

NAME \_\_\_\_\_  
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YEARS IN PROJECT \_\_\_\_\_  
YEARS IN 4-H \_\_\_\_\_

4-H 1078B



# 4-H COMPUTER PROJECT II:

## *Learning About Programming*



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Institute of Food and Agricultural Sciences  
University of Florida, Gainesville  
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*The 4-H program is for all young people ages 8 through 18. Members can choose from a wide range of educational activities and have fun while learning. Contact your county 4-H Extension agent to learn how you can participate in the many projects and activities for young people.*

This manual is the product of a project that was supported by a special needs grant from the Extension Service, USDA, Washington, D.C. This revision, following a pilot test by 12 states, has been prepared by University of Kentucky Extension Agricultural Engineer George A. Duncan with the help of University of Kentucky Computer Project Committee members Dennis Goodman, Richard Maurer, Patricia P. Schrader and George Turner. The pilot test draft was prepared by Lee Hays, George A. Duncan and George Turner, with artwork by Ron Hutt, from the original materials prepared by George Duncan, George Turner, Linda Bach, Steve Duncan, Sandy Holland, Bernie Bourbeau, Richard Maurer, David Miles, Jerald Rose and Kathy Wyatt.



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# Computer Project II: *Learning About Programming*

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## **Introduction**

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Welcome back to the world of computers. In *Computer Project I: Learning About Computers* you learned how the parts of the computer function, how to operate a computer keyboard, how to do calculations on a computer, how to take care of cassette tapes and diskettes, how diskettes and cassette tapes store information, and how to *load* and *run* programs from the cassette tapes and diskettes. In this project you will learn about programming a computer.

In Project I we discussed the word "program." Do you remember the meaning of a program? Let's review. A program is the statements and commands stored in the computer by the operator to instruct the computer how to perform. Programs must be written to the specific format for each type of computer. If you do not follow the format to the letter, the computer will not understand. This is one characteristic that makes each type of computer unique.

In this project you will be asked to type and run programs. The programs are already written for you in ordinary language. What you must do is look on pp. 37-38 and select the computer language—the matching computer commands or keys for your unique machine. You must type in the computer commands letter by letter. To type the keys, you simply locate and press the correct ones. Following the exercises on commands and their functions, you will complete activities in which you write your own programs.

## **What You Will Learn in This Project**

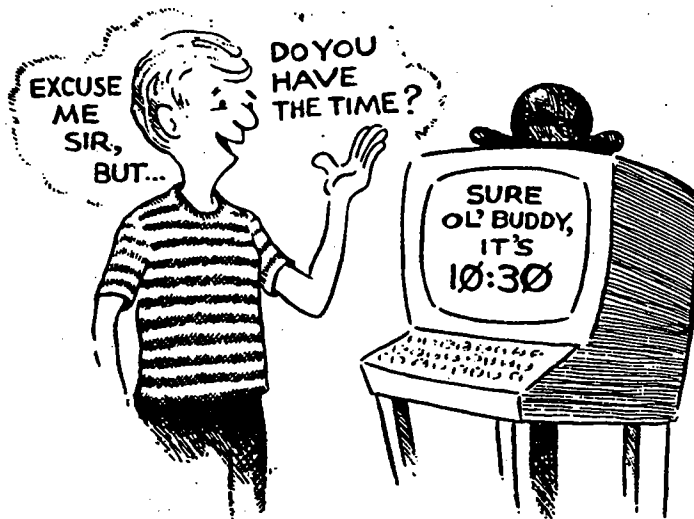
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- How to communicate with the micro-computer
- How to make information appear on the video screen
- How to write, run and list a program
- How to use input and produce output in various ways
- How to recognize specific computer instructions

## **What You Will Do in This Project**

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- Type commands
- Write programs
- Run programs
- Change short programs
- Give a demonstration on a computer
- Keep a record of your 4-H computer project



## Computers Are All Around Us

Computers are used widely. You can find them in banks and businesses, in many government offices, in schools, and in some homes, maybe yours. You can even find them in typewriters, microwave ovens, cars, and wristwatches.

Where have you seen computers used in your community?

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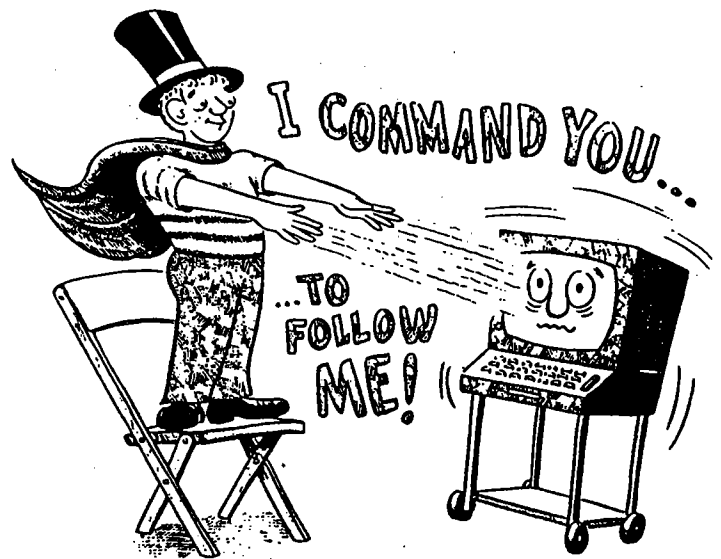
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## You, a Programmer?

The following activities will let you type short programs into the computer and see what happens. By observing the results of certain commands, you will learn how to program the computer. Each activity shows you a new command word and asks you to apply the command. Be sure to learn how these command words work since you will be using them to write programs in this computer project. The activities in this project



book use the BASIC computer language—the language used by most microcomputers.

## Before You Begin

First you must know the type of computer you will be using. Then you must find the computer keys or commands for your computer that match the English instructions below. Use the list on pp. 37-38 and your computer's instruction manual. When you find the proper key or command for each of these instructions, write the names in the spaces provided for an easy reference. If a computer is available, find the keys on the keyboard. The four instructions below will occur quite frequently as you work through this project. Write the name of the key or command that matches each instruction.

- stop execution key: \_\_\_\_\_
- clear key: \_\_\_\_\_
- enter/return key: \_\_\_\_\_
- new program command: \_\_\_\_\_

The following is a description of important keys on the keyboard and symbols that appear on the video display (screen). You will use these often during this project. If a computer is available, locate the keys and symbols. Remember, you will have to check the list on pp. 37-38 to find some of these keys.

**Key or Symbol**  
stop execution key

**Use**

A key (or keys) that stops the computer and tells it to wait for a new command.

clear key

A key (or keys) that clears the video display but does not erase information in memory.

enter or return

A key that causes the computer to respond to any statement or information just typed (used as **ENTER/RETURN** in the rest of this project book).

> or OK or ]

These symbols are called the prompt and mean that the computer is ready to receive a new statement or command.

Computers have different prompts. These are some examples. The prompt appears on the screen after you press the **ENTER/RETURN** key.

\_ or ■

The underline is called the cursor and shows you, on the screen, where you will type the next character. Some microcomputers use a blinking cursor. Also, the cursor could be a white rectangle rather than an underline.



The left arrow is the backspace key on many microcomputers

**Key or Symbol**

**Use**

and is handy to correct errors. On some equipment it erases each character you backspace over. Just type or space again, and you are on your way.

Quotation marks

Comma

Semicolon

"at" symbol

Equal key (S)\*

Subtraction key

Multiplication key (S)\*

Addition key (S)\*

Period or decimal key

Divide key

Exponential key

Greater than

Less than

These are the numbers one and zero, which are two of the 10 numbers on the keyboard.

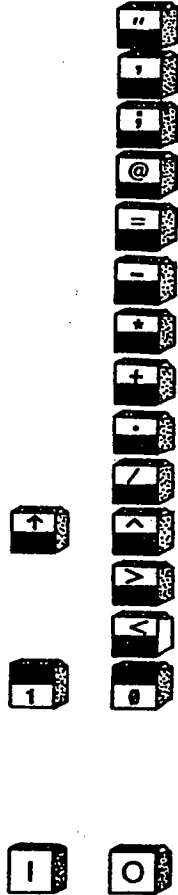
These are the letters I and O, which are two of 26 letters on the keyboard. Notice the difference between the two letters and the two numbers.

shift

space bar

Shift key is used with (S)\* keys.

This is called the space bar key. If a blank is needed in a certain spot while typing, press the bar.



\* (S) means you must press the shift key while pressing that key to produce the symbol desired.

# Activity 1. Your First Program

You will learn how to clear the video; print words onto the video; use the *NEW*, *END*, *RUN*, and *LIST* commands; and the importance of line numbers.

1. First, you may need to power-up the computer and obtain the prompt indicating the BASIC language is ready to use. (Check the operations manual for your computer.) Then prepare the computer for a new program by pressing the stop execution key, clear key, **ENTER/RETURN** key; typing the new program command and pressing the **ENTER/RETURN** key. (For example, for one type of computer you may press **BREAK, CLEAR, ENTER**: type **NEW** and **ENTER**.)
2. Locate the following instructions in the list on pp. 37-38 and see how specific commands or statements for the computer are written. (See *Sample Program* below. Remember, this is an example for one type of computer. Yours may be different.)

Instructions	Sample Program
10 Clear the screen	10 CLS
20 Print to video "your name" (Put your name between the quotes.)	20 PRINT "your name"
30 End of program	30 END
Run the program	RUN

Now do the same program for your machine. Look up the various computer commands and write the proper statements and commands for your machine. You may need to refer to the instruction manual for your machine.

Instructions	Write Your Program
10 Clear the screen	10 _____
20 Print to video "your name" (Hint: Put your name between the quotes.)	20 _____
30 End of program	30 _____
Run the program	RUN _____

3. If a computer is available, type your program into it. If you make a mistake in typing, use the backspace key to back up and correct the mistake. When you have finished line 30, type **RUN** and press **ENTER/RETURN**. What happened? If you had an error in the program, a "syntax" or other error message occurred. Don't worry; skip down to paragraph 5, **LIST** your program, check for the error, correct it, **RUN** the program again and continue with paragraph 4.
4. Congratulations! You have written and **RUN** your first computer program! Let's review the steps that occurred. Typing the command word **NEW** tells the computer to forget the old program, if there was one, and to receive a new program. The clear screen command clears the video display. Your name appears on the top line as a result of the **PRINT** command. **END** signals the end of the program. The numbers identify each command or statement line and the order of execution. **RUN** causes the computer to execute the program. Easy, isn't it?
5. To see what your program looks like, press the clear key, type **LIST**, and press **ENTER/RETURN**. The program that is stored in the computer's memory will appear on the video. You may correct or change any line by merely typing the entire line again. The computer will insert the line in the proper place in the program according to the line numbers.

## The Importance of Line Numbers

The line numbers you have been using, 10, 20, 30, 40, etc., identify each command or statement line and determine the order of execution. You could have used the numbers 1, 2, 3, 4, 5, 345, 678, etc. Usually, numbers are skipped so new lines can be added between the existing lines as you will later learn and do. Each line may contain up to 255 characters in most versions of the BASIC language. Line numbers are useful when you want to change the commands in specific lines or change the order of execution of a program. Line numbers are like house numbers; you can tell exactly where to go in a program. Now let's try a few changes and additions.

6. Put a new name on line 20. Try it by typing:

```
20 PRINT "new name"
```

and press **ENTER/RETURN**. Type **RUN** and press **ENTER/RETURN**. The new name appears. Notice that by typing an existing line number with new information following, you replace the old information with new information, whereas a new line number will add another line in numerical order.

7. Add the following lines and run the program:

```
20 PRINT "your name"  
22 PRINT "your address"  
24 PRINT "your city, state, zip"
```

What happened? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. Now you may better understand why line numbers have spaces left between them. You may want to add more lines later.

9. Try some other names and addresses by retyping lines 20, 22 and 24.

What have you told the computer to do? \_\_\_\_\_  
\_\_\_\_\_

10. The **PRINT** command used alone will cause a blank line to be added. It is useful when you want to put blank lines in your output on the video.

## Are You Ready to Write Your Own Program?

1. Type the new program command and press the **ENTER/RETURN** key.

2. Write a short program to clear the screen, print the day, month and year on one line and run the program.

Write your program below. Remember to include line numbers beside each line.

```
_____  
_____  
_____  
_____
```

3. Now type your program into the computer and run the program. If the day, month and year do not appear on the screen, then type **LIST** and press **ENTER/RETURN**. Check for your mistake and correct it by typing the line over. Did you get information from the previous program? If so, remember to type **NEW** when starting a new program.

## Activity 2. Going By the Road Map!

You will learn how to use the **GOTO** command and a flowchart. The **GOTO** command allows program transfers to specific line numbers; it lets you skip or repeat lines. A flowchart is a diagram showing how a program works. It lets you follow the commands and statements just like you would follow a road map through the country.

1. Very few programs follow all the line numbers in an exact order from beginning to end. You may want to repeat or skip portions of the program. The **GOTO** command and the line numbers allow you to do this.

2. Retype a short program you used in Activity 1 into the computer and use the following line instead of the **END** command:

**30 GOTO 20**

(Note: Line 20 should be a **PRINT "words"** command in your program.)

3. Type **RUN** and press **ENTER/RETURN**.

What happened? \_\_\_\_\_

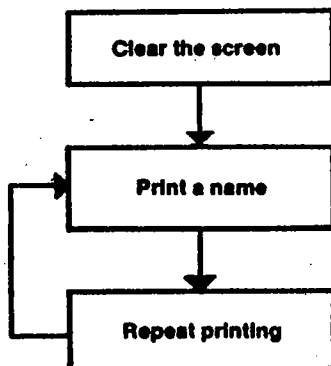
How do you properly stop the execution of the program? \_\_\_\_\_

4. The **GOTO** command tells the computer to go back to line 20 and repeat execution of line 20 and all lines that follow up to line 29. This forms a "loop" that continues indefinitely until you stop the computer. The proper way to stop the computer is to press the stop execution key (**BREAK** or equivalent) you reviewed on page 4.

5. Try some other **GOTO** commands in your program.

6. Following is a block diagram to illustrate the program you have just used. These diagrams can be called "flowcharts" and are very helpful in planning a long, complicated program or determining how one works. Sketch a flowchart of one of the programs you used in Activity 1 or 2. You will learn more about flowcharts later in this project.

Sample Flowchart



Your Flowchart

# Activity 3. Punctuation , ; : It Changes Things!

You will learn the importance of the comma, semicolon and colon ( , ; : ) with the print to video instruction.

1. Prepare the computer for a new program by pressing the stop execution key, clear key and **ENTER/RETURN**. Type the new program command and press **ENTER/RETURN**.
2. Locate the following instructions in the table, and write the commands or statements for your computer in the spaces to the right of the instructions.

Instructions

Write Your Program

10 Clear the screen

\_\_\_\_\_

20 Print to video "your name"

\_\_\_\_\_

30 Go to line 20

\_\_\_\_\_

Run the program

\_\_\_\_\_

No punctuation after **PRINT " "** causes your name to be printed how?

- 
3. Stop the program and clear the screen. (Remember how?)  
Type in a new line 20 by adding a *comma* at the end:

20 PRINT "your name",

Run this program. Your name will be printed in how many columns? \_\_\_\_\_

4. Stop this program. Type a new line 20 by adding a *semicolon* in place of the comma:

20 PRINT "your name";

Run this program. Your name will fill the screen and may "march" left or right, depending on the spaces in your name. Why? \_\_\_\_\_

- 
5. Stop the program and add a few *spaces* to your name between the " ", such as:

20 PRINT "your name ";

Then run the program. What is the difference? \_\_\_\_\_

- 
6. Stop the program and type a new line 20 with a *colon* and another **PRINT** command on the same line:

20 PRINT "your name":PRINT "your address"

Run this program.

What does the colon permit you to do? \_\_\_\_\_

7. Stop the program and type a new line 20 with multiple commas on the same line.  
**20 PRINT "your name", "your favorite food", "your weight"**

Run this program. Then press the stop execution key.  
What do the multiple commas produce on the video display?

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8. Stop the program and type a new line 20 with multiple semicolons on the same line. Insert your favorite number between the quotes.

**20 PRINT "your favorite number"; "your favorite number minus one";**

Run this program. Press the stop execution key. What do the multiple semicolons produce on the video display?

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How would a single semicolon after **PRINT " "** cause your name to be printed?

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### Are You Ready to Write Your Own Program?

1. Prepare the computer for a new program.
2. Write a program to clear the screen and print your name and city on one line in columns. On the next line print your favorite hobby and then your birthday. The video display should look as follows:

your name	your city
your hobby	your birthday

Write your program here. Remember to write the line numbers beside each line.

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3. Now type your program into the computer. Type **RUN** and press **ENTER/RETURN**. If the program does not work, press the clear key, type **LIST** and press the **ENTER/RETURN** key to see your program and check for a mistake. To correct a mistake, retype the line number and a new or corrected statement.

Frequently numbers will be omitted between numbered lines so that other lines of information may be added later. Usually line numbers will increase by 10, to allow you to go back and add extra information if needed. The computer automatically arranges the lines in sequence beginning with the smallest number and ending with the largest number. It "executes" the commands in the same sequence, unless a special command, such as **GOTO**, tells the computer to "jump" to some other line number.

### Let's Review

You have used lots of new words and symbols to communicate with the computer. Stop for a moment and write the meaning for these computer commands or statements.

**CLS or HOME** \_\_\_\_\_

**GOTO** \_\_\_\_\_

**PRINT " "**, \_\_\_\_\_

**PRINT " ";** \_\_\_\_\_

**PRINT " ":** \_\_\_\_\_

**LIST** \_\_\_\_\_

**NEW** \_\_\_\_\_

**END** \_\_\_\_\_

**RUN** \_\_\_\_\_

**Line number** \_\_\_\_\_

**Flowchart** \_\_\_\_\_

**If you had trouble remembering the meaning for these computer commands, refer to the first two activities. Do not go on until you know and understand these commands and keys.**

