Creative Programming for Young Minds

. . . on the TI-99/4A

Volume I

CREATIVE
PROGRAMMING INCORPORATED

FUNCTION KEYS

Both the TI 99/4 and the TI 99/4A consoles come with keyboard overlays identifying special computer functions (BACK, BEGIN, QUIT, etc.). To access TI99/4A overlay functions, as well as any function or symbol that appears on the front of a key, hold down the FCTN key while pressing the appropriate function or symbol key.

The owner's manual enclosed with an applications software package may reference only the TI 99/4 function keys (SHIFT C for CLEAR, SHIFT R for REDO, etc.). Most Command Module, Diskette, and Cassette programs are compatible with both consoles; however, the keystroke sequences used in accessing the special functions of these programs differ somewhat for each keyboard.

The following chart shows the relationship between the function keys on the TI 99/4 and the TI 99/4A for most software applications.

FUNCTION KEYS

Name	TI 99/4 Keys	TI 99/4A Keys
AID	SHIFT A	FCTN 7
CLEAR	SHIFT C	FCTN 4
DElete	SHIFT E	FCTN 1
INSert	SHIFT G	FCTN 2
QUIT	SHIFT Q	FCTN =
REDO	SHIFT R	FCTN 8
ERASE	SHIFT T	FCTN 3
LEFT arrow	SHIFT S	FCTN S
RIGHT arrow	SHIFT D	FCTN D
DOWN arrow	SHIFT X	FCTN X
UP arrow	SHIFT E	FCTN E
PROC'D	SHIFT V	FCTN 6
BEGIN	SHIFT W	FCTN 5
BACK	SHIFT Z	FCTN 9
ENTER	ENTER	ENTER

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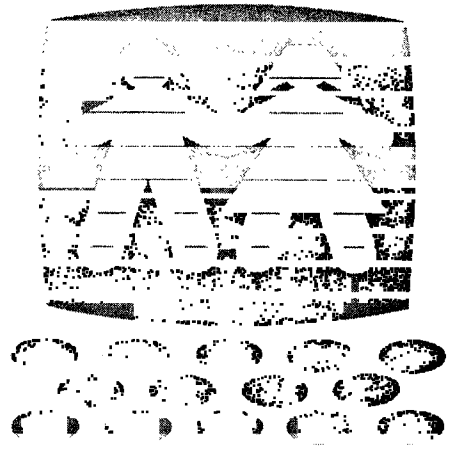
Volume I

by Leonard Storm



CREATIVE PROGRAMMING FOR YOUNG MINDS

...ON THE TI-99/4A

VOLUME I

T A B L E O F C O N T E N T S

POWER UP (How to turn your computer on.)

1. Find the ON/OFF switch on the TV. Switch on the TV.
2. Find the ON/OFF switch on the front right of the computer's keyboard. Use your thumb to slide the switch to the right. The red POWER light should come on.
3. When the POWER light does come on, you will hear a bleep from the TV and see:

   TEXAS INSTRUMENTS

   HOME COMPUTER

   READY-PRESS ANY KEY TO BEGIN

   Do just as the screen says. Push any one of the keys.
4. Now, on the TV screen you will see:

   PRESS

   1 FOR TI BASIC

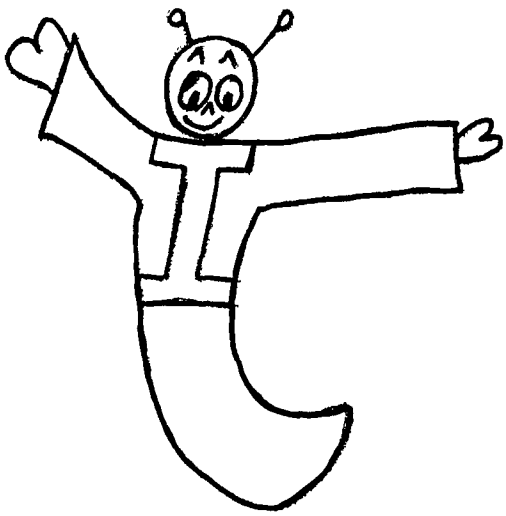
   This time, push the 1 key.
5. In the lower corner of the TV screen, you will see a small blinking square. It is called a cursor. The cursor shows you exactly where the next key that you press will show up on the screen. Now you are ready to begin programming.

POWER DOWN (How to turn your computer off.)

1. Slide the computer's ON/OFF switch to the left. The red POWER light will go out.
2. Turn off the TV.

NOTE: WHEN YOU TURN OFF THE COMPUTER YOU WILL LOSE YOUR PROGRAM.

LESSON #1 PRINT



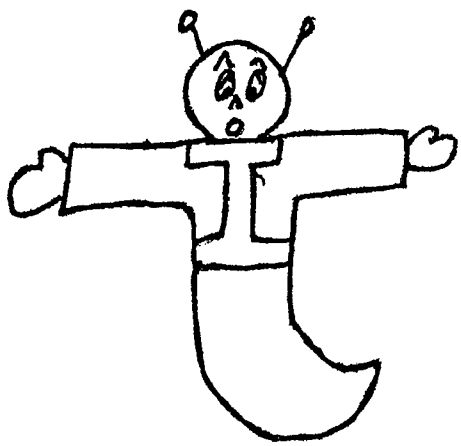
HI! I'M TEX THE INCHWORM. IN THIS BOOK, I WILL BE TELLING YOU HOW TO TALK TO YOUR TI COMPUTER. TALKING TO THE COMPUTER, OR TELLING IT WHAT TO DO, IS CALLED PROGRAMMING. YOU ARE GOING TO LEARN HOW TO PROGRAM THE COMPUTER.
ARE YOU READY? LET'S GO!!

Does the TV screen say TI BASIC READY?
If it does, you are ready to start programming in a computer language called BASIC.
If the screen doesn't say TI BASIC READY, first do the POWER UP steps given on the first page of this book. Now let's start programming.

Find the N key on the computer keyboard. Press it. See what happens on the TV screen? The N is printed. Next, find the E key. Press it. NE should now appear on the TV screen. Now find the W key and press it. The word NEW should now be on the screen.

NOTE: Your computer can print in both uppercase (capital letters) and lowercase. Right now you're in lowercase. In order to print in uppercase you can either hold one of the [SHIFT] keys down while pressing the key you need or you can just press the [ALPHA LOCK] key. This will "lock" you in uppercase. You must press it again to get back to lowercase.

Do you still have the word NEW on the screen?
Now press the [ENTER] key. It can be found at the right side of the middle row. (It has a yellow dot on it.)
If you did everything correctly, the word NEW will disappear from the screen. Only TI BASIC READY will remain, along with the blinking cursor.



WHEN THE NEW COMMAND IS USED, IT TELLS THE COMPUTER TO FORGET ABOUT ANY OLD COMPUTER PROGRAMS. USE THE NEW COMMAND WHEN YOU ARE READY TO START A NEW PROGRAM. THE [ENTER] KEY IS A VERY SPECIAL KEY. WHEN IT IS PRESSED, THE COMPUTER KNOWS THAT YOU HAVE A COMMAND READY FOR THE COMPUTER.

Try the NEW command again by typing NEW, and then pressing the [ENTER] key.

But what happens if you press the wrong key? Don't worry. The computer won't blow up!

Try this. Type NEY instead of NEW. Now press [ENTER] to tell the computer that its next instruction is ready. See what happens? The computer says:

* INCORRECT STATEMENT

The computer doesn't know the word NEY. NEY is an incorrect statement.

Now try this. Type the letters N E W T O N . See where the cursor is? It is at the place where the next letter would go, after the last N.

Find the [FCTN] key. (It has a white dot on it.) It will help you erase the letters T O N from the screen.

Find the S key. On the front of the S you will find the ← symbol. The ← can be used to move the cursor on the screen.

Push down the [FCTN] key with one hand and keep it down.

While the [FCTN] key is still down, press the ← key.

Now release the ← key.

Finally, release the [FCTN] key.

NOTE: The cursor is now over the N. The cursor has been moved one space to the left.

Use the [FCTN] key and the ← key to move the cursor to the T. Do it.

Now press the long black space bar at the bottom of the keyboard. Your TV screen should look like this:

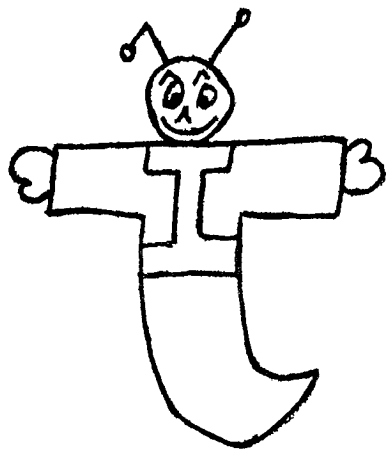
```
NEW ON
```

Press the space bar two more times.

Now the screen looks like this:

```
NEW
```

Press [ENTER] to enter the NEW command into the computer.



LET'S REVIEW. THE ← KEY CAN BE USED TO MOVE THE CURSOR BACKWARDS TO A WRONG LETTER (OR SYMBOL). THEN JUST TYPE IN THE CORRECT LETTER (OR SYMBOL).

THE [FCTN] KEY MUST ALWAYS BE USED WHEN YOU WANT TO TYPE THE FRONT SYMBOL ON A KEY.

For practice, type in the letters N E and X .

Now use the ← key to change the X to a W.

Since you have cleared the computer's memory with the NEW command, it's about time to give the computer an honest-to-goodness program.

Type the following program lines. Be sure to type the lines exactly as they are. Use the space bar to put spaces in the right places. Also, remember to push the [ENTER] key after every program line. This tells the computer that you are done with one program line and are ready for another.

Type:

```
10 PRINT "TEX IS CUTE!"      (Press [ ENTER ].)
20 STOP                      (Press [ ENTER ].)
```

If you make a mistake use the ← key to correct it.

If the computer says INCORRECT STATEMENT, just retype the line with the error corrected.

Now type in the letters R U N and press [ENTER].

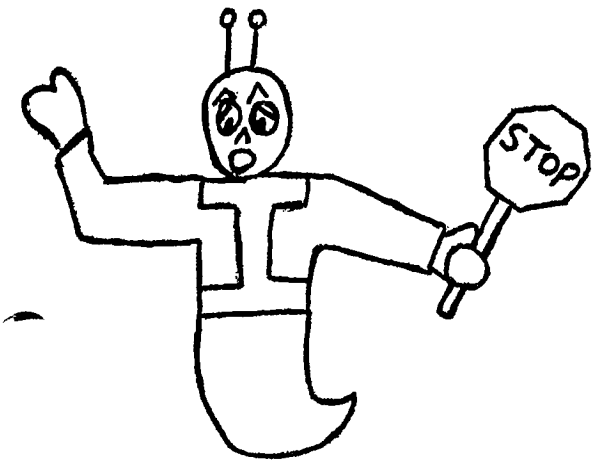
See what happens?

Type RUN again and press [ENTER].

Terrific! Isn't it?

Whenever you type RUN and press [ENTER], the computer RUNs the program.

Try RUNning the program a few more times.



THE LINE NUMBERED 10 IS A PRINT STATEMENT. IT TELLS THE COMPUTER TO PRINT EVERYTHING BETWEEN THE QUOTATION MARKS (" ").

THE LINE NUMBERED 20 TELLS THE COMPUTER TO WHOA! (STOP).

Now type

```
LIST
```

and press [ENTER].

The LIST command tells the computer to LIST the program.

Can you get the computer to LIST the program a few more times? Try it!

Next type

```
5 PRINT "TEX IS ORNERY, BUT"
```

Remember to push [ENTER].

Make the computer LIST the program on the TV screen.

See where the computer puts statement 5? It puts statement 5 before statement 10. The computer will always put the lower numbered statements before the higher numbered statements.

Make the computer RUN the new program.

The TV screen should say:

TEX IS ORNERY, BUT
TEX IS CUTE!

The computer did statement number 5 before it did statement number 10.

Now type the following PRINT statement, but put whatever you want between the quotation marks.

Type

11 PRINT " " *(Press ENT .)*
You fill in this space.

Make the computer LIST the program.

The computer will do the program statements in the following order:

5 (first)
10 (second)
11 (third)
20 (fourth)

RUN the program to check out the computer's order of doing things.

Now it's your turn, Pardner!

Write a PRINT statement that the computer will do before statement number 5. Write your statement on the line below.

Now type it into the computer and press [ENTER].

LIST the program.

RUN the program.

Did it work?

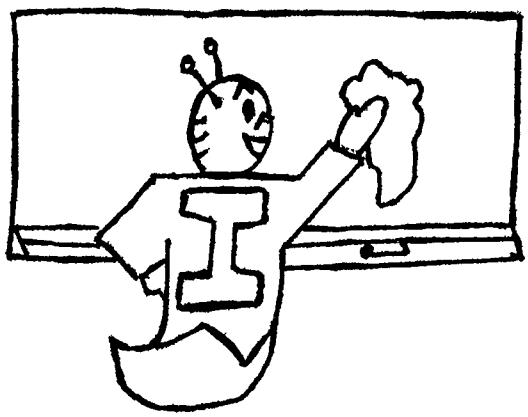
If it didn't work, keep at it until you get all the bugs (errors) out. Try again!

By now the TV screen is getting a little cluttered. It's time to learn how to erase the screen.

Type this:

```
1 CALL CLEAR
```

and press [ENTER].



Then LIST the program.

Is everything OK?

If so, RUN the new program.

See what happens to the screen?

THE CALL CLEAR STATEMENT TELLS THE COMPUTER TO ERASE (OR CLEAR) THE TV MONITOR.

Now let's try an experiment to see what the computer will do.

Type:

```
5
```

and press [ENTER].

The computer didn't complain!

Well, let's see if anything has happened to the program.

LIST the program.

Has anything happened to the program?

Which statement is gone? _____

Type:

```
11
```

and press [ENTER].

Look at the program again to see if any new changes have occurred. (LIST it!)

RUN the program.

Now you know a quick way to get rid of program lines. Just type the line number without any statement and press [ENTER].

Try to get rid of the line that you wrote earlier. Do it!

LIST the program again.

Now let's change statement 10.

Type:

```
10 PRINT "I'M A MAD SCIENTIST!"
```

LIST the program to see the change, then RUN it.

A statement is easily changed (or erased) just by typing another line with the same number as the old statement.

Hey! How about an action-packed program?

You are about to type in a new program so what should you type in to clear the computer's memory?

Type it in and [ENTER] it.

Now put the following program into your computer. Then RUN and LIST it a few times until you are positive you know how the program works. Don't forget to press [ENTER] after each line.

```
10 CALL CLEAR
20 PRINT "  *"
30 PRINT " ***"
40 PRINT "*****"
50 PRINT "  *"
60 PRINT "  *"
70 PRINT "  *"
80 PRINT "  *"
```

Good work! you've made the computer print the picture of an arrow on the screen. Also, note that the computer stops after the highest line number even without a STOP statement.

On the next page we'll see how to put a little action into the program! So, DON'T ERASE IT!

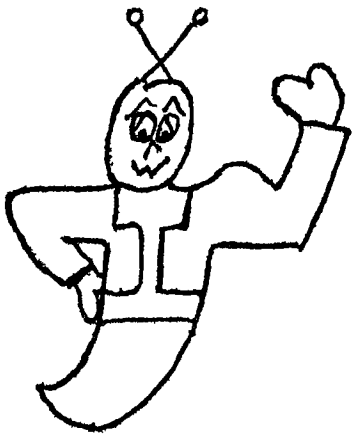
ENTER the following program lines.

```
90 PRINT
100 PRINT
110 PRINT
120 PRINT
130 PRINT
140 PRINT
150 PRINT
```

Now RUN the program again.

See the arrow move? The added PRINT statements print blank lines which cause everything to move up from the bottom of the screen. (The upward motion of the lines is called scrolling.)

Now add some more blank lines so that the arrow moves completely off the screen. Then, RUN the program as many times as you wish.



WOW, PARDNER! YOU'VE LEARNED A LOT ABOUT PROGRAMMING ALREADY. NOW LET'S EXERCISE A FEW OF THOSE NEW-FOUND SKILLS. IF YOU HAVE TROUBLE WITH ONE OF THE FOLLOWING EXERCISES, JUST TAKE YOUR TIME AND THINK IT OUT. DON'T GIVE UP. ABOVE ALL, HAVE FUN! (P.S. DON'T FORGET WHEN TO USE NEW AND ENTER .)

EXERCISE 1-1

Put this program into your computer.

```
10 CALL CLEAR
20 PRINT " BBB"
30 PRINT "AAAAA"
40 PRINT "LLLLL"
50 PRINT " LLL"
```

RUN the program a few times.

LIST the program.

Notice how the letters B A L L have been used to make a ball-shaped object.

Now add some statements that will cause the ball to move up the screen.

RUN and LIST the program.

EXERCISE 1-2

Put this NEW program into the computer's memory.

```
10 CALL CLEAR
20 PRINT "Z"
30 PRINT " I"
40 PRINT "  G"
50 PRINT "  Z"
60 PRINT " A"
70 PRINT "G"
```

RUN the program.

Notice that to print letters farther to the right you have to put extra spaces inside the quotation marks.

Next, change the program so that a blank line will separate each of the letters in the ZIGZAG message as shown below:

```
Z

 I

  G

  Z

 A

G
```

Write the added lines below then RUN your program to make sure that it works.

_____

_____

_____

_____

_____

EXERCISE 1-3

Program your computer to display the following:

```
COMPUTER
 RELATED
  ENRICHMENT
   AND
    TECHNOLOGICALLY
     INSPIRED
      VIABLE
       EDUCATION
```

(Notice how the first letter of each word spells CREATIVE.)

Begin your program with a CALL CLEAR statement.

You may use blank PRINT lines if you wish. Be CREATIVE!

Experiment with your program.

EXERCISE 1-4

Now write a program that will print out the following information on the TV screen:

your name

your age

your street address

your city, state, and zip code

My program starts out like this: (But you don't need to copy it.)

```
100 PRINT "TEX"      (name)
200 PRINT "2"        (age)
```

Don't let the age fool you. Inchworms are smart for their age!

After you get your program RUNning correctly, add some more program lines to explain the information shown on the screen.

My new program lines could be:

```
50 PRINT "MY NAME IS:"
150 PRINT "MY AGE IS:"
ETC.
```

After you get your program written, try RUNning it. Correct any bugs that you may find.

Now put a CALL CLEAR statement at the beginning of your program and put blank PRINT statements between each line.

RUN your program again and correct any bugs.

Put a CALL CLEAR statement at the end of your program and RUN the program again.

Notice that the words printed by your program don't stay on the screen very long. What happened?
First, the computer cleared the screen.
Then, it printed the information you told it to.
Finally, it cleared the screen again.
All of this happens very rapidly which doesn't give you much time to read the TV screen.

Now get rid of the last CALL CLEAR statement. Do you remember how?
Next, put a STOP statement in the middle of your program somewhere. Can you guess what will happen when you RUN the program again? Try it and see.

EXERCISE 1-5

Here is a puzzle.
Use pencil and paper to figure out what the following program will print on the screen.

Then type the program into the computer and RUN it to check your answer. If you were wrong, find out why.

```
207 PRINT " XXXX "
192 PRINT "X    X"
150 PRINT " ^ ^ "
191 PRINT "  OO  "
160 PRINT " O  O "
170 PRINT "  II  "
100 CALL CLEAR
```

EXERCISE 1-6

Use the PRINT command to write a program that will produce your very own computer figure. Use CALL CLEAR at the beginning of your program. Write your program on the lines below. Be CREATIVE!

EXERCISE 1-7

Let's see how much you remember.

Match up words and meanings by placing the letter of the correct meaning on the blank space beside the correct word.

_____ PRINT

_____ CALL CLEAR

_____ LIST

_____ STOP

_____ " "

_____ RUN

_____ space bar

_____ FCTN

_____ ←

_____ SHIFT

_____ INCORRECT STATEMENT

_____ ENTER

_____ NEW

_____ programming

_____ BASIC

A. Moves the cursor to the left.

B. Erases the computer's memory.

C. Oops! You've made a statement error!

D. Prints a blank space on the screen.

E. The computer language you are learning.

F. These go around what you want printed.

G. Tells the computer to write all your program lines.

H. Telling the computer what to do.

I. Tells the computer to do the list of things you've given it to do.

J. Tells the computer to write everything between two quotation marks.

K. Tells the computer to cease running.

L. Causes the upper character on a key to be printed.

M. Tells the computer to accept another command or program line.

N. Erases the screen.

O. Causes the character on the front of the key to be printed.

LESSON #2 GOTO

You have learned that the computer will do lower numbered program statements before higher numbered ones.
It would be great if you could sometimes change this order.
One command that will change the order of doing things is the GOTO command.

Type the following:

```
10 PRINT "HELP!  I'M STUCK!"
11 PRINT "1"
12 PRINT "2"
13 PRINT "3"
```

RUN the program.
See, it does just what you thought it would.
Now, add another line to your program:

```
20 GOTO 10
```

RUN the program again.

Well, I'll be a black-eyed, rootin', tootin'....
The computer really is stuck!
Tex to the rescue!

Push down the [FCTN] key and hold it down while you press the 4 key. (When the program stops, you may stop pressing [FCTN] 4.)
Notice that the computer has left us a message:

* BREAKPOINT AT *(number)*

This message tells you which statement the computer would have done next if you hadn't stopped the program. You can get the program to continue by typing CONTINUE. Let's do it.

Type CONTINUE and press [ENTER].

Use [FCTN] 4 to stop the program again.

Now type CON and press [ENTER]. The computer accepts CON or CONTINUE. From now on use CON, it's shorter.

QUESTION: If you pressed [FCTN] 4 and got this message from the computer, * BREAKPOINT AT 11 and then you started the program using CON , what would be the next thing the computer puts on the screen? _____

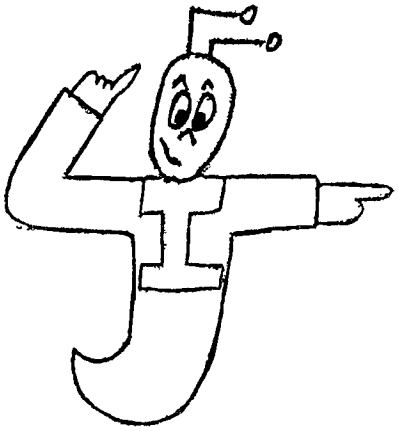
To check your answer, try starting and stopping your program until you get the message * BREAKPOINT AT 11 . Then, try CON and note what is printed first.

QUESTION: Now suppose you pressed [FCTN] 4 and got the message * BREAKPOINT AT 11 . Then, you typed in RUN and pressed [ENTER]. What would be the next line which the computer prints on the TV monitor? _____

Check your answer by using CON and [FCTN] 4 to start and stop the program until you get the message * BREAKPOINT AT 11 . Then, type RUN instead of CON and see what the computer first prints out on the screen. Do it!

Do you see the difference between RUN and CON? RUN starts the program all over again and CON makes the computer continue where it last stopped.

But back to the main point:



THE GOTO COMMAND TELLS THE COMPUTER TO GO TO A CERTAIN LINE IN THE PROGRAM. IT'S WRITTEN LIKE THIS: GOTO *(line number)*. LINE NUMBER IS THE NUMBER OF THE LINE YOU WANT THE COMPUTER TO DO NEXT.

NOTE: GOTO may be written as one word (all run together), OR it may be written as two separate words as GO TO.

The program which you have just RUN is one example of a program containing an endless loop. When GOTO keeps sending the computer back over the same line an endless loop is formed.

Now, try this program. It also contains an endless loop.

```
5 CALL CLEAR
10 PRINT "...O..."
15 PRINT ".....O."
20 PRINT "......O"
25 PRINT "......O"
30 PRINT ".....O."
35 PRINT "...O..."
```

Keep going. ——————→

```
40 PRINT ".O....."
45 PRINT "O......"
50 PRINT "O......"
55 PRINT ".O....."
60 GOTO 10
```

If you start getting seasick, just press [FCTN] 4.

Type in this NEW short program and RUN it.

```
50 CALL CLEAR
100 CALL SCREEN (7)
200 PRINT "HOW ABOUT A CHANGE OF SCREEN?"
```

Did you see the brief change in screen color? It didn't last very long!

Add a GOTO statement to the program to form an endless loop. Write your program statement on the line below.

_____

RUN the program. The screen now stays red.

Getting jittery? Use [FCTN] 4 to stop the program.

Erase the GOTO statement that you wrote and replace it with the following statement:

```
300 GOTO 300
```

RUN the program again.

Notice that this GOTO statement loops back to itself. The program turns the screen red, then prints out the message, and finally, performs the GOTO loop over and over endlessly. In this program, only line number 300 is repeated.

EXERCISE 2-1

Remember the moving arrow program on pages 9 and 10. You surely remember the time it took to type in all of those blank PRINT statements! Well, your mission now is to rewrite that program using only one blank PRINT statement and a GOTO statement. Keep program statements 10 through 90 the same as before and add one GOTO statement that will cause a blank line to be printed over and over.

Write your new program statement on the line below.

_____

Now, RUN your program. When it is working correctly, the arrow should move just like it did before.

Next, change the GOTO statement so that the computer prints out the arrow, a blank line, another arrow, a blank line, and so on.

The new GOTO statement is:

_____

RUN the program to see that it works correctly.

Now, replace the GOTO statement with this one:

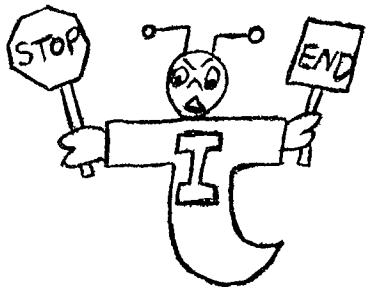
```
100 GOTO 10
```

RUN the program. Try to understand why it works as it does.

EXERCISE 2-2

Here is another puzzle! Try to figure out what message the following program will print. Then, check your answer by RUNning the program.

```
10 GOTO 100
20 PRINT "LOVES"
30 GOTO 90
40 PRINT "HIS"
50 PRINT "TI"
60 GOTO 160
70 PRINT "TO"
80 GOTO 140
90 GOTO 70
100 CALL CLEAR
110 PRINT "TEX"
120 GOTO 20
130 END
140 PRINT "PROGRAM"
150 GOTO 40
160 PRINT "HOME"
170 PRINT "COMPUTER"
180 GOTO 130
190 PRINT "TRICKY"
200 GOTO 130
```



STOP AND END DO THE SAME THING.

THEY CAUSE A PROGRAM TO STOP RUNNING.

THE COMPUTER AWAITS YOUR NEXT COMMAND.

EXERCISE 2-3

Now it's your turn. Fill in each blank with the proper word so that the message PETER PIPER PICKED A PECK OF PICKLED PEPPERS is printed.

Finally, try the program out by RUNning it on the computer. Don't give up until you get the program to run correctly.

```
10 GOTO 50
20 PRINT " _____"
30 PRINT " _____"
40 GOTO 120
50 CALL CLEAR
60 GOTO 100
70 PRINT " _____"
80 PRINT " _____"
90 GOTO 140
100 PRINT " _____"
110 GOTO 20
120 PRINT " _____"
130 GOTO 170
140 PRINT " _____"
150 GOTO 190
160 END
170 PRINT " _____"
180 GOTO 70
190 GOTO 160
```

Put these words in the blanks:

PETER

PIPER

PICKED

A

PECK

OF

PICKLED

PEPPERS

EXERCISE 2-4

You've done so well that it's about time to let you write a program all by yourself. Try to create your own GOTO puzzle, something like the one in EXERCISE 2-2.

First, think of some catchy phrase and then "hide" the words in the proper order in your GOTO program.

Write your program below and then test it by RUNning it on the computer.

LESSON #3 RUN AND LIST

In this lesson, you are going to learn some more about RUN and LIST.

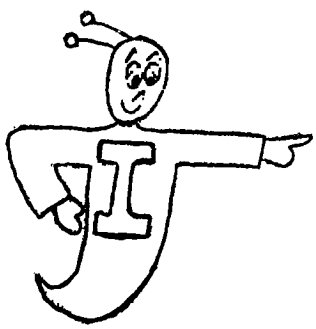
Type in the following program and RUN it. Don't worry about the parts that you don't understand yet. You will study those soon.

```
1 CALL CLEAR
2 CALL SCREEN(4)
3 PRINT "4 = LIGHT GREEN"
4 PRINT
5 FOR I=1 TO 500
6 NEXT I
7 CALL SCREEN(5)
8 PRINT "5 = DARK BLUE"
9 PRINT
10 FOR I=1 TO 500
11 NEXT I
12 CALL SCREEN(7)
13 PRINT "7 = DARK RED"
14 PRINT
15 FOR I=1 TO 500
16 NEXT I
17 CALL SCREEN(11)
18 PRINT "11 = DARK YELLOW"
19 PRINT
20 FOR I=1 TO 500
```

Keep going. ——————>

```
21 NEXT I
22 CALL SCREEN(16)
23 PRINT "16 = WHITE"
24 PRINT
25 PRINT
26 PRINT
27 PRINT
28 FOR I=1 TO 500
29 NEXT I
30 GOTO 2
```

DON'T ERASE THIS PROGRAM! We'll use it again later in this lesson.



THE CALL SCREEN COMMAND CAN BE USED TO CHANGE THE TV SCREEN'S COLOR. A NUMBER FROM 1 TO 16 TELLS THE COMPUTER WHICH COLOR TO DISPLAY. FOR EXAMPLE: CALL SCREEN(7) TURNS THE SCREEN DARK RED.

Turn the page for a list of the CALL SCREEN color codes.

VALUE	COLOR
1	Transparent
2	Black
3	Medium Green
4	Light Green
5	Dark Blue
6	Light Blue
7	Dark Red
8	Cyan
9	Medium Red
10	Light Red
11	Dark Yellow
12	Light Yellow
13	Dark Green
14	Magenta
15	Gray
16	White

After you get the program to RUN correctly, stop it by using [FCTN] 4. Now LIST the program. Notice that the whole program will not fit on the screen at once. The first few program statements have disappeared off the top of the screen. But suppose those were the lines that you wanted to study carefully.

Try this. Type:

```
LIST 1-10
```

and press [ENTER].

This command causes only the lines from 1 to 10 to be printed on the screen. Now, you can easily study the beginning statements without having to LIST the whole program. This is quite helpful for very long programs.

Now try:

LIST 25-

This kind of LIST command causes all the statements from 25 on to be printed.

Try out this command on the computer:

LIST 13

What does this cause the computer to print? _____

_____

Let's look at all the different things we can do using LIST.

IF YOU TYPE	THE COMPUTER WILL:
LIST	LIST the whole program.
LIST 10	LIST only line 10.
LIST 10-30	LIST the lines from 10 to 30 including 10 and 30.
LIST 10-	LIST 10 and all the lines after.
LIST -10	LIST all the lines up to and including 10.

Try to figure out what the following commands will do. Then type the command into the computer to check your guess.

Fill in the blanks with the line numbers of the program statements displayed. If the computer gives an error message, write that on the blank line. (The first one has been done for you.)

IF YOU TYPE	THE COMPUTER WILL PRINT:
LIST 1-3	1, 2, 3
LIST -3	
LIST 28-	
LIST 28-30	
LIST 40	
LIST 51	
LIST 28-40	
LIST 3	
LIST 0	
LIST 32766	
LIST 32767	
LIST 32869	
LIST 3.9	

Now, RUN the program again. Watch for the order of the colors being displayed. First, light green is displayed, then dark blue, then dark red, and so on.

Stop the program. Remember how?

Now [ENTER] this command:

RUN 17

TERRIFIC! You can even tell the computer to start at a different place in the program. This time the computer started with line number 17. It turned the screen dark yellow.

Try starting the program several times using the RUN command with different line numbers.

Now, suppose that you had forgotten to put in several program lines, say between program lines 6 and 7. How could you put them in? There is no room.

Usually, programmers number their program statements by tens: 10, 20, 30 and so on. This leaves room to insert additional program lines.

Never fear. Tex to the rescue!

[ENTER] this command into the computer:

RESEQUENCE 10,10

Now LIST the program using:

LIST -100

Notice that the program has been automatically renumbered! That saves a lot of time!

Now, your extra program lines can be put in.

ENTER these additional lines:

```
61 PRINT "EXTRA"
62 PRINT "STATEMENTS"
```

Now LIST the program lines up to 100.

Room has been made for these extra statements.

Now LIST the program again.

Look at the last line. The GOTO statement used to be:

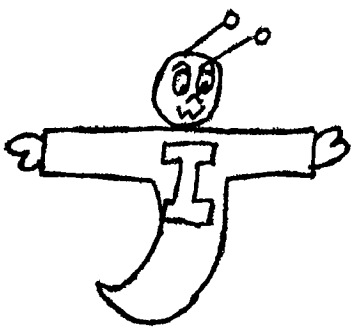
```
GOTO 2
```

Now it is:

```
GOTO 20
```

The RESEQUENCE command automatically changes GOTO statements so that they will loop back to the same place in a program, even though it has been renumbered. In this example, the GOTO statement still loops back to the CALL SCREEN(4) statement.

RUN the program again to see the changes you have made in the program.



THE RESEQUENCE COMMAND RENUMBERS PROGRAM LINES. THE FIRST NUMBER IS THE FIRST LINE NUMBER IN YOUR PROGRAM AND THE SECOND NUMBER IS THE STEP SIZE (THE AMOUNT EACH LINE IS INCREASED BY).

For instance, RESEQUENCE 100,20 would number the first program line 100, the second 120, the third 140, and so on, increasing each line number by 20.

The computer will also accept the following shortened form of RESEQUENCE:

RES

ENTER the following command:

RES 100,20

Now, LIST all the lines up to and including 200.

The first line is numbered _____.

Each line number is increased by _____.

Now try:

RES 50

LIST the program to find out the first line number and the difference between one line number and the next.

The first line number is _____.

The step size is _____.(The difference between one line number and the next.)

Now try:

RES ,30

The first line number is _____.

The step size is _____.

If only the first number is given in a RES command, that number will be the first line number. The step size will automatically be 10.

Let's look at some examples.

IF YOU TYPE	YOU WILL GET THESE LINE NUMBERS:
RES 50	50, 60, 70, 80, 90 ...
RES 101	101, 111, 121, 131, ...

If only the second number is given, it will be the step size. The first program line will automatically be 100.

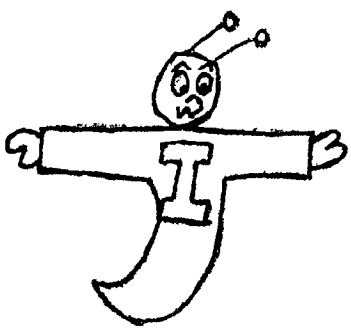
IF YOU TYPE	YOU WILL GET THESE LINE NUMBERS:
RES ,30	100, 130, 160, 190 ...
RES ,50	100, 150, 200, 250 ...

Try several different RES commands on the program already in memory. Each time, LIST the program. Try to understand what the RES command has done in each case.

When you finish, type the following command:

BYE

and press [ENTER].



THE BYE COMMAND CAUSES THE COMPUTER'S MEMORY TO BE ERASED. THE BYE COMMAND ALSO CAUSES THE COMPUTER TO GO OUT OF THE PROGRAMMING MODE.

To verify that computer memory has been erased, get back to TI BASIC and try LISTing the program.

What message do you get? _____

What message do you get if you try to RUN when no program is stored in memory? _____

EXERCISE 3-1

Fill in the following blanks.

1. What command would you use to turn the TV screen to magenta? _____

2. What command would you use to list the statement numbered 60 in a program? _____

3. What command would list all the program statements from 60 on? _____

4. What command would list all the program statements up to and including 60? _____

5. The command _____ will cause a program to begin running at the first statement, no matter what the first statement is numbered.

6. What command would cause a program to start running at line statement 120? _____

7. What command would cause statement numbers 40, 47, 54, 61 and so on to occur in a program? _____

8. What command can you use to tell the computer that you are ready to quit programming? _____

EXERCISE 3-2

Can you find 10 statement errors in the following program?

Write down descriptions of the errors in the blanks.

NOTE: O is the letter; Ø is a zero.

```
5 CALL CLEAR                                    _____
1Ø CALL SCREEN(17)                              _____
15 PRIINT "HELLO!"                              _____
2Ø GOT O 3Ø                                     _____
25 HALT                                         _____
3Ø CALL PRINT "GOODBYE!"                        _____
31 PRINT                                        _____
35 GOTO 71                                      _____
4Ø RUN                                          _____
45 GOTO 25                                      _____
7Ø PRINT "I'M LATE! I'M LATE! I'M LATE!"        _____
75 SCREEN(7)                                    _____
8Ø PRINT "....SAID THE WHITE RABBIT.            _____
9O GOTO 45                                      _____
```

Now, go back and correct the program so that when you RUN it the following message is printed:

```
HELLO!
GOODBYE!

I'M LATE! I'M LATE! I'M LATE!
....SAID THE WHITE RABBIT.
```

LESSON #4 LOADING PROGRAMS

You have had some experience, now, in writing short programs. But suppose that you had written a long program, say 1000 statements long. It would take you a long time to enter this program into the computer's memory. If you had to enter this long program every time you wanted to run it, you might soon give up programming altogether.

Fortunately, programs may be saved (recorded) on cassette tape. Then, a program can easily be loaded into the computer's memory in a short amount of time.

In this lesson, you will learn how to load a program which has already been stored on cassette tape. The program is a game which you may play.

Get the first game tape. (Your teacher can show you where it is.) On this tape is a fun game. Before you can play it, you must learn how to load it into your computer's memory. Just follow the directions below and on the next few pages. Have fun!!

HOW TO LOAD A PROGRAM STORED ON TAPE

1. Open the door to the cassette recorder by pushing the eject (or open) button.
2. Put the cassette tape into the recorder with the program side up. BE CAREFUL! THE TAPE WILL ONLY GO IN ONE WAY. BE GENTLE! DON'T FORCE THE TAPE.

3. Close the door to the cassette recorder.

4. [ENTER] the following command into your computer:

   OLD CS1

   NOTE: THIS COMMAND MUST BE WRITTEN IN UPPERCASE. Look back on page 1 to see how to get your computer to print in uppercase.

5. Your computer will now guide you through the remaining steps. It will say:

   ```
   * REWIND CASSETTE TAPE     CS1
     THEN PRESS ENTER
   ```

   Do what the computer asks. Rewind the tape on cassette number 1 (CS1) by pressing the rewind button. When the tape is completely rewound, press the recorder stop button. Then on the computer press [ENTER].

6. When you press [ENTER] in step 5, the computer will say:

   ```
   * PRESS CASSETTE PLAY      CS1
     THEN PRESS ENTER
   ```

   Do it! (Press the play button on the recorder and then press [ENTER] on the computer keyboard.)

7. As the tape begins to play, the computer will display the message:

   ```
   * READING
   ```

   This means that the computer is reading the program and storing it in memory. You should also be able to hear a garbled sound as the recorder plays the information.

8. If the program has been read correctly, the following messages will be printed on the screen:

   * DATA OK

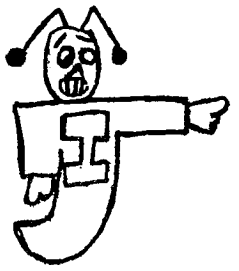
   * PRESS CASSETTE STOP CS1
     THEN PRESS ENTER

   Do as the messages say. (Press the cassette recorder stop button and then press [ENTER].)

9. Press the rewind button on the cassette recorder. When the tape has been rewound, press the stop button.

10. Press the eject (open) button on the cassette recorder and carefully remove the cassette.

11. Close the door of the cassette recorder and put the tape back where you got it.



NEVER PUT A TAPE NEAR HEAT, ELECTRICITY, MAGNETS, FOOD, OR WATER. THESE MAY RUIN THE TAPE.

12. Tell the computer to RUN the program you have just loaded.

13. Have fun!!

IF YOU GET AN ERROR MESSAGE, try again, making sure that you have done everything right. If it still doesn't work, ask your teacher to help you.

HINTS:

If the program does not load correctly, you will get an error message. Press E to EXIT from the loading procedure. Then press stop on the cassette and press [ENTER] on the computer. You may now repeat the loading procedure, starting with step 4.

If the program still does not load correctly, check the following:

1. Is the cable connecting the recorder and the computer loose? If so, push in the loose connector.

   NOTE: The red wire goes to the microphone jack.
   The black wire goes into the remote jack.
   The white wire goes into the earphone jack.
   The other end of the connector plugs into the computer on the back right-hand side.

2. The cassette recorder volume control should be set around 8.
3. Neither the recorder nor the computer should be sitting on a metal surface.
4. The recorder should be 2 feet or more away from the television set.
5. If none of the above changes work, maybe the cassette tape is bad. Try to load the program on a different one.

name _____

VOLUME I REVIEW QUIZ

Fill in the blank with the correct word from the ANSWER POOL. (If you get stuck, turn back to the correct page and review.)

ANSWER POOL

RUN	cursor	90 STOP
CALL SCREEN(9)	←	FCTN 4
scrolling	FCTN	OLD CS1
RES 200,20	20 PRINT	20 GOTO 20
NEW	CON	RUN 170
" "	CALL CLEAR	LIST 25-230
programming	GOTO	BYE
BASIC	endless loop	ENTER
LIST	* INCORRECT STATEMENT	

1. _____ is a small blinking square which indicates where the next letter of your command or statement will go (p.i).

2. _____ is telling the computer what to do (p.1).

3. _____ is the computer language you are learning (p.1).

4. _____ tells the computer to erase the old program (p. 2).

5. _____ puts a command or line into the computer (p.2).

6. _____ is printed on the screen when there's a misspelled command in a statement that has been ENTERed (p.2).

7. _____ causes the front symbol on a key to be printed (p.4).

8. _____ together with the [FCTN] key is used to move the cursor to the left (p.4).

9. _____ can be used to write a blank line on the screen (p.10).

10. _____ causes the computer to display the program stored in memory (p.5).

11. _____ causes the computer to follow the instructions stored in its memory (p.5).

12. _____ erases the TV screen (p.7).

13. _____ is the upward motion of lines on the TV screen (p.10).

14. _____ is a program statement which causes a program to cease running (p.5).

15. _____ go around a message that you want displayed on the TV screen (p.5)

16. _____ tells the computer which program statement to do next and allows statements to be executed out of the usual order (p.20).

17. _____ is a way to stop a program before it comes to a STOP or END statement (p.18).

18. _____ causes the computer to begin running where it left off at a break rather than at the beginning of the program (p.19).

19. _____ is a group of program lines which the computer repeats over and over (p.20).

20. _____ is an example of a one statement endless loop (p.21).

21. _____ causes a program to start running at statement 170 rather than at the lowest numbered statement (p.31).

22. _____ changes the screen color to medium red (p.28).

23. _____ displays all program lines between 25 and 230, including 25 and 230 (p.28).

24. _____ renumbers the line statements of a program with 200, 220, 240, 260 ... (p.32).

25. _____ is the command which is used to start loading a cassette tape program (p.39).

26. _____ causes computer memory to be erased and causes the computer to exit from the TI BASIC mode (p.34).

PROJECT PAGES

At the end of each manual, you will find several projects that test your ability to use what you have learned. There are no right or wrong answers. If your program does what is asked, then it is quite acceptable. You are free to express your creativity. Be proud of what you do. Do not worry whether your solution is like anyone else's.

The projects at the end of this book may seem to be easy...but do not be deceived into thinking that you can skip them. After all, if they are easy for you, then it will not take long to do them.

The projects in the later books will be more challenging...now is the time to enjoy a few that are not too hard.

Good Luck!

RED PROJECT 1

Using your knowledge of the PRINT command, create a program that will produce a picture of a house on the screen.

RED PROJECT 2

Write a program that uses most of the commands you have learned. When the program works, copy it below.

RED PROJECT 3

Load a game tape. List the tape so that you can see the commands. Notice how many you already know.

Play the game.

RED PROJECT 4

CREATE a dragon with PRINT commands that will fit on your screen. Copy your program below or on the back.