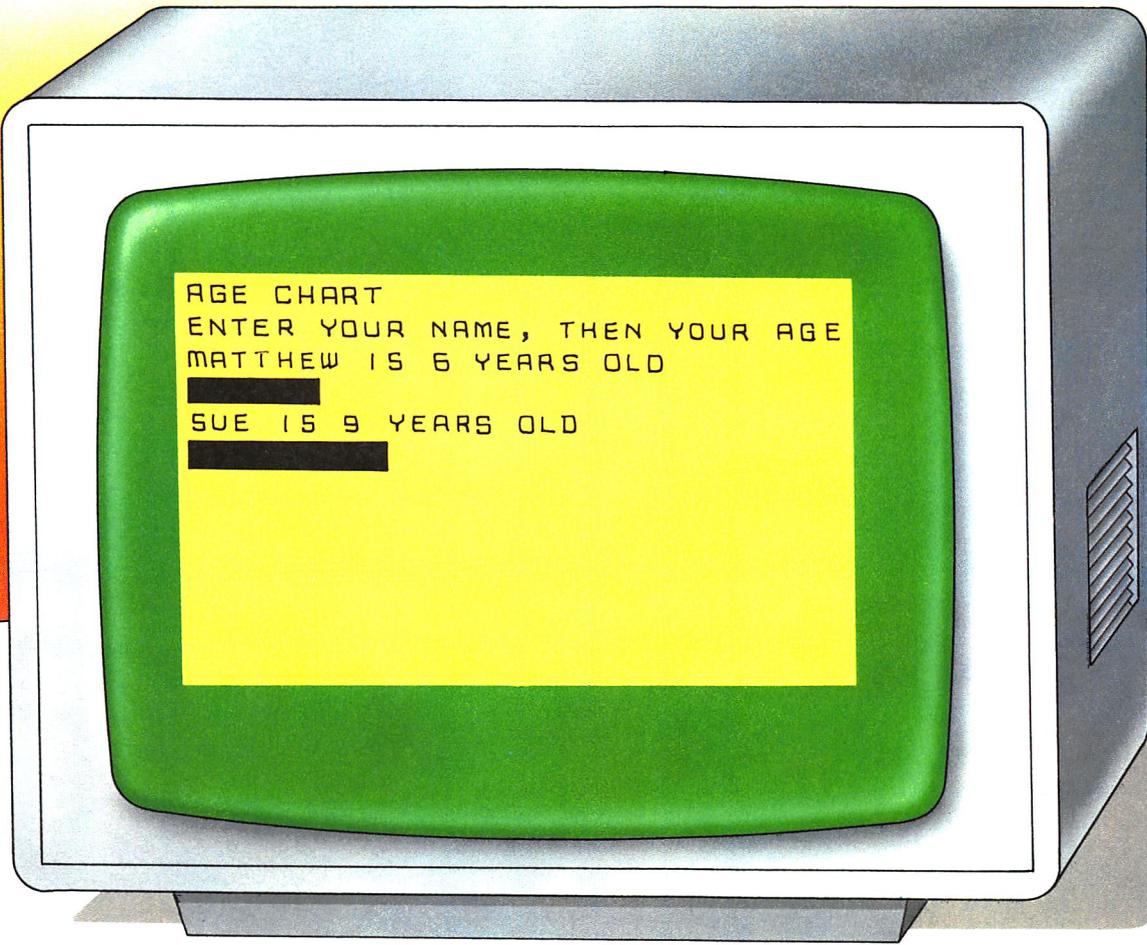
## Age bars

This program displays the ages of people as bars on a chart. In line 70, enter the graphics character that displays a square.

```
10 PRINT "AGE CHART"  
20 PRINT "ENTER YOUR NAME, THEN  
   YOUR AGE"  
30 INPUT N$  
40 INPUT A  
50 PRINT N$;" IS ";A;" YEARS  
60 FOR X=1 TO A  
70 PRINT "■";  
80 NEXT X  
90 PRINT  
100 GOTO 30
```

The computer first asks you to enter your name, then your age. Type your name and press **NEW LINE**, **RETURN** or **ENTER**. Then do this again with your age. Use a number, for example 12 not TWELVE. After displaying your name and age in years, the computer then shows your age as a bar. Enter the names and ages of the other members of your family to build up a chart of their ages.

△ Most microcomputers have graphics characters that are made up of patterns of small squares. These screens show how three of these characters can be used to draw patterns across the screen.



On some computers, there are no graphics characters. Use a sign such as \* instead. Alternatively, you may be able to enter **CHR**\$ and a number instead of “■”.

✱ **N**\$ stands for each person’s name and **A** for their age. The loop in lines 60, 70 and 80 displays a bar that is made up of a number of squares equal to **A** placed next to each other. **PRINT** alone in line 90 sends the computer to the next line without displaying anything, and line 100 makes the computer ready for the next person.

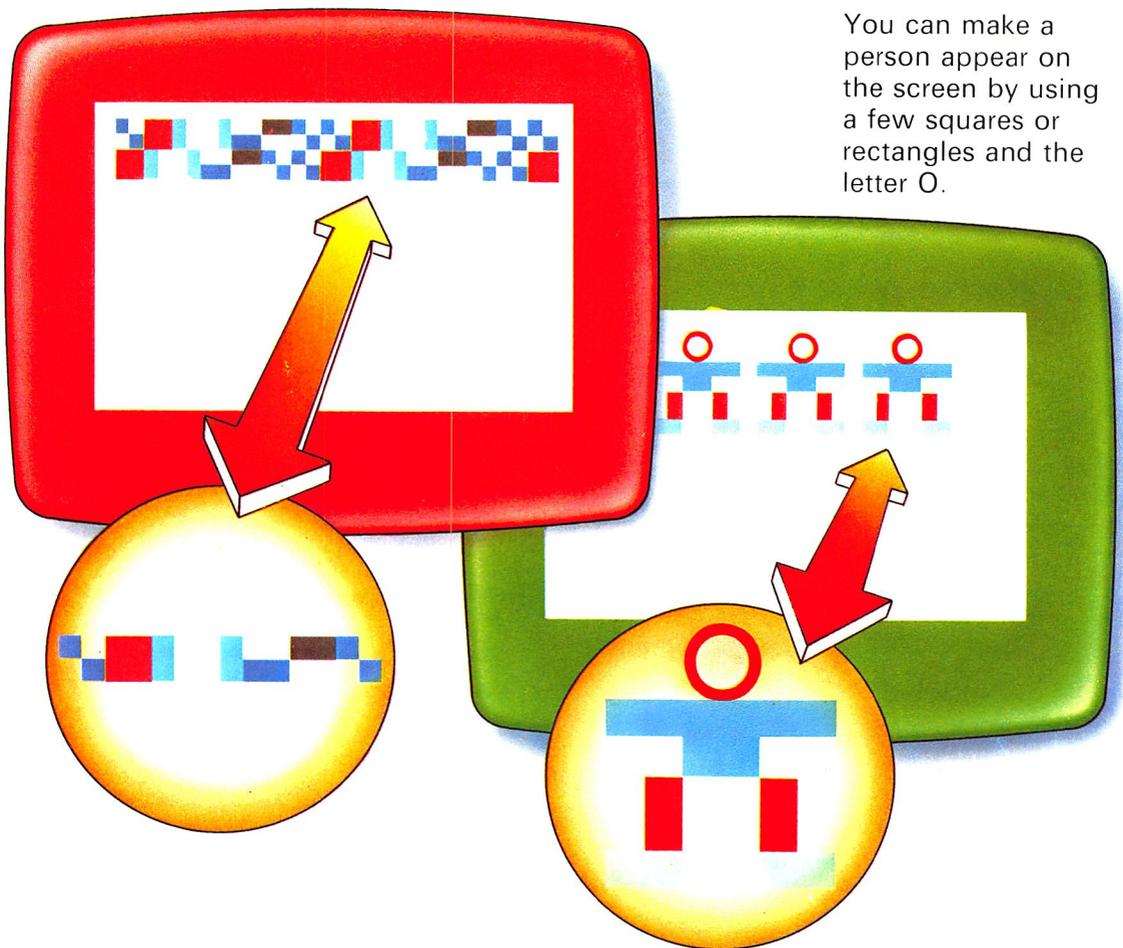
△ In this program, the bar showing Matthew’s age is six squares long and the bar showing Sue’s age is nine squares long. Note that each square takes up the same space on the screen as one letter or number.

▽ This pattern is made by repeating the single pattern of characters over and over again using the program called Pattern making on page 13.

### Chequerboard

Run the program called Pattern making on page 13, but use a few graphics characters or signs where it says NAME instead of letters. A pattern like a chequerboard builds up on the screen.

You can make a person appear on the screen by using a few squares or rectangles and the letter O.



# Quiz master

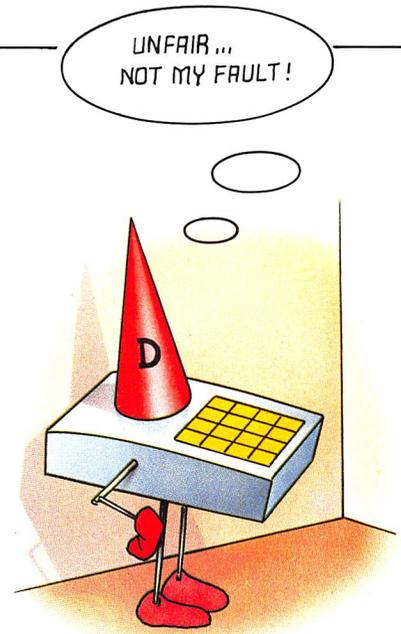
Make the computer set questions, check answers and keep the score.

## Sum fun

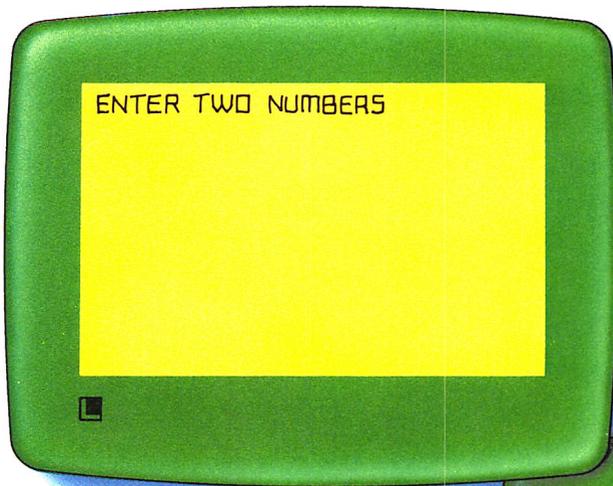
Enter this program:

```
10 LET S=0
20 PRINT "ENTER TWO NUMBERS"
30 INPUT X
40 INPUT Y
45 CLS
50 PRINT "WHAT IS ";X;" PLUS ";
   Y;"?"
60 INPUT A
70 IF A=X+Y THEN GOTO 110
80 PRINT A;" IS WRONG. TRY
   AGAIN."
90 PRINT "YOUR SCORE IS ";S
100 GOTO 60
110 PRINT A;" IS RIGHT. WELL
   DONE."
120 LET S=S+1
130 PRINT "YOUR SCORE IS ";S
140 GOTO 20
```

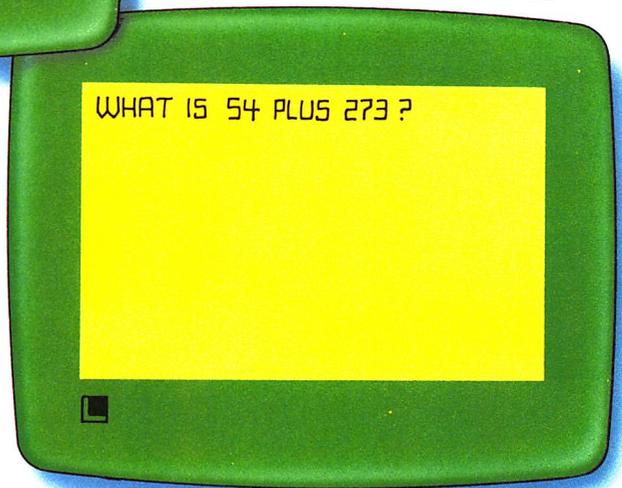
The computer asks you to enter two numbers. Type the first number and press **NEW LINE**, **RETURN** or **ENTER**. Repeat this for the second number. The computer then asks you to add them



△ If a program does not work, don't blame the computer right away. There is probably a bug in the program. A bug is a mistake that stops the program running or makes it perform badly. It is very unlikely that there is anything wrong with the computer, so check your program to make sure that you have entered it correctly.



1



2

△ This is how the screen looks when the program is run.

1 The computer begins by asking you to enter two numbers.

2 The two numbers entered are 54 (X) and 273 (Y).

3 The answer entered is 326 (A), which is wrong. The computer displays the score as zero and waits for another answer.

4 This time the answer is 327, which is correct.

The computer makes the score equal to 1 and asks you to enter two new numbers.

together. Get a friend to enter an answer. The computer says whether it is right or wrong and gives one point for a correct answer.

With some computers, **LET** is not required. Enter  $S = 0$  in line 10 and  $S = S + 1$  in line 120.

3

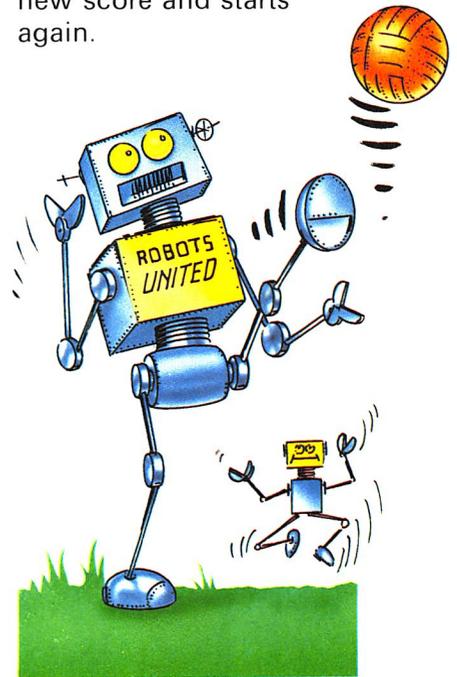
```
WHAT IS 54 PLUS 273?
326 IS WRONG. TRY AGAIN.
YOUR SCORE IS 0
```

4

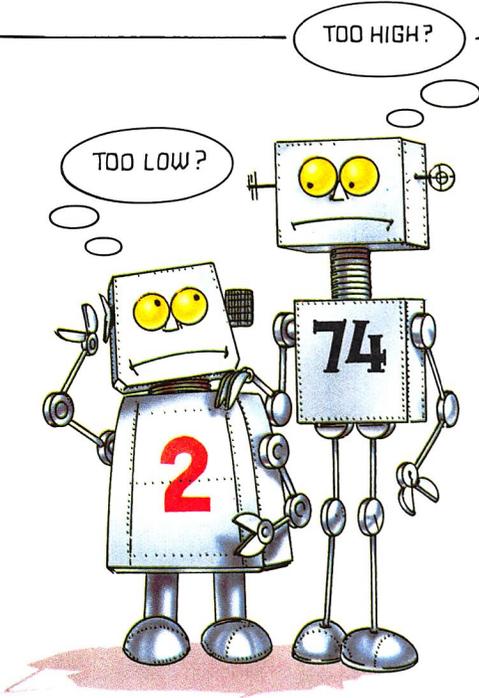
```
WHAT IS 54 PLUS 273?
326 IS WRONG. TRY AGAIN.
YOUR SCORE IS 0
327 IS RIGHT. WELL DONE.
YOUR SCORE IS 1
ENTER TWO NUMBERS
```

✱ In line 10, S stands for the score. As the quiz has not yet started, the score is zero. This may seem obvious, but you have to tell the computer. So you enter **LET S = 0** or **S = 0**, which means *make the score equal zero*. Next the computer asks you to enter two numbers, which are represented by X and Y. Line 50 displays the question and then the computer waits for an answer, which is represented by A. In line 70, the computer checks the answer and goes to line 110 if it is right. If not, the computer proceeds to lines 80, 90 and 100. These tell the computer to say the answer is wrong, display the score and wait for another answer. If the answer is right, lines 110 to 140 tell the computer to say it is right, increase the score (make the new value of S equal to the old value plus 1), display the new score and start again.

▽ This program works rather like a game of football. The score is zero as the game starts. If a team scores, they get one or more goals or points and play starts again. In the same way, the computer sets the score to zero, receives inputs, works out any new score and starts again.



# Guessing game

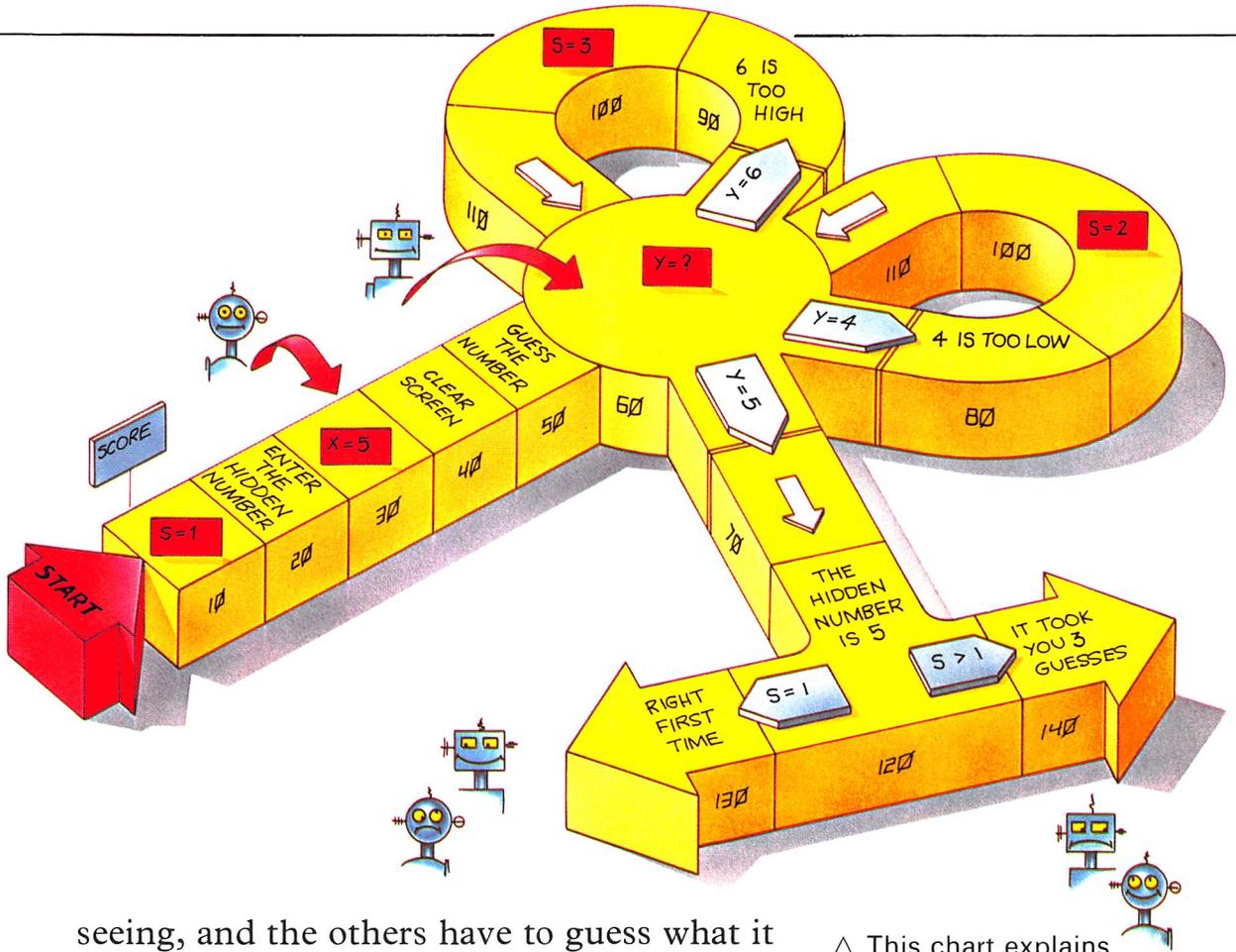


The instructions given in this book and two new instructions will enable you to play this guessing game.

Find the hidden number

```
10 LET S = 1
20 PRINT "ENTER THE HIDDEN
NUMBER"
30 INPUT X
40 CLS
50 PRINT "GUESS THE NUMBER"
60 INPUT Y
70 IF Y = X THEN GOTO 120
80 IF Y < X THEN PRINT Y;" IS TOO
LOW"
90 IF Y > X THEN PRINT Y;" IS TOO
HIGH"
100 LET S = S + 1
110 GOTO 60
120 PRINT "THE HIDDEN NUMBER
IS ";X
130 IF S = 1 THEN PRINT "RIGHT FIRST
TIME"
140 IF S > 1 THEN PRINT "IT TOOK
YOU ";S;" GUESSES"
```

Two or more can play this game. One person enters a number without the others

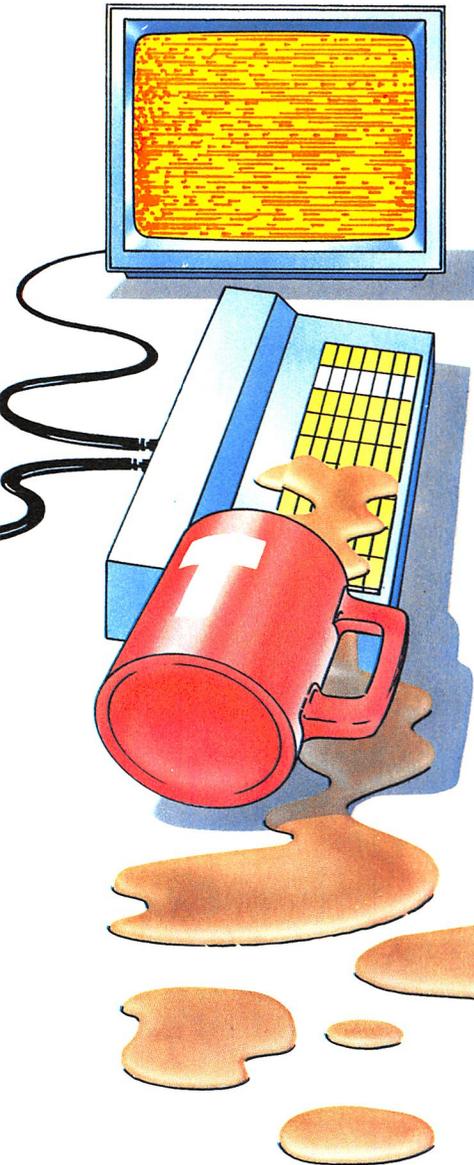


seeing, and the others have to guess what it is. The computer tells them if the guess is too high or too low. You keep on guessing until you get it right, and the computer tells you how many guesses you had. If you want to give up, enter **X** instead of a number. To play again, enter **RUN**, then **NEW LINE**, **RETURN** or **ENTER**.

The sign  $<$  in line 80 means “is less than” and  $>$  in line 90 means “is more than”.

△ This chart explains how the program works. The hidden number ( $X$ ) is 5. If the first guess ( $Y$ ) is 5, the program goes to line 130 because  $S$  is still equal to 1. But if the first guess is 4 and the second guess is 6,  $S$  becomes 2 and then 3. The third guess is 5, and the program goes to line 140 because  $S$  is now more than 1.

# Tips and troubles



△ **Never** allow the computer to get wet.

## These tips will help you to get out of trouble with the computer.

You may give the computer a wrong command when typing a line in a program. It will register an error called a *syntax error* when you try to enter the line, and show you where the error is. A common error is to miss out a semicolon (;).

To stop a program running and display the list of program lines, try pressing **ESCAPE**, **STOP**, **NEW LINE**, **RETURN** or **ENTER**. Then type or press **LIST**, followed by **NEW LINE**, **RETURN** or **ENTER**.

A program may not run or may stop while running. Try to run it again. If this does not work, a number or some words called an *error report* may appear on the screen. If it is not clear what is wrong, look up this report in the instruction manual to find out.

To run a program again, type or press **RUN** and then **NEW LINE**, **RETURN** or **ENTER**.

When you have finished with a program and want to enter a new one, you may be able to remove the old program by entering **NEW** or **BREAK** and then **NEW LINE**, **RETURN** or **ENTER**. If this doesn't work, simply switch the computer off and then switch it on again.

With some computers you may need to add a line with the instruction **STOP** or **END** at the finish of a program.

You can keep programs by recording them on to cassettes. The instruction manual will tell you how to use a cassette player with the computer to do this. It will also tell you how to connect a printer to the computer to print out programs and displays.

# Glossary

---

## Command

A command is an instruction that you give to the computer. It usually takes the form of a word such as **PRINT**, followed by letters or numbers.

## Enter

When you press the keys of a computer to give it commands or information, it is called entering. You may also need to press **NEW LINE**, **RETURN** or **ENTER** to do this.

## Graphics character

A graphics character is a pattern of tiny squares in a shape that takes up the same space as one letter or number. With most computers, any kind of shape can be created, for example a diamond, arrow or heart as well as small squares and rectangles.

## Line

A computer program is made up of lines. Each line contains a separate command or group of commands. The display on the screen is also

made up of lines of numbers, letters, signs or graphics characters that run across the screen.

## Loop

A loop is a set of commands that make the computer change the value of a letter such as X from one value to another in order.

## Memory

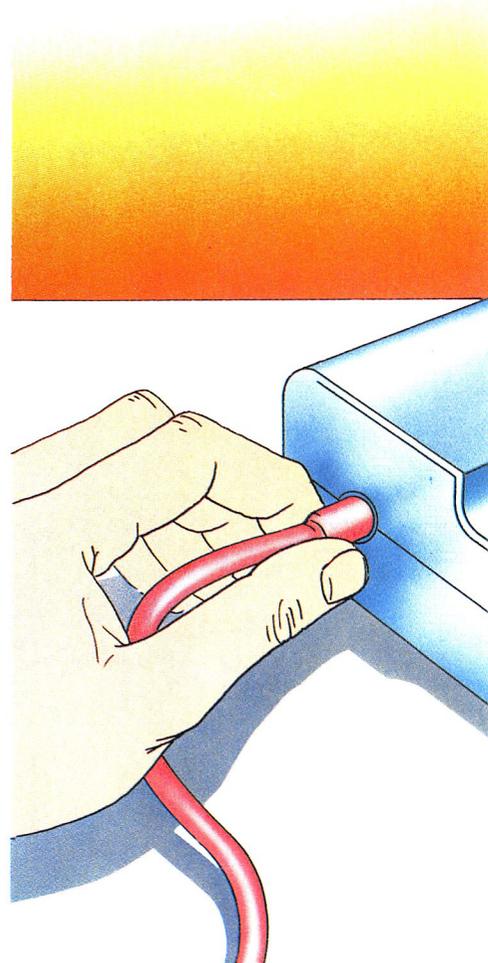
The memory is the part of the computer where the program and all the information that you enter is stored.

## Program

A computer program is a list of commands that the computer carries out to get a certain result. For example, a game program contains all the commands that the computer needs to play the game.

## Run

When you run a program on a computer, you operate the computer to make the program work. This usually involves entering the command **RUN**.

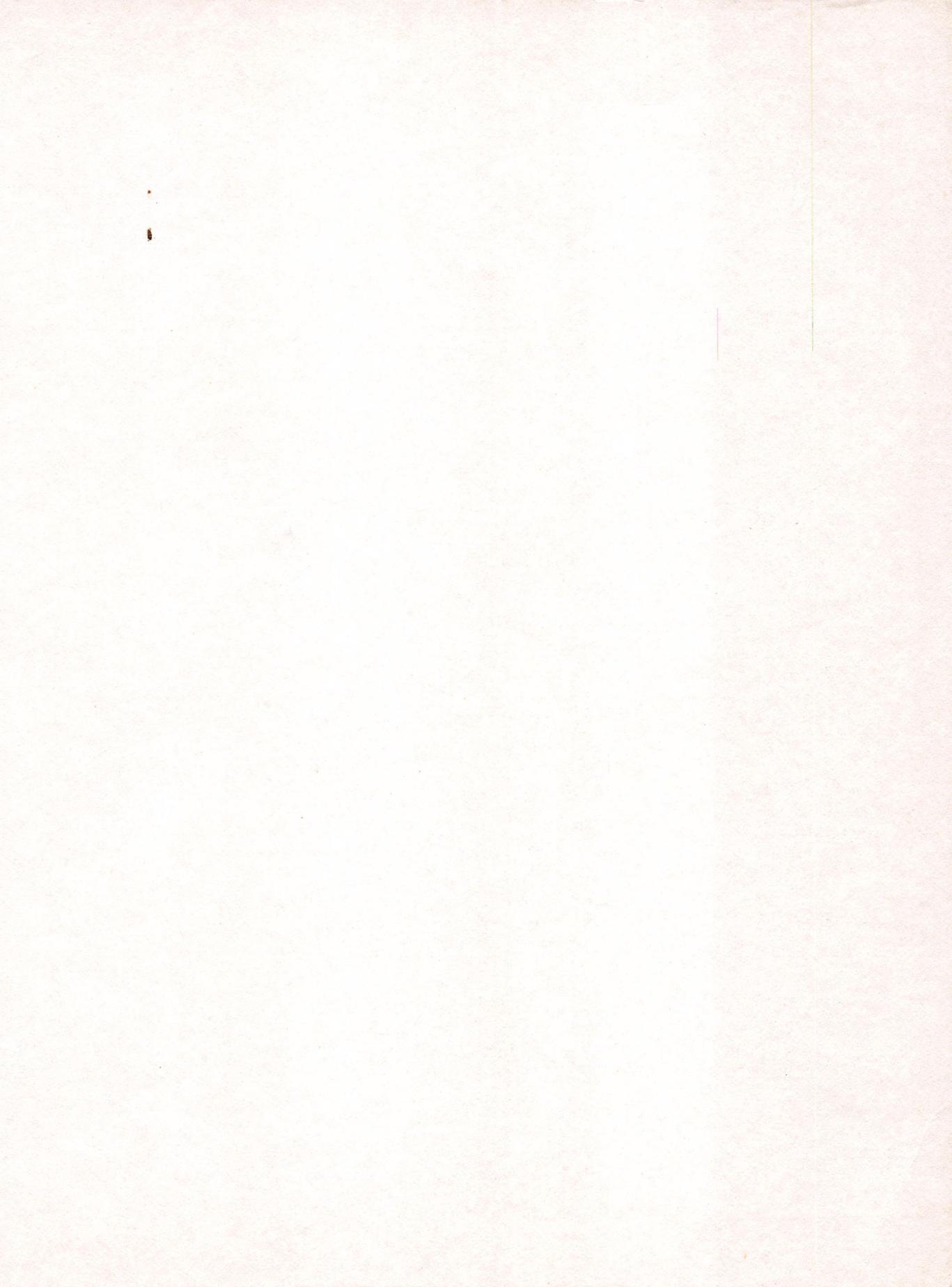


△ Make sure that the computer is plugged in firmly. If it loses power, or if you switch it off, you will wipe out the program from its memory and have to enter it again.

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