Florida Cooperative Extension Service
Institute of Food and Agricultural Sciences
University of Florida, Gainesville
John T. Woeste, Dean for Extension
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.

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4-H Computer Project III: Using Computers in 4-H Projects

Introduction

In 4-H Computer Project I, you learned about some of the components of small computers, how to load a program from a cassette tape or diskette, and how to run and respond to a program. In 4-H Computer Project II, you learned about programming and how commands direct the computer to do useful things.

This more advanced project will challenge you to use microcomputer programs in various 4-H activities, perhaps even developing your own programs to use. The project requires access to a microcomputer to fully develop and apply programs. This project also provides some guidelines on reviewing and selecting a microcomputer for your present or future needs.

If your 4-H group does not have a microcomputer available, try to find a friend (or a school or business) who has a microcomputer on which you can practice. Learning to use or to program a computer is just like learning to play a piano; you must sit down at a keyboard to really master the instrument.

What You Will Learn in This Project

- Helpful pointers on microcomputer hardware and software
- Ways to use microcomputers in 4-H projects
- Potential benefits of microcomputers
- How to plan and develop your own programs
- How flowcharts can help you plan and organize a computer program

What You Will Do in This Project

- Review computer terms and commands.
- Use available programs for various activities.
- Plan a program.
- Develop your own program.
- Give a demonstration about the computer or a program.
- Keep a record of your 4-H computer project.
A Review of What You Have Learned

Let's review what you learned in the first two computer projects. You must have a good understanding of the information in these two project booklets before you can learn more about computers. To help you review, write a brief sentence about the following components of a microcomputer and what each does.

HARDWARE

SOFTWARE

VIDEO DISPLAY

KEYBOARD

RAM MEMORY

DISKETTE

PRINTER

CPU stands for

C

P

U

Looking at the components of the computer represented below, draw the arrows to indicate the flow of information.

The keyboard is the means by which you "communicate" to the computer. Briefly explain what each of the following important keys does.

CLEAR

BREAK

ENTER or RETURN

SHIFT

SPACE BAR
What is the "prompt" symbol and what does it mean?

What is the "cursor" symbol and what does it mean?

Choosing A Microcomputer

More and more people are buying computers every day, and there are many types from which to choose. New models are becoming available nearly every month—a trend which may continue for several years. You may wonder which microcomputer is the best to use in your 4-H project or other home, school or personal use. If a microcomputer is already available, you are ready to begin—provided it has the software support and features you will need. However, many 4-H'ers will be interested in buying their own microcomputer someday, maybe soon, or in helping others select equipment. To learn more about microcomputers, you should
review books in the library, obtain issues of current magazines, visit local computer stores, and talk with teachers, leaders, and friends about the equipment they use. The following brief pointers on microcomputer hardware features will help you better understand which equipment might best suit your needs.

**Portability:** Quite powerful microcomputers from pocket or book size units up to tabletop sizes are available. Factors to consider include the size, weight, whether the microcomputer is one unit or has components with cables, and the cost.

**Memory capacity (RAM):** A memory of at least 16K is essential for beginning programs; 48K, 64K and 128K are now widely available and preferred since these capacities allow you to develop and use larger programs.

**Keyboard:** Most all keyboards have the keys arranged like a typewriter and have raised keys. However, some economical units have “membrane” type key switches that require pressure on an exact spot. These are not as easy and fast to use as regular keys. An extra set of keys in a separate group (numeric keypad) is helpful for data entry.

**Video display:** Video displays range from a 25-30 character one-line LCD display on a pocket-size microcomputer to the 12- to 13-inch monochrome or color monitors. If you plan long-time use and viewing, the video display would be more desirable. These displays feature line lengths of 32 to 80 characters and 16 to 24 lines (80 by 24 is the industry standard for professional computers). If you want compactness and easy portability, the multi-line LCD character displays may be more appropriate.

**Color or monochrome video:** Monochrome means a one-color display. These are available as black and white, green or amber. Opinions differ as to which is easiest to see and less tiring on the eyes. Size is probably more important for viewing ease. The color video output of many microcomputers allows the use of color monitors for extra opportunities and challenges in producing color video displays.

**Graphics:** High resolution graphics enable fine detail for symbols, illustrations, and other creations. Good graphics features are available on both monochrome and color microcomputers, but a proper video monitor is necessary to display the graphics.

**Musical tones:** Several octaves of simple musical tones are available in some microcomputers for those who want to develop musically related programs or tunes.

**Cassettes or diskettes:** A cassette recorder and tapes are economical but slow and limited in data access and versatility. The floppy disks and disk drives are much faster and offer many conveniences and advantages at a reasonable cost. Any microcomputer intended for serious use should have the capability of adding disk drives.

**Printer:** An economical printer is a desirable accessory to provide printed copies of the results of the microcomputer’s output. Many capable and economical dot matrix printers are available using single sheet or continuous form paper.

**RS232C Serial Interface:** This component allows a microcomputer to “communicate” with other microcomputers or with larger computers over the telephone lines or similar networks. A MODEM is also needed to connect the RS232C device to the telephone circuit.

What Software Is Available?

Thousands of software programs are available for the popular brands of microcomputers. This software ranges from the arcade type games to very useful home, business and educational programs. Several 4-H related programs have been developed and are available free from your 4-H Extension agent or leader. Many other programs are available from microcomputer user groups, friends, schools, computer stores or catalog sources. Some programs are free. Others may cost a few dollars or several hundred dollars depending on the scope and complexity. Much commercial software is “copyrighted” which means it is not legal to make copies to distribute or share with others. Proper selection and use of software
Software for specific applications includes programs for home energy analysis, diet and nutritional analysis, irrigation scheduling, crop drying and system design, crop and animal performance records, chemical applications, building designs and estimated costs, etc.

Should You Use Available Software or Develop Your Own?

Both, depending on your needs and the resources available! Ignoring the availability and use of existing software is poor judgment and careless oversight. However, some software may have a cost that you, your agents, leaders, teachers, or friends cannot afford, so you will have to rely on the free or affordable sources. The real challenges and satisfaction of using microcomputers come about when you develop your own useful programs.

The remainder of this project will guide you in learning to use available software and in developing your own new programs for your 4-H, home, farm, ranch, or school needs.

Using Existing 4-H Software

Several programs have been developed for use with some of the popular microcomputers as part of this 4-H computer project. These are available from your 4-H agent or leader. If the microcomputer available to you will not use these versions, then you might undertake modifying and adapting the BASIC language of the program to work on your microcomputer. This assumes you have learned programming in BASIC well enough to do the conversion. If not, perhaps you can review Project II, read other programming books and/or get help from a friend, teacher, or leader.
Here's how you can use some of the programs.

**Program: FUELCAST**

**Benefits:**
1. Determine annual fuel costs of your family vehicles.
2. Compare fuel efficiency and savings of several vehicles.
3. Learn how to economize on automobile fuel costs.

**Requirements:**
1. The FUELCAST program
2. A microcomputer to run this program
3. The following data for each car:
   a. average miles driven daily
   b. average miles per gallon of fuel
   c. cost of fuel per gallon

**Procedures:**
1. Obtain the above data for one or more cars.
2. Prepare the FUELCAST program for operation on the microcomputer.
3. Enter the above data when requested by the program.
4. Write down the annual fuel costs for the vehicles.

```
vehicle model: __________________________

                      __________________________

annual fuel costs: __________________________
```

5. Show the results to the owners of the vehicles and suggest ways to economize with tune-ups, fewer trips, carpooling, combined errands, etc.
6. Remember that fuel costs alone are only part of a car's total annual costs.

The car operating costs program (CARCOST) gives a more complete analysis of a car's annual cost.

7. Write a summary of your experiences with this program.

**Program: CARCOST**

**Benefits:**
1. Determine overall annual car operating costs.
2. Compare costs and savings of different models of cars.
3. Plan for future car purchases that provide the most economical operating costs.

**Requirements:**
1. The CARCOST program
2. A microcomputer to run this program
3. The following data for each car:
   a. size category of the car; for example, standard 8-cylinder, intermediate 6-cylinder, compact 6- or 4-cylinder, sub-compact 4-cylinder
   b. annual insurance costs
   c. annual license registration fee
   d. average miles driven per day
   e. average miles per gallon of fuel
   f. cost of fuel per gallon

**Procedures:**
1. Obtain the above data for the cars.
2. Prepare the CARCOST program for operation on the microcomputer.
3. Enter the data when requested by the program.
4. Write the following results:

```
car model: __________________________

                      __________________________

miles driven: __________________________

                      __________________________

annual costs: __________________________

                      __________________________

cost/mile: __________________________

                      __________________________

which car is more economical: __________________________
```

7. Compare the cost of trading a car for a more economical model and how long it will take for the savings in operating costs to offset the cost of trading.
8. Give a demonstration to your 4-H group, school class, community club, or other group on the results of this car cost analysis.
9. Write a summary of your experiences with the car cost program.

Program: GARDEN

Benefits:
1. Have the most productive and efficient garden for the number of people in your family in the space available.
2. Determine the estimated cost of seeds and plants required.
3. Determine the estimated value of products grown.
4. Review or learn ways to serve, freeze, can, or otherwise preserve the harvested vegetables for home use. (Refer to other 4-H projects or check with your Extension agent.)

Requirements:
1. The GARDEN program
2. A microcomputer to run the program
3. Selection of any of 36 listed vegetables
4. A data input form, if you use the program at an exhibit, to accommodate large numbers of people more conveniently

Procedures
1. Prepare the GARDEN program for operation. (Note: some data in the program on planting and harvesting dates may have to be modified for your region of the U.S.)
2. Enter the number of people the garden will produce for.
3. Select the vegetables to be grown.
4. Display or print the results.
5. Write the following results:
   - number of people to produce for
   - square feet of area required
   - approximate cost of seeds and plants
   - approximate value of products to be grown
   - returns of your garden

6. Make other vegetable selections and compare the area, costs, and yield.
7. Help friends and neighbors plan their garden.
8. Organize and conduct garden projects for the summer.
9. Give a demonstration on how to plan a good garden and use the vegetables produced.
10. Write a summary about your experiences with the GARDEN program.

Using Commercial Software

Numerous programs to perform useful tasks are available for most all microcomputers. They may be purchased from computer stores, catalogs and magazines. The general-purpose software described in a previous section is widely used in offices, by businesses, farmers, ranchers, teachers and even in homes. The top quality software has been developed and tested by professional programmers and capable users over many months or years. It should be error-free, easy to use and supported with good instructional manuals. The cost varies depending on the capabilities and market competition.

The following activities will guide you to learn more about such software, its availability in your community, how it is being used and ways you might use it for 4-H projects.
Program: Word Processing Software

Benefits:
1. Prepare letters, reports, documents, etc.
2. Make changes, corrections, additions, deletions, etc., readily and easily.
3. Format page margins, lengths, etc.
4. Print one or several copies.
5. Save the final version on diskette for future uses.

Requirements:
1. A microcomputer and printer
2. The word processing software and the instruction manual for its use
3. Assistance in the proper use of the equipment and the software
4. A brief letter, report, announcement or minutes of club meeting, etc., which you wish to type and have several copies produced

Procedures:
1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type your letter, report, etc.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future uses.
7. Print a hard copy and double-check for correctness, margins, etc.
8. If you find errors or changes, make the corrections, save the corrected version, and reprint one or more copies as needed.
9. Write results of your activity here:
   a. Whose equipment did you use?

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

10. What are some other uses of word processing software?

   __________________________
   __________________________
   __________________________
   __________________________
   __________________________

11. Write a school report, news article or give a demonstration on the capabilities of word processing software and how it can be used.
Program: *Mailing List Software*

**Benefits:**
1. Have accurate names and addresses of friends, club members, relatives, etc.
2. Prepare mailing labels for envelopes.
3. Print lists so others can have up-to-date rosters.
4. Make changes as people move or membership status changes.
5. Save the final version on diskette for later uses without retyping.

**Requirements:**
1. A microcomputer and printer
2. The mailing list software and instruction manual for its use
3. Assistance in the proper use of the equipment and software
4. Names and addresses you wish to have typed and copies or labels produced

**Procedures:**
1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type your names and addresses.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future uses.
7. Print a hard copy and double-check for correctness, margins, etc.
8. In case of errors or changes, make the corrections, save the corrected version, and reprint the copies needed.
9. Write results of your activity here:
   a. Whose equipment did you use?
   
   b. What was the commercial name of the software?

   c. Whose names and addresses did you use?

   d. Did you learn to make corrections?

   e. What were some corrections you had to make?

   f. How many copies did you make?

   g. Describe some advantages and disadvantages of the software you used.

10. What are some other uses of mailing list software?

11. Write a school report, news article or give a demonstration on the capabilities of mailing list software and how it can be used.
Program: *Electronic Spreadsheet Software*

**Benefits:**
1. Prepare tables of data with titles in column and row form.
2. Prepare income and expense lists, a treasurer's report, budgets, financial statements, etc., with summaries of desired columns and rows.
3. Update change of value and related results immediately.
4. Print copies for distribution.
5. Save the final version on diskette for later use without retyping.

**Requirements:**
1. A microcomputer and printer
2. Electronic spreadsheet software and the instruction manual for its use
3. Assistance in using the equipment and the software
4. Data or information such as a treasurer's report, income and expenses, budget, etc., that you wish to have typed and copies produced

**Procedures:**
1. Locate a person or business who has the equipment and software needed.
2. Read the instruction manual to learn proper use of the software.
3. Ask the person presently using the equipment for guidance in its proper use.
4. Prepare the software for use and type in your data or information, etc.
5. Check the typed information on the video display for accuracy.
6. Save (store) a copy on a diskette for future use.
7. Print a hard copy and double-check for correctness, margins, etc.
8. If there are errors or changes, make corrections, save the corrected version, and reprint copies as needed.
9. Write results of your activity here:
   a. Whose equipment did you use?

b. What was the name of the commercial software?

c. What data or information did you use?

d. Did you learn to make corrections?

e. If so, what were some corrections you made?

f. How many copies did you make?

g. Describe some advantages and disadvantages of the software you used.

10. What are some other uses of electronic spreadsheet software?

11. Write a school report, news article or give a demonstration on the capabilities of electronic spreadsheet software and how it can be used.
Developing Your Own Software

Those of you who are advanced or eager 4-H members will want to develop your own programs. There are numerous programs you can develop which will be useful in your other 4-H projects. This section presents several topics and outlines procedures for you to use in developing programs. However, you must first learn and understand flowcharting—a helpful technique for planning and developing your software.

Flowcharting

Working at a computer is fun, however, to be a good programmer you first need to use a pencil and paper to plan and practice writing programs. Writing a computer program is somewhat like building a house, assembling a bicycle or following a recipe. You must put many different ideas and actions together in a certain way. If you do not follow the steps correctly, the results will not be what you expect and probably not what you want.

The flowchart diagrams the step-by-step procedure for solving a problem. A flowchart uses certain symbols or diagrams that you should understand. Write the meaning for the following flowchart symbols below (refer to Project II if necessary).

**Flowchart Symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oval</td>
<td></td>
</tr>
<tr>
<td>Square/rectangle</td>
<td></td>
</tr>
<tr>
<td>Diamond</td>
<td></td>
</tr>
</tbody>
</table>

To flowchart a problem, you must think of all the steps involved in solving the problem and the correct order in which they must be completed. For example, tests of certain logic conditions such as true/false, yes/no, greater than/less than/equal to often have to be performed and transfers made to various sections of the program for proper instructions.

In order to end up with valid conclusions, you must program your computer to determine whether the information input by the user is proper. For example, 1. no entry (a blank zero entry), 2. a number, letter, character or word as appropriate, and 3. if a number, whether it is within an acceptable range.

A flowchart has no "dead ends" except for the END of the program. Every step must lead to another step or return to a previous step.
Practice Flowcharting

Now try sketching your own sample flowcharts. Select a topic you know something about and list the steps. Your flowchart will be more interesting if you pick a topic that has some choices. Here are some suggestions:

- How to make lemonade
- How to groom a show animal
- How to start a lawn mower
- Directions from home to the grocery or school including stop signs, stoplights, intersections, etc.

YOUR FLOWCHART

TOPIC: ____________________________________________

Up, Up and Away

Now you should be ready to plan and develop some programs. You will need:

- A microcomputer with the BASIC language
- A pencil and paper
- Project book II to review BASIC commands and/or the BASIC manual for your microcomputer

Read each proposed program that follows. Sketch the sequence of instructions as you read the steps. Develop your program statements and commands. Check them for accuracy and an orderly sequence. Then type the program into the microcomputer and hope it runs the first time! If not, then happy “debugging”! (Debugging is the process of finding the errors in the code and making corrections.) If you have great difficulty, find someone who can help you. He or she may be able to spot your errors quickly and save you some frustrating hours!

Program: Calendar of Events

Objective:

To develop a program that will organize important events such as birthdays, club meetings, holidays, etc., for a given month and display or print the list.

Benefits:

1. Provides for organization of time and events
2. Eliminates conflicts in scheduling
3. Helps make efficient use of time in a day

Requirements:

Equipment
1. A microcomputer (and printer if hard copy is desired)
2. A calendar

Data
1. Month desired
2. Day and important events to be entered

For More Information

- Read the programming manual that accompanies the microcomputer you are using.
- Visit a computer store or library for more books on programming.
Procedure:
1. Define an array for characters (Hint: C$\{(\)} to accept important events for a given month.
2. Input the month as an individual data item to identify the month to which the list pertains.
3. Input each day and the events of the day in chronological order. You may input the time of each event, if desired.
4. Use a loop to continue inputting events until all have been entered.
5. Use a special code and an IF...THEN statement to end the input of events and terminate the loop.
6. Display and/or print the calendar of events.

Remember this is only one way to make a calendarized list of important events. Use your imagination and make some improvements in the program.

Results
1. Did you succeed in preparing a program that worked?

2. What problems did you encounter?

3. Did you understand how to use arrays?

4. What kind of improvements did you attempt?

Program: Predicting Beef Animal Market Weight

Objective:
To develop a program that will allow you to predict a beef animal's potential market weight and desired average daily gain to reach the potential market weight.

Benefits:
1. Gives a derived weight to set your goals for the animal's market weight
2. Aids in determining an animal's average daily gain

Requirements:

Equipment
1. A microcomputer (and printer if hard copy is desired)
2. Hip-height measurement device

Data
1. Hip height in inches
2. Age of animal in days
3. Weight of animal in pounds
4. Number of days from date of above measurements to desired market date

Procedure:
1. Use input commands to enter data values for the following items:
   a. Hip height in inches, HH
   b. Age of animal in days, ND
2. Use the above values in the equation below to calculate an adjusted hip height (which is based on a standard age of 205 days):

   \[ AH = (205 - ND) \times SH + HH \]
   where HH and ND are the values entered above and

   \[ SH = 0.033 \text{ for steers} \]
   \[ = 0.025 \text{ for heifers} \]

   \[ AH = \text{adjusted hip height} \]

Plan your program to request or use the proper value for the variable \( SH \) when computing the adjusted hip height for either steers or heifers.
3. Use the value for AH in the following equation to determine the "frame index." ("Frame index" is an indication of the animal's body size and growth potential.) There are two equations—one for steers and one for heifers. Use the proper equation for the animals you are evaluating:

Steers: Frame Index = 3 - (39.75 - AH)/2
Heifers: Frame Index = 3 - (39 - AH)/2

4. After computing the frame index, display it on the computer video. Look at the proper table below to find the potential market weight for your animal. The frame index computed by the equations may not be an exact whole number, thus you may have to make an approximation within the range of numbers given.

<table>
<thead>
<tr>
<th>STEERS</th>
<th>HEIFERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame index</td>
<td>Potential market weight</td>
</tr>
<tr>
<td>1</td>
<td>750-850</td>
</tr>
<tr>
<td>2</td>
<td>851-950</td>
</tr>
<tr>
<td>3</td>
<td>951-1050</td>
</tr>
<tr>
<td>4</td>
<td>1051-1150</td>
</tr>
<tr>
<td>5</td>
<td>1151-1250</td>
</tr>
<tr>
<td>6</td>
<td>1251-1350</td>
</tr>
<tr>
<td>7</td>
<td>1351-1450</td>
</tr>
</tbody>
</table>

5. Prepare an input statement to enter the following data values:

PW = potential market weight from the table
WT = animal weight in pounds at time of measurement
TD = number of days from date of measurements to desired market value

6. Compute the average daily gain (AG) required for the animal to reach its potential market weight by the following equation:

\[ \frac{PW - WT}{TD} \]

7. Display all the above data and results on the video in the format below. If a printer is available, prepare your program to use the printer.

AGE OF ANIMAL = .......
HIP HEIGHT = .......
WEIGHT OF ANIMAL = .......
DAYS FROM MEASUREMENTS TO MARKET DATE = ......
PREDICTED MARKET WEIGHT = ......
AVERAGE DAILY GAIN REQUIRED = ...

Results:

1. Is your average daily gain realistic for your animals?

2. If not, what changes are required in your data to achieve a realistic daily gain?

3. What problems, if any, did you encounter in developing the program?

4. Note: contact your Extension agent for information on a feeding schedule to help achieve the desired average daily gain.

Program: Home Energy Consumption

Objective:
To develop a program that uses natural gas and electric meter readings to compute daily and monthly energy consumption.
Benefits:
1. Display of energy consumption according to time
2. Indication of peak energy usage
3. Record of past and present energy usage
4. Indication of times to conserve energy
5. Study of how various appliances affect energy consumption

Requirements:
Equipment
1. A microcomputer (and printer if a hard copy is desired)
2. Access to home or apartment natural gas and/or electric meters
3. Data sheet for recording meter readings

Data
1. Dates of daily reading for one month
2. Natural gas meter reading each day
3. Electric meter reading each day

Procedure:
1. Prepare a data sheet for daily recordings of the date, gas and electric meter readings. A sample of the data sheet form and a daily entry are shown below:

<table>
<thead>
<tr>
<th>Date</th>
<th>Gas meter reading in cubic feet</th>
<th>Electric meter reading in kilowatt-hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/3/83</td>
<td>4075</td>
<td>67143</td>
</tr>
</tbody>
</table>

2. Read the meters serving your house or apartment at approximately the same hour each day and record the data on your data sheet. Accumulate data for a month or more before, or as, you develop your program in order to have ample data available.

3. Develop a program to calculate the Btu's of energy consumed daily for each source, the daily total of both sources, and the sum to date. The input data and results should be displayed and/or printed as shown by the following table:

<table>
<thead>
<tr>
<th>Date</th>
<th>Meter Readings</th>
<th>Daily Btu's</th>
<th>Daily Total</th>
<th>Sum to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gas Electric</td>
<td>Gas Electric</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Use the following steps to guide you in developing the program. Remember to sketch a flowchart to help organize the program.

a. Store the input data in DATA statements. Each DATA statement should have a line number, contain the date, the daily natural gas meter reading (cubic feet) and the daily electric meter reading (kilowatt hours). For example, if the date is August 3, 1983, the gas reading is 4075 and the electric reading is 67143, then the DATA statement should be:

150 DATA "8/3/83",4075,67143

To include a new day's recording, add a new DATA statement with a larger line number and adjust your program to read the new data.

b. Write commands and statements in the BASIC language that will create a loop to READ the data from the DATA statements, compute the daily consumption, the daily total and the sum to date. This computational loop will be repeated once for each day of data available. (Hint: Use three arrays - one for the date such as D$(I), one for the gas readings such as G(I) and one for the electric readings such as E(I).)

c. Subtract one day's meter reading from the next day's reading to obtain the cubic feet or kilowatt hours used that day.

(Hint: Gas used, GU, equals G(I)-G(I-1) and electricity used, EU, equals E(I)-E(I-1).

d. Convert the cubic feet of natural gas and kilowatt hours of electricity to Btu's with the relationships:

1 cubic foot = 1000 Btu's
1 kilowatt hour = 3413 Btu's

e. Sum the daily gas and electric Btu's for the daily total (Hint: total daily Btu's, TD, equals daily gas Btu's, BG, plus daily electric Btu's, BE.)

f. Add the daily total to the previous sum-to-date for a new sum-to-date.

(Hint: SD = SD + TD.)

g. Display these input data and results on the video or computer printout.

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h. Repeat the loop until all daily data are used. Then end the program.

Results:
1. Which type of energy (gas or electric) had the highest Btu consumption in your home or apartment?

2. Were there any days where the total energy consumption was significantly higher than others?
   If so, what days were these and what day of the week?

3. Can you determine which appliances or other devices might have been causing the heavy consumption? If so, list them.

4. Is there a way some of these appliances could be used less or at a lower energy level?

5. Do the total daily Btu's used fluctuate from day to day? If yes, can you explain why?

Program: Beef Feed and Gain Records

Objective:
To use the computer to establish records of feed consumed, weight gained, and feed-to-weight gain ratio for a group of beef animals.

Benefits:
1. Provide organized use of data gathered on your animals.
2. Show a ratio between the amount of feed the animals consume and the weight gained.
3. Maintain a current record of past and present data.
4. Aid in making predictions on the correct amount of feed required for other animals.

Requirements:
Equipment
1. A microcomputer
2. A printer if a copy is desired

Data
1. Date of each month's input
2. Number of animals in the group
3. Total weight of animals each month
4. Total weight of feed consumed during the month

Procedures:
1. Prepare a data sheet to record the following data once a month on approximately the same day each month:
   a. Date
   b. Number of animals in the group
   c. Total weight of animals in pounds
   d. Weight of feed and pasture consumed in one day in pounds
   e. Number of days between monthly input dates

   The number of animals involved permits averaging of the data and results in case animals are added to or removed from the group during your record period. Obtain the weights of feed (grain, hay, and/or silage) and animals by weighing with proper scales. Remember to include the weight of pasture consumed (on a dry matter basis) which can be estimated
using tables from your 4-H beef project books. Or you may contact an Extension agent or beef cattle specialist for the information. The above format can be used for your data sheet.

2. Store the data in data statements. Each data statement contains the date, the total current weight of the animals (lbs.), the total amount of feeds (lbs.) consumed on date of entry and the number of days in the month. For example, if the date is September 23, 1983, the current weight of animals is 8500 lbs., the amount of feed consumed on this date is 220 lbs., and there are 30 days in the month, then the DATA statement should be

100 DATA "9/23/83",8500,220,30

To include a new month’s recordings, add a new DATA statement and adjust your program to handle the new data.

3. Use a READ command to obtain one month’s set of data and then perform the following computations using the data:

a. Add the weights of the feed and pasture consumption to obtain total feed consumed for one day.

b. Multiply the total feed consumed for one day by the number of days in the month to obtain the total feed consumed for the month.

c. Compute the weight gain of the animals during the month by subtracting one month’s total weight of animals from the next month’s total weight of animals.

e. Compute the ratio of feed-to-weight gain by dividing the total feed consumed in one month by the weight gain of the animals during the month.

f. Display (or print) the results of one month’s computations in the following table form, and then loop back through the same READ statement and computations for each month’s data until all data are used:

<table>
<thead>
<tr>
<th>Date</th>
<th>No. of Animals</th>
<th>Total Wt. of Animals</th>
<th>Weights of One Day’s Consumption</th>
<th>No. Days in Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Grain</td>
<td>Hay</td>
</tr>
</tbody>
</table>

Results:

1. What problems, if any, did you encounter?

2. Do you understand the ratio determined?

3. Did the feed efficiency ratio (lbs of feed/lbs of gain) vary from month to month?

   Yes_____ No_____ 

4. If yes, what might have caused the variation?

5. Can you describe some ways to improve the feed efficiency ratio for your animals?
Program: Dairy Feed and Milk Records

Objectives:
To establish records of feed consumed, milk produced and price values to calculate a loss or gain of profit for a dairy cow.

Benefits:
1. Provides organized use of data gathered monthly on your dairy cow
2. Helps eliminate waste of resources and income
3. Retains past records for future use
4. Simplifies projections of cost of production
5. Shows a calculated gain or loss of income produced by a single cow

Requirements:
Equipment
1. Microcomputer
2. Paper for data recording

Data
1. Date of input
2. Weight of milk produced and silage, grain and hay consumed
3. Price of milk produced and silage, grain and hay purchased or produced

Procedures:
1. Prepare a data sheet to record the following data taken once a month on approximately the same day each month.
   a. Date
   b. Weight and price of milk
   c. Weight and price of silage
   d. Weight and price of grain
   e. Weight and price of hay
   f. Number of days between monthly dates

Obtain the weights of feed (grain, hay, and/or silage) with proper scales or measurement instruments. Consult your Extension agent for price tables of the value of feed (grain, hay and/or silage) and milk produced. The two tables shown below can be used for your data sheet:

**TABLE 1**

<table>
<thead>
<tr>
<th>DATE</th>
<th>WEIGHT OF SILAGE</th>
<th>WEIGHT OF GRAIN</th>
<th>WEIGHT OF HAY</th>
<th>WEIGHT OF MILK</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

**TABLE 2**

<table>
<thead>
<tr>
<th>PRICE OF SILAGE</th>
<th>PRICE OF GRAIN</th>
<th>PRICE OF HAY</th>
<th>PRICE OF MILK</th>
<th>NUMBER OF DAYS IN MONTH</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

2. Store the data in DATA statements, adding a new statement for each month’s data. Each DATA statement contains the date, weight and price of silage, grain, hay and milk on the measurement date. If the date is October 3, 1983, weight and price of silage is 18 lbs. @ .015, grain is 7 lbs. @ .05, hay is 19 lbs. @ .035, amount of milk is 70 lbs. @ .13 and the number of days is 30, then the DATA statement would look as follows:

```
DATA "10/3/83",18,7,19,70,.015,.05,.035,13,30
```

To include a new month’s recordings, add a new data statement and adjust your program to handle the new data.
3. Use a READ statement to obtain one month's set of data and then perform the following computations using the data:
   a. Multiply the silage, hay and grain consumed in one day by the number of days in the month. This will give you an approximate total for one month's consumption in each category.
   b. Multiply the milk produced for one day by the number of days in the month to obtain an approximate total for one month.
   c. Compute the cost of feed and value of milk by multiplying the price of silage, hay, grain and milk by the totals for one month as calculated in (a) and (b) above.
   d. Calculate your own production gain or loss by subtracting all your cost of feed from the value of milk produced.
   e. Display (or print) the results of one month's computations in the following table form. Now loop back to the READ statement for each month until all data are used.

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOTAL</th>
<th>TOTAL</th>
<th>TOTAL</th>
<th>TOTAL</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COST OF SILAGE</td>
<td>COST OF GRAIN</td>
<td>COST OF HAY</td>
<td>PROFIT OF MILK</td>
<td>GAIN OR LOSS +/-</td>
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</tr>
</tbody>
</table>

Results:
1. What problems did you encounter?

2. Did your production gain vary in amounts?
   Yes_____ No_____
   Why?

3. What kind of improvements did you incorporate to make this program more useful to you, if any?

4. How could this recordkeeping concept be useful in other activities?

5. Did you understand READ-DATA statements?
Demonstrations and Illustrated Talks

Give a demonstration or illustrated talk on computers to help others learn.
- Research the uses of some available computer software and tell your 4-H group what you have learned.
- Demonstrate how to use several available 4-H computer programs such as the ones listed in this project.
- Show how to develop a program.
- Give some examples of the uses of ARRAYS and DATA-READ statements in development of programs.

Conclusion

This project has exposed you to many important aspects about hardware, software, benefits of microcomputers, advantages of existing software, and how to develop your own program. Computer programming does not stop here! There are many advanced computer programming commands, techniques and languages that have not been discussed. More information on computer programming can be obtained by reading books, talking to professionals, and taking courses to broaden your knowledge. Computer programming is the way of the future and will affect us all. The more you know about it will put you one step into tomorrow. Good Luck!
PROJECT RECORD FORM

Name ___________________________ School ___________________________

County __________________________ Birth Date ___________________________

Name of 4-H Club/Group ____________ Today’s Date _________________________

A. Tell what you learned in this project (for example, how to develop a flowchart and how to use arrays and DATA-READ statements).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

B. List any activity related to this project in which you participated, such as group meetings, tours, exhibits, demonstrations.

________________________________________________________________________
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________________________________________________________________________

C. List any awards or recognition you have received in this project.

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________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________

D. If you helped others with their computer project, give the number of people you helped and what you did to help them.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
E. Write a story telling what you did and learned including how the project helped you, who helped you with the project, and why computers are important to us.
This publication was promulgated at a cost of $979, or 42.6 cents per copy, to teach 4-H members about computers. 6-2. 3M-85