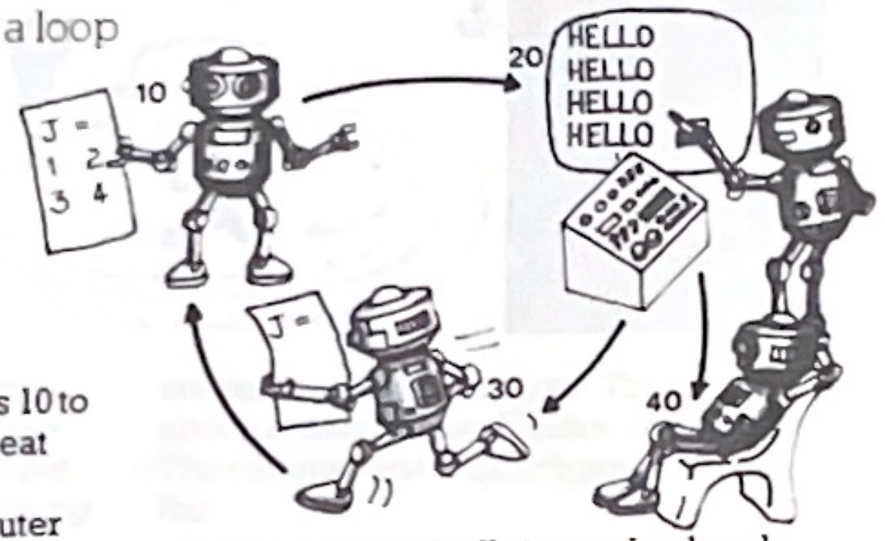
Making loops

You often need the computer to do the same thing several times in a program. On page 21 you can see how to make it repeat part of a program using GOTO and a variable which acts as a counter. Another way is to repeat the same lines several times using the words FOR . . . TO and NEXT. This is called making a loop.

1 Hello loop

```
10 FOR J=1 TO 6
20 PRINT "HELLO"
30 NEXT J
40 END
```

(Lines 10 to 30: Loop)



This program has a loop from lines 10 to 30 which makes the computer repeat line 20 six times. The letter J is a variable and line 10 tells the computer to set J at 1 on the first run through the program, 2 the next time, then 3, etc., up to 6. Line 20 tells it to print the word hello and line 30 tells it to go back and find the next value for J. When J=6 the computer goes on to line 40.

2 Silly sums program

```
10 FOR J=1 TO 8
20 PRINT "2 PLUS 2 IS 5"
30 NEXT J
40 PRINT
50 PRINT "ONLY JOKING!"
60 END
```

(Lines 10 to 30: Loop)

Some computers do not have an exclamation mark and you can leave it out.

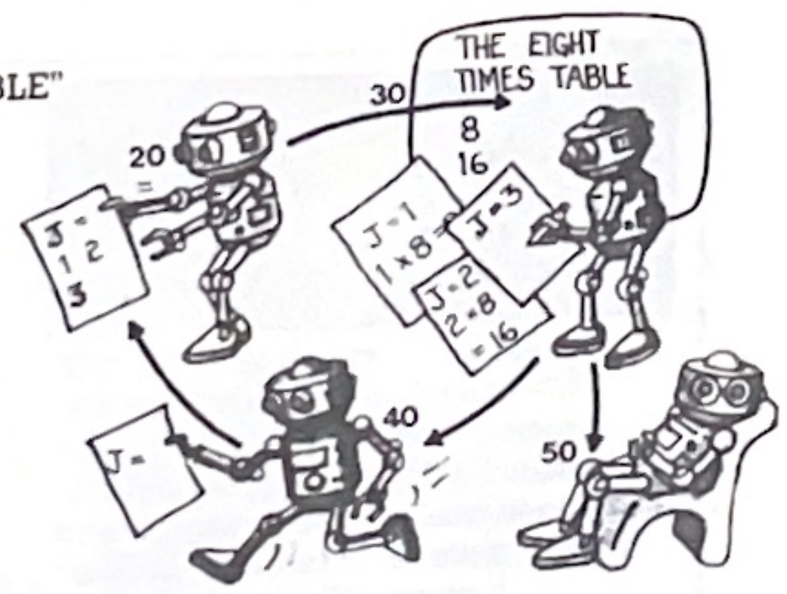
```
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
2 PLUS 2 IS 5
ONLY JOKING!
```

In this program, the loop from lines 10 to 30 makes the computer repeat line 20 eight times. Each time it passes through line 20 it prints out the same silly sum. After doing it eight times the computer carries on with the rest of the program. Line 40 just makes it leave an empty line.

3 Eight times table program

```
10 PRINT "THE EIGHT TIMES TABLE"
20 FOR J=1 TO 12
30 PRINT J*8
40 NEXT J
50 END
```

(Lines 20 to 40: Loop)



This time J is used to count the number of loops and also as part of the sum J*8. Line 20 tells the computer to set J at 1, then 2, 3, etc, up to 12. Line 30 takes the current value of J, multiplies it by 8 and prints out the answer. Then line 40 sends the computer back to line 20 to find the next value of J.

Making patterns

FOR . . . NEXT loops are useful for making patterns, like this, of a simple shape repeated lots of times. The program for this pattern is too long to write out here in full, but it would look something like this:

```
10 FOR I=1 TO 45
20 Draw a rectangle and change its
   position a little each time.
30 NEXT I
40 END
```

Steps

Sometimes it is useful to change the value of J by amounts other than 1. For instance, you may want to go up in 3s or down in 7s. To do this you use the word STEP. In the following program STEP −1 makes J go down by 1 each time the computer passes through the loop in lines 10 to 40.

Greedy computer program

```
5 CLS
10 FOR J=7 TO 2 STEP -1
20 PRINT "THERE ARE ";J;" PIES LEFT"
30 NEXT J
40 PRINT
50 PRINT "I SHALL EXPLODE"
60 FOR K=1 TO 1000
70 REM: DO NOTHING
80 NEXT K
90 PRINT
100 PRINT "B A N G S P L A T T"
```

(The figure 2 stops the loop after J=2 (i.e. when there is one pie left).)

(Lines 10 to 30: Loop)

(Lines 60 to 80: Loop)

```
THERE ARE 7 PIES LEFT
THERE ARE 6 PIES LEFT
THERE ARE 5 PIES LEFT
THERE ARE 4 PIES LEFT
THERE ARE 3 PIES LEFT
THERE ARE 2 PIES LEFT
I SHALL EXPLODE
BANGSPLATT
```

Some computers are slower than others and they need a lower figure such as 500 or 250 in line 60.

There are two loops in this program. The one from lines 10 to 30 makes the computer print line 20 six times. Each time, the value of J is reduced by one and the figure for J is printed in line 20. In the loop from lines 60 to 80 the computer does not have to do anything. It just runs through all the values for K from 1 to 1000 and this makes it pause for a moment. Lines which start with REM (short for remark) are ignored by the computer and are useful to remind you what the program is doing.

Program puzzles

1. Can you alter the eight times table program on the left to make it display "1×8=" as well as the answer?

2. Can you write a program for the "N" times table, that is, a program which works out the tables for any number you type into the computer? First you need to get the computer to ask you for a number, N. Then use a loop to work out and display the tables. If you want, include some lines at the end of the program so it asks you if you want the tables for another number and the program repeats itself.